GREEN VOLT

Chapter 4

Site Selection and Assessment of Alternatives

Offshore EIA Report: Volume 1

Revision history

Revision	Date	Description	Prepared	Checked	Approved
1	08/02/2022	First draft	CC (Royal HaskoningDHV)	JM (Royal HaskoningDHV)	VC (Flotation Energy)
2	15/12/2022	Second draft	CC (Royal HaskoningDHV)	JM (Royal HaskoningDHV)	VC (Flotation Energy)
3	10/01/2023	Final for submission	JM (Royal HaskoningDHV)	CM (Royal HaskoningDHV)	VC (Flotation Energy)

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Acronyms

Acronym	Description
AC	Alternating Current
AfL	Area for Lease
AoS	Area of Search
BEIS	Department for Business, Energy and Industrial Strategy
BGS	British geological Survey
CCS	Carbon Capture and Storage
CES	Crown Estate Scotland
DC	Direct Current
DPO	Draft Plan Option
EIA	Environmental Impact Assessment
ESO	Electricity System Operator
GIS	Geographical Information System
HDD	Horizontal Directional Drilling
HND	Holistic Network Design
HNDFUE	Holistic Network Design Follow Up Exercise
HRA	Habitats Regulations Appraisal
HVDC	High voltage direct current
INTOG	Innovation and Targeted Oil and Gas
MHWS	Mean High Water Springs
MPA	Marine Protected Area

MS-LOT	Marine Scotland Licensing Operations Team
MSS	Marine Scotland Science
MW	Megawatt
NETS	National Electricity Transmission System
NGESO	National Grid Electricity System Operator
NMP	National Marine Plan
NSTA	North Sea Transition Authority
O&M	Operation and Maintenance
OGA	Oil & Gas Authority
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OSP	Offshore Substation Platform
OTNR	Offshore Transmission Network Review
PAC	Pre-application Consultation
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TLP	Tension Leg Platform
TO	Transmission Operator
WTG	Wind Turbine Generator

Glossary

Term	Description
Applicant	Green Volt Offshore Windfarm Ltd.
Buzzard	Buzzard Platform Complex.
Buzzard Export Cable Corridor	The area in which the export cables will be laid, from the perimeter of the Windfarm Site to Buzzard Platform Complex.
Green Volt Offshore Windfarm	Offshore windfarm including associated onshore and offshore infrastructure development (Combined On and Offshore Green Volt Projects).
Horizontal Directional Drilling	Mechanism for installation of export cable at landfall.
Inter-array cables	Cables which link the wind turbines to each other and the offshore substation platform.
Landfall Export Cable Corridor	The area in which the export cables will be laid, from the perimeter of the Windfarm Site to landfall.
Mean High Water Springs	At its highest and 'Neaps' or 'Neap tides' when the tidal range is at its lowest. The height of Mean High Water Springs (MHWS) is the average throughout the year, of two successive high waters, during a 24-hour period in each month when the range of the tide is at its greatest (Spring tides).
Moorings	Mechanism by which wind turbine generators are fixed to the seabed.
NorthConnect Parallel Export Cable Corridor Option	Landfall Export Cable Corridor between NorthConnect Parallel Landfall and point of separation from St Fergus South Export Cable Corridor Option.
NorthConnect Parallel Landfall	Southern landfall option where the offshore export cables come ashore.
Offshore Development Area	Encompasses i) Windfarm Site, including offshore substation platform ii) Offshore Export Cable Corridor to Landfall, iii) Export Cable Corridor to Buzzard Platform Complex.
Offshore export cables	The cables which would bring electricity from the offshore substation platform to the Landfall or to the Buzzard Platform Complex.
Offshore Export Cable Corridor	The proposed offshore area in which the export cables will be laid, from offshore substation to landfall or to the Buzzard Platform Complex.
Offshore infrastructure	All of the offshore infrastructure, including wind turbine generators, offshore substation platform and all inter-array and export cables.
Offshore substation platform	A fixed structure located within the Windfarm Site, containing electrical equipment to aggregate the power from the wind turbine generators and convert it into a more suitable form for export to shore.
Onshore Export Cable Corridor	The proposed onshore area in which the export cables will be laid, from landfall to the onshore substation.
Project	Green Volt Offshore Windfarm project as a whole, including associated onshore and offshore infrastructure development.

Safety zones	An area around a structure or vessel which must be avoided.
St Fergus South Export Cable Corridor Option	Landfall Export Cable Corridor between St Fergus South Landfall and point of separation from NorthConnect Parallel Export Cable Corridor Option.
St Fergus South Landfall	Northern landfall option where the offshore export cables come ashore.
Windfarm Site	The area within which the wind turbine generators, offshore substation platform and inter-array cables will be present.

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CHAPTER 4: SITE SELECTION AND ASSESSMENT OF ALTERNATIVES

4.1 Introduction

1. This chapter details the site selection process that was undertaken for the Project (in this instance the Project refers to the offshore elements of the Green Volt Offshore Windfarm only, up to Mean High Water Springs (MHWS)), and alternative sites considered for the Project.

2. Section 5 of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 and Schedule 4 of the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 requires that information pertaining to alternative sites considered through the site selection process is provided in any submitted Environmental Impact Assessment (EIA) (Scottish Government, 2017) :

3. "*An EIA report is a report prepared in accordance with this regulation by the developer which includes (at least) a description of the reasonable alternatives studied by the developer, which are relevant to the development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment*."

4. "*A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the applicant, which are relevant to the proposed works and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects."*

5. Where decisions on the Project are still to be made, all studies will consider the differences in environmental effects over the full wind farm lifecycle, including decommissioning

4.2 Key Components of the Project

6. The Project (**Figure 5.1**) will comprise the following main offshore components:

   - Wind turbine generators (WTGs) and their associated floating platforms and moorings;
   - Offshore substation platform (OSP) and associated foundation(s);
   - Subsea cables – offshore export cable(s) to subsea terminus using Horizontal Directional Drilling (HDD) at landfall, offshore export cables to Buzzard Platform Complex (Buzzard), inter-array cables; and
   - Wave buoys and Lidars.

7. The onshore works, including HDD of two ducts at landfall, onshore buried cable corridor, onshore substation and associated temporary and permanent compounds, infrastructure, access roads, earthworks and landscaping, will be subject to a separate application made to Aberdeenshire Council and are not considered within this document.

8. Further details of the key components of offshore infrastructure can be found in **Chapter 5: Project Description**. Details of the key components of onshore infrastructure will be presented in the separate **Onshore EIA Report**.

4.3 Site Selection Process and Consultation

9. The Project site selection process has followed IEMA mitigation hierarchy (IEMA, 2013), firstly to avoid causing adverse effects on the environment, and secondly to minimise any adverse effects that might occur. Site selection for the project has been influenced by the following key factors:

- Crown Estate Scotland's (CES) Innovation Targeted Oil and Gas (INTOG) Decarbonisation Leasing Round (discussed further in **Section 4.4.1** and **Chapter 2: Need for the Project**);
- Identification of at least one suitable offshore oil and gas platform to supply power to;
- Scotland's National Marine Plan;
- Marine Scotland's Offshore wind energy - draft sectoral marine plan: strategic environmental assessment (SEA);
- Department for Business, Energy and Industrial Strategy – Offshore Petroleum Regulator for Environment and Decommissioning (BEIS/OPRED) Offshore Energy SEA;
- Initial Plan Framework Sectoral Marine Plan for Offshore Wind for INTOG; and
- Scottish National Marine Plan (NMP)/environmental sensitivity data.

10. The site selection and project design process is an iterative one, involving early engagement with stakeholders. Consultation and engagement with landowners, communities and regulators enables communication of the reasons for site selection decisions and allows for the feedback received to influence and refine the project design. Further details are provided in **Chapter 6: EIA Methodology**, and in the consultation section within **Chapters 7 to 20** of this **Offshore EIA Report**, which summarise the consultation undertaken to inform and focus the approach to each technical aspect of the EIA. Specific details of how the project has taken account of the comments received are also provided in each chapter of this **Offshore EIA Report** where relevant.

11. The siting, design and refinement of the Project have taken account of environmental, physical, technical, commercial and societal considerations and opportunities as well as engineering requirements. This is with the aim of identifying sites that will be environmentally acceptable, deliverable and able to achieve consent, whilst also enabling decarbonisation within the oil and gas industry.

12. Green Volt Offshore Windfarm Limited (the Applicant) has undertaken pre-application engagement with stakeholders, communities and landowners to seek input to refine the Project's design, and to communicate key decisions made with regard to both design and location. Feedback from stakeholders has shaped the design of the Project, including adaptation of the Windfarm Site boundary to avoid an area of commercial fishing interest (see **Chapter 13: Commercial Fishing**).

13. Consultation on refinements to the Project site selection, layout and configurations have been undertaken through both informal and formal pre-application stages. The feedback received has been taken into consideration throughout the Project design process, via a range of means including (but not exclusively limited to):

    - Provision of Offshore **Scoping Report** (Royal HaskoningDHV, 2021) (**Appendix 1.2**) and receipt of **Scoping Opinion** (Marine Scotland Licensing Operations Team; MS-LOT, 2022) (**Appendix 1.1**);
    - Targeted consultation with regulators and key marine and local stakeholders, via
        - Emails;
        - Meetings;
        - Workshops;
    - Provision of dedicated project website https://greenvoltoffshorewind.com/; and
    - Pre-Application Consultation (PAC) (including provision of project details and dedicated interactive virtual event) and **Offshore PAC Report** (**Appendix 6.2**).

14. The consultation process is discussed further in **Chapter 6: EIA Methodology**. Consultation relating to onshore works will be discussed in the **Onshore EIA Report**.

4.4 Identification of the Windfarm Site

15. The proposed Project is to be located on the decommissioned Ettrick and Blackbird oil and gas developments, which ceased production in 2016, with final decommissioning activities currently being finalised. Ettrick and Blackbird fields are brownfield sites with large amounts of site data captured, including EIA and Environmental Appraisal reports during previous oil and gas field construction, operation and decommissioning works. The Applicant will utilise this data to inform EIA, Habitats Regulations Appraisal (HRA) and other associated consent submissions of the Project. The data has also been used to avoid key environmental impacts where possible (as discussed further within this chapter), in line with the mitigation hierarchy (see **Chapter 6: EIA Methodology**). In 2019, the Applicant started the process of the identification of a suitable project development area to support the installation of a floating offshore wind for the purpose of supporting the decarbonisation of the oil and gas platforms in the North Sea. This process, which included a Geographical Information System (GIS) review of environmental sensitivity data, created the initial project concept for the Green Volt Offshore Windfarm, which was based on the review of early phase scoping reports of the offshore wind energy draft sectoral marine plan SEA, where oil and gas areas were specifically excluded from the area of search in 2018 (Marine Scotland Science (MSS), 2018). Figure 24 of the document (MSS, 2018) shows the reduced potential environmental impact across the Ettrick and Blackbird field, whilst Figure 25 shows the industrial weighting which identifies the oil and gas impact in this area. Oil and gas installation locations in the North Sea overlapped with some of the Areas of Search (AoS), which were revised to decrease the overlap with oil and gas clusters and reduce potential impacts with the oil and gas industry.

16. Key environmental factors which shaped the Project site selection process included:

- Siting the Windfarm Site beyond sight of shore, therefore avoiding seascape, landscape and visual effects;
- An initial site selection assessment was undertaken using the recently (Cleasby et al. 2018) published RSPB Hotspot mapping GIS data layers. These data were used to help support the selection of the wind farm site over sites to the west and due east of the Buzzard oil platform. These data suggested higher seabird numbers than the Green Volt site and therefore the site was selected. Additionally, in 2019, the site was outside the maximum foraging range for Kittiwake *Rissa tridactyla* from any Scottish bird colony;
- Avoiding areas important for the commercial fishing industry;

17. In addition, the following constraints were also considered;

- Wind resource;
- Safety (shipping, navigation and hard constraints i.e. infrastructure); and
- Engineering.

18. As part of the initial draft plan option (DPO) identification scoping work, it was identified that several oil and gas developments located in the area between DPO NE7 and E2 had been considered a hard constraint for offshore wind development and that these areas of search were removed from the overall sectoral marine plan process at an early stage.

19. The site selection process identified two potential project areas that were available for brownfield redevelopment and the Applicant then undertook a high-level assessment to confirm which site development area should be taken forward for additional assessment. The key consideration for this review was the potential distances to surrounding oil platforms that had significant power requirements (demand) and long-term future operational life spans (at least 15 years). This review clearly showed that the Buzzard Platform Complex (Buzzard) (consisting of four platforms) is a suitable oil platform complex to start the process of electrification with offshore wind power. Buzzard has a relatively long remaining operating life, but it is also one of the largest platform complexes in

the North Sea (hence electrification abates notable quantities of associated emissions from power generation activities) and is sufficiently close to land to enable an alternating current (AC) electrical connection to the UK grid. AC electrical connections are considered preferable over direct current (DC) at shorter distances due to their lower costs and use of transformers allowing for voltage to be raised and lowered, minimising power losses over long distances. Buzzard has an annual baseload demand of 70 Megawatts (MW).

20. It is also of note that Buzzard is in an area within close proximity of a number of other oil fields that could benefit from decarbonisation in future (**Figure 17.2**). As such, locating a wind farm near Buzzard with an operating life in excess of the platform complex offers the opportunity to serve neighbouring installations. Other Outer Moray Firth platforms will also have the potential to use electricity generated by the Project.

21. The development of the Project was discussed with Marine Scotland and Crown Estate Scotland at the early stages.

22. The initial concept was based around directly locating wind-turbines on the main platform structure, but it was quickly determined to be unsuitable due to limits with capacity and availability which would not de-couple the need for gas-powered generation on the platform. After economic modelling the wind farm capacity versus platform power demands, the concluded configuration was to link a standalone wind farm with Buzzard and the national grid to ensure uninterrupted power availability to the platform. This also created an opportunity for providing renewable power to shore from an area with higher expected wind resource availability compared to offshore locations closer to shore. For the Windfarm Site, the average annual wind speed is recorded at 10.80 - 10.98 m/s, significantly higher than the inshore offshore wind farm sites in Scottish waters and will result in higher operational hours for the turbines.

23. Having selected Buzzard as a target consumer for electrical power, a number of sites as candidates for installation of an offshore floating wind farm were investigated. Two sites were considered in detail – these were:

- The decommissioned Ettrick and Blackbird oil and gas field, 20 km from Buzzard; and
- The decommissioned Buchan oil and gas field, approximately 50 km east of Buzzard (**Figure 17.2**).

24. It was subsequently noted that, in light of the discovery of additional oil reservoirs, a new oil production development will be located at the old Buchan oil field by Jersey Oil and Gas Plc which is scheduled to become active within the next decade; therefore, rendering this site unsuitable for the development of an offshore wind farm. This site selection review took account of and also identified the following key advantages for the Ettrick and Blackbird site:

- Located 20 km away from Buzzard, minimising cable route;
- A brownfield development area with significant and long-term environmental datasets;
- Significant site geotechnical and geophysical data set availability to minimise future survey requirements (such as soil sampling and vessel-based surveys) and accelerate site development activities;
- Water depth (100-115 m) is suitable for the deployment of floating wind turbine substructures fitted with the next generation of offshore turbines (>10 MW);
- Average mean wind speed of 10.93 m/s (UK Offshore Wind Resource Dataset 2015 – Hindcast of 30-year average at 110 m above sea level by The Met Office) (The Crown Estate, 2015);
- Favourable seabed and environmental conditions for floating wind technology;
- Current shipping and fishing activity at the site is limited due to the present oil and gas designation;
- Not within any environmental designated sites;

- The site is 80 km from shore, which will minimise seascape and landscape visual effects;
- Existing datasets for the area confirm that ornithological activity within the site is less than locations closer to shore and breeding colonies;
- The location further from shore has access to an increased wind resource for a given footprint, in turn providing an increased value proposition; and
- Floating substructures have reduced impact during construction and decommissioning since the seabed anchor points need not be piled or cemented. The seabed conditions within the area are already known to be conducive with suction anchors or drag anchors, due to the existing datasets available for the area.

25. The site boundaries will be selected from within the area identified in the Area for Lease (AfL) applied for through CES INTOG leasing round (discussed further in **Section 4.4.1** and **Chapter 2: Need For The Project**). The Windfarm Site will cover a relatively small area, approximately 116 km², but further engineering assessments will be required to confirm the area and optimum layout once turbine and foundation selection have been made.

4.4.1 Crown Estate Scotland's Innovation and Targeted Oil and Gas (INTOG) Decarbonisation Leasing

26. The North Sea Transition Deal, agreed between the UK Government and UK oil and gas industry, was announced in March 2021, and includes targets to reduce CO_2 emissions in line with Scottish and UK targets. Further details are provided in **Chapter 2: Need for the Project** and **Chapter 3: Policy and Legislation**. The sector deal will support workers, businesses, and the supply chain through the transition to a low carbon future by harnessing the industry's existing capabilities, infrastructure and private investment potential to exploit new and emerging technologies such as hydrogen production, Carbon Capture Usage and Storage (CCS), offshore wind, as well as supporting decommissioning.

27. Platform electrification is a key component of the North Sea Transition Authority's (NSTA) vision for an integrated energy basin. The OGA's Energy Integration Report (OGA, 2019) found that the UK Continental Shelf could (through a mix of platform electrification, carbon capture and storage, offshore wind and hydrogen) absorb up to 60% of the UK's entire CO_2 abatement needed to achieve net zero emissions by 2050.

28. The Scottish and UK Governments are currently encouraging the development of floating offshore wind farms as a method of reducing the greenhouse gas emissions generated from the operations of oil and gas facilities. CES has established the INTOG leasing round, in line with Marine Scotland's Initial Plan Framework for Offshore Wind for INTOG projects, to encourage developers to submit lease applications to develop floating offshore wind projects that will specifically power renewable electricity for offshore oil and gas facilities in Scottish waters (Crown Estate Scotland, 2021). The areas designated in the leasing round are situated next to oil and gas facilities which are actively seeking to support their operations with renewable electricity production to reduce greenhouse gas emissions.

29. In parallel to the site selection works being undertaken by the Applicant, an Opportunity and Constraint analysis has been undertaken by Marine Scotland (Marine Scotland 2021 and Marine Scotland, 2022) examining at a national scale potential areas of opportunity for future development in line with the Plan specification. In line with Scottish Government strategies and commitments, it also examines areas where constraints or multiple conflicts may present challenges to future development, including negative effects for other sea users or environmental receptors. The full process and list of data considered is outlined in the Plan Specification and Context Report (Marine Scotland, 2021). This analysis identified initial broad areas of opportunity, and these were outlined as a series of Areas of Search (where development could take place) and areas of Exclusions (where development under this planning process would not be considered).

30. The Applicant will seek to acquire a site lease in accordance with the INTOG process. At the time of writing in Q1 2023, the Windfarm Site falls entirely within proposed Area of Search site Eb, identified by the INTOG process (Marine Scotland 2021, Marine Scotland, 2022). Potential INTOG projects will be able to apply for exclusivity agreements at an early stage, although only project locations included within the final INTOG plan will be awarded Option Agreements. Projects that progress through the planning process will still require the appropriate marine licences and Section 36 consent under the Marine (Scotland) Act 2010 and the Electricity Act 1989, respectively.

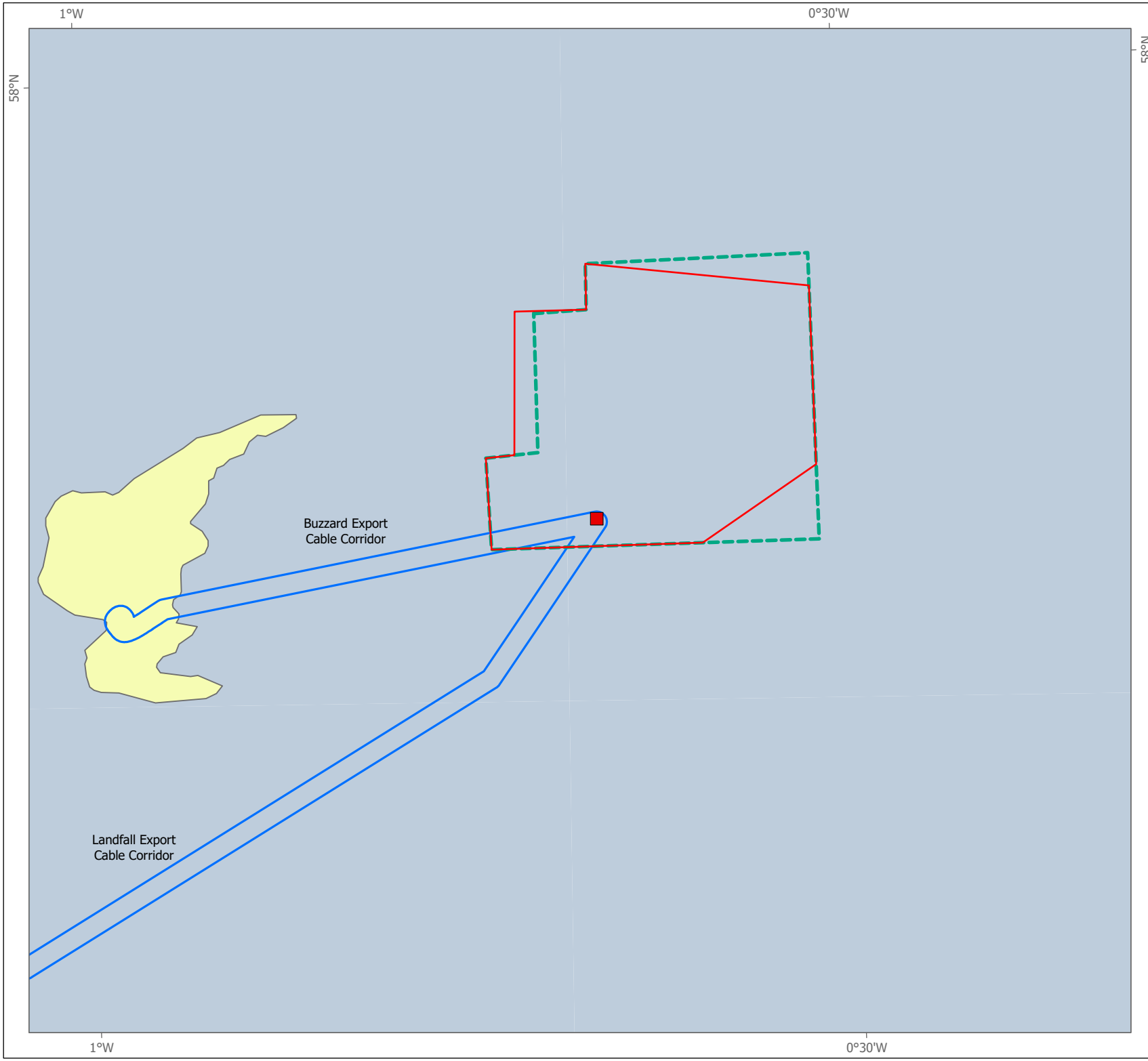
4.4.2 Assessment of Alternatives within the Windfarm Site boundary

31. Following identification of the Ettrick and Blackbird oil and gas fields for development of the Project, further refinement of the project boundaries has taken place. The initial Windfarm Site boundary presented in the Project's **Offshore Scoping Report** (**Appendix 1.2**) was defined by the oil and gas lease block area for Ettrick and Blackbird, to ensure the Windfarm Site was located entirely within the long-term brownfield site where basic British Geological Survey (BGS) and water depth data was known. The boundary has been adapted to further minimise potential environmental interactions through the following changes:

- Firstly, the southeast corner of the Windfarm Site was removed, reducing the site from 123.42 km^2 to 116.79 km^2. During stakeholder engagement and consultation with the local fisheries community, it was identified that the southeast portion of the red line boundary was of importance to the commercial fishing industry (**Chapter 5: Project Description** and **Chapter 13: Commercial Fisheries**). In response, the Applicant made the decision to completely remove this portion of the red line boundary of the site to minimise adverse effects on the fisheries community.
- Secondly, an area to the northeast of the Windfarm Site was removed, reducing the site by 5.54 km^2. This reduction was the result of Crown Estate Scotland placing a buffer zone between the INTOG lease area Eb, and a carbon capture storage site licensed by the NSTA to Storegga Limited for their Acorn Carbon Capture and Storage project. This 5.54 km^2 reduction ensures the Project is maintained within the boundary of the INTOG lease area and minimises adverse effects on other marine users.

  To offset the reduction in Windfarm Site area due to the refinements discussed above, the Applicant has increased the Project's western boundary by 4.73 km^2 to accommodate the new project design envelope. The Applicant already had all necessary survey data for this area, and it remains within the INTOG lease area Eb. This slight extension to the west is within the area surveyed during baseline geophysical and benthic surveys. It does not generate any additional potential environmental impacts beyond those identified by the Applicant or stakeholders during the Scoping Phase, and aligns with the assessments already being considered within this **Offshore EIA Report**. As such, the Applicant is confident that this slightly revised area does not result in any changes to the conclusions of the **Offshore Scoping Report** (**Appendix 1.2**) or **Scoping Opinion** (**Appendix 1.1**) and all relevant stakeholders have been informed and updated of these changes during the process of preparing the **Offshore EIA Report** and application (see **Offshore PAC Report**) (**Appendix 6.2**).

32. **Figure 4.1** shows the refinements made to the Windfarm Site boundary.



LEGEND

- Green Volt Offshore Wind Farm
- Offshore Export Cable Corridor
- Original Wind Farm Site Boundary
- Offshore Substation Platform
- Buzzard Oil Field

0 8

Kilometres

Data:
Esri, HERE, Garmin
Esri, HERE

Contains data from OS Zoomstack

PROJECT: GREEN VOLT

TITLE: Figure 4.1 Changes to the Windfarm Site boundary

VER	DATE	COMMENTS	DRAWN	CHECKED
001	13/01/2023		GC	CM

ARCGIS REF: PC2483_RHD_EIA_Offshore_Chpt_ProjectDescription
LAYOUT: PC2483-RHD-EI-OF-D-GS-0063

SCALE:	PAGE SIZE:	COORDINATE SYSTEM:
1:200,000	A4	WGS 1984 UTM Zone 30N

GREEN VOLT

Royal HaskoningDHV
Enhancing Society Together

33. A number of potential constraints remain within the Windfarm Site, including decommissioned wells and pipelines from oil and gas activities within the Ettrick and Blackbird oil and gas fields which are well-documented in historic and Project specific baseline datasets, and will be avoided through the site selection process. Once the decommissioning programme is complete, there is no legislation that states how decommissioned fields with infrastructure left in-situ are to be re-used. The Applicant has engaged with the oil and gas industry on post decommissioning requirements but in the absence of guidance or regulations at this point the Applicant is assessing and continuing dialog with regulators on appropriate exclusion zones. The Applicant endeavours to use industry best practice, for example a floating substructure will not be placed directly above a decommissioned well. The possibility of co-locating the offshore substation with the existing Buzzard Platform Complex, as opposed to installing a new fixed jacket platform within the Windfarm Site was considered. This was discounted due to the requirement to provide capacity (i.e. weight and space) on Buzzard. In addition, the platform life may not coincide with the wind farm life and restricts connection of the Project to Buzzard where there may be opportunity to connect to further nearby oil and gas facilities.

4.5 Grid Connection Point

34. Developers wishing to connect new electricity generation to the National Electricity Transmission System (NETS) must make a connection application to the Electricity System Operator (ESO). A modification application is also required to be submitted to ESO when developers amend their proposals. When the proposed development is an offshore wind farm, the connection options are comparatively assessed to identify the most appropriate connection location.

35. The assessment and identification of the project connection point to the NETS was undertaken by National Grid Electricity System Operator (NGESO) alongside the Transmission Owner (TO), who in the north of Scotland are SSEN Transmission Plc. This process resulted in a grid connection offer being made to the Applicant to connect to New Deer 400kV substation.

36. The New Deer onshore grid connection point, located in Aberdeenshire approximately 35 km from the potential landfall options, was defined by NGESO in their June 2021 Offer as the grid connection point for the Project. The location of the New Deer site provides a number of options for landfall both north and south of Peterhead, which have been considered by the Applicant as part of the onshore site selection works (**Onshore Scoping Report**). The location of New Deer is also a suitable location for the connection point, based on economic and technical grounds, as the limited distance to the National Grid network means the project can justify using an AC transmission system.

37. In July 2020 UK government launched the Offshore Transmission Network Review (OTNR) which was tasked with developing a strategy to co-ordinate interconnectors and offshore networks for wind farms and their connections to the onshore NETS. As part of this review NGESO have developed the Holistic Network Design (HND) to coordinate offshore generators. The INTOG projects were not part of the July 2022 HND (which covered Round 4 and 11GW of ScotWind projects) however they are expected to be part of an HND follow up exercise (HNDFUE). The scope for the current HNDFUE excludes INTOG but is expected to provide recommendations for the remaining ScotWind projects in March/April 2023. After this process the INTOG projects will be assessed against the HNDFUE recommendations. This process is ongoing.

38. The process looks at technical, commercial, regulatory, environmental, stakeholder, planning and deliverability aspects to identify the preferable connections for the consumer. The Electricity Act 1989 requires transmission networks, when formulating proposals, to be efficient, co-ordinated and economical whilst also having regard to the environment. When the development being connected is offshore, the offshore aspects need to be considered in that evaluation too. The assessment process therefore looks to minimise the total capital and operational cost whilst taking into account other key considerations as outlined.

4.6 Assessment of Infrastructure

4.6.1 Technology Decisions

39. The waters within the Windfarm Site are too deep for fixed turbines, and therefore floating technology is required. Several potential floating substructure foundation designs are being evaluated for use on the Project (see **Chapter 5: Project Description** for further details). These are semi-submersible, tension leg platform (TLP) and barge foundations. The spar foundation system has been removed from further consideration due to the water depth at the proposed site being too shallow for the system to be viable. One of the primary concerns regarding foundation type will be to minimise the mooring lengths, so that the clearance between turbines may be maximised. In design of the Project, the Applicant will seek to minimise mooring radius for environmental, economic and operational factors. Other elements that will be considered during the technology evaluation will be the long-term reliability of the foundation, its service life and minimising maintenance where possible.

40. Currently under evaluation is the size and type of WTG that will be utilised for the Project, with this decision potentially impacting on the size of the eventual array site. For example, if larger WTGs were selected to be used, this could result in fewer units being required and thus a potential reduction in array site size, and their layout within the array site. **Chapter 5: Project Description** provides further information on the size/type of WTG being considered in the design envelope.

4.6.2 Construction/Operation/Maintenance Base Selection

41. Potential construction and operation and maintenance (O&M) bases are currently under evaluation, with the selection being driven by reducing the environmental impact, in part by minimising the distance from the wind farm. This will apply to both the construction stage along with the operation and maintenance phase.

42. Construction and operation and maintenance ports may be at different locations. The construction port will be temporary and the decision as to which port is used will be driven by distance to Windfarm Site, location, capacity, assembly and storage space, draught and bearing capacity of the quay. The decision as to the location of the permanent Operation and maintenance port will be driven by distance to Windfarm Site, location, capacity and commercial factors.

4.7 Landfall Export Cable Corridor and Landfall Appraisal

43. This section details the options considered for the Landfall Export Cable Corridor and Landfall options, and how the decision process was guided by environmental factors.

4.7.1 North/South of Peterhead – Landfall Options

44. The landfall location for the export cable has not yet been determined; however, two principal areas are currently under consideration and assessed in this **Offshore EIA Report (Figure 1.1)**. Any option must provide a viable onward routing solution to the New Deer grid connection point identified by National Grid (see **Section 4.6** above):

- St Fergus South Landfall Option: Located north of Peterhead with various possible locations for an onshore / offshore jointing pit and onward cable to New Deer. Locations to the north allow the project to avoid the Buchan Ness to Collieston Special Protection Area (SPA) and Special Area of Conservation (SAC) but provide a more complex path onshore with a number of river crossings on route to the project substation at New Deer.
- NorthConnect Parallel Landfall Option: located south of Peterhead with various possible locations for an onshore / offshore jointing pit and onward cable to New Deer. Locations to the south may require crossing the Buchan Ness to Collieston SPA and SAC via HDD and is co-locating with the NorthConnect High Voltage Direct Current (HVDC) Link cable.

45. A Landfall Feasibility Report has been undertaken (**Appendix 4.1**) which considers potential landfalls at NorthConnect Parrallel and St Fergus South from a practical, constraint and feasibility perspective including environmental, cultural and technical considerations. Both landfalls were considered feasible. The final decision on landfall location will be determined following a detailed evaluation of the potential routes from the landfall options and New Deer, which will be presented within the **Onshore EIA Report**. Key principles that will inform the onshore cable corridor site selection exercise include:

- Accommodation of a corridor 60 m wide and up to 250 m at trenchless crossings;
- Preference for shortest onshore cable to minimise the overall footprints and the number of receptors that will be affected;
- Landowner acceptance;
- Avoid populated areas, where possible; and
- Avoid key sensitive features, where possible, such as sites designated for nature conservation (e.g. SPA, SAC, Site of Special Scientific Interest (SSSI)), historic designations (e.g. scheduled monuments); flood zones / drinking water protected areas, quarries, military activities, contaminated land and other infrastructure (e.g. buried cables, railways, roads).

46. For either location, HDD will be used to take the cable from the jointing pit to a location approximately 750 m offshore.

47. Open trenching the landfall connection is not proposed as that technique would either require crossing Buchan Ness to Collieston SAC / SPA (NorthConnect Parallel) or Peterhead golf course (St Fergus South) within the Buchan Ness to Collieston SAC or SPA to avoid direct impacts on the Annex I vegetated sea cliff features for which the SAC is designated, that support semi-natural plant communities. These communities are now rare on the coast of northeast Scotland, with this section of coastline containing some of the best remaining examples (JNCC, 2022). HDD works would also be undertaken outside of April to August breeding season when the SPA colony will be breeding on the sea cliffs. For both landfall options, the marine terminus of the HDD avoids exiting the seabed within the Southern Trench Marine Protected Area (MPA) to avoid direct impacts to the MPA.

4.7.2 Landfall Export Cable Corridor identification

48. A large majority of the Landfall Export Cable Corridor will follow the currently consented NorthConnect route to the north Aberdeenshire coast. Collaboration and data sharing is underway with the NorthConnect HVDC Link project. The project benefits from access to the NorthConnect's data and a proximity agreement will be in place to allow an element of sharing with the pre-selected route that minimises impact. The NorthConnect landfall route is also based on HDD solutions.

49. Although crossing the Southern Trench MPA, the Landfall Export Cable Corridor avoids the key designated benthic features of the protected site (See **Chapter 9: Benthic Ecology**). Careful site selection ensured that muds of high geodiversity value were avoided by the Offshore Export Cable Corridor so that the mud would not be affected by cable installation. The route also benefits from minimising the number of cable and pipeline crossings and avoidance of disposal sites and oil and gas infrastructure whilst utilising suitable seabed conditions.

4.8 Summary

50. This site selection and assessment of alternatives chapter explains this process and presents the final project design included within the **Offshore EIA Report**. The parameters for the final project design included within the EIA Report are included in **Chapter 5: Project Description** and shown in **Table 4.1**.

Table 4.1: Summary of key site selection decisions

Infrastructure Element	Options Considered	Decision	Main Environmental Benefits
Windfarm Site location	North Sea, narrowed down to Ettrick and Blackbird oil and gas field or Buchan oil and gas field	Ettrick and Blackbird oil and gas field	Brownfield site Significant and long term historic environmental data from oil and gas activities on site Avoids hard constraints (including existing infrastructure) Lower impact zone for kittiwake foraging (agreed through ornithological work groups with NatureScot, RSPB and Marine Scotland Science) Minimises environmental interactions (low commercial fishing activity, lower levels of ornithology interest compared to nearshore sites, low shipping activity) Close to Buzzard (which has long-term future operational life span and four platforms, requiring 30 MW per year to maintain operations) Close to other oil and gas facilities for potential future connections and associated decarbonisation benefits Potential to provide renewable power to shore from an area with higher expected wind resource availability compared to offshore locations closer to shore Avoids landscape and seascape effects due to distance from shore (80 km) Suitable seabed conditions for floating system High wind resource
Windfarm Site boundary	Ettrick and Blackbird oil and gas field, reduced to area in **Offshore Scoping Report**	Removal of northeast corner of scoped area	Maintains footprint wholly within revised INTOG area
		Removal of south-east corner of scoped area	Avoids area of commercial fisheries interest
		Increase at western boundary to compensate reductions discussed above	Avoids infrastructure / environmentally sensitive areas and within area for which baseline data is collected
Offshore substation location	Within Green Volt Windfarm Site or on Buzzard Platform	Within Green Volt Windfarm Site	Allows Buzzard to be decommissioned at end of life if that is prior to the Project's end of life and maintains flexibility to connect to and decarbonise other nearby oil and gas facilities.
Size of turbines	14MW to 16MW turbines	Currently unconfirmed	Although the size of turbines is not confirmed, larger (16 MW) turbines are under consideration in the design envelope. Should larger turbines be chosen, this will reduce the number of units required. The final decision will be based on engineering and environmental constraints.

Infrastructure Element	Options Considered	Decision	Main Environmental Benefits
Floating substructures	Semi-submersible, TLP and barge designs	Currently unconfirmed	Spar system have not been considered as they are not suitable for the water depth. Part of the evaluation process is to minimise mooring lengths to maximise clearance between turbines. Other elements will include maximising long-term reliability and service life along with minimised maintenance.
Turbine mooring anchors	Drag embedment anchors, torpedo anchors, gravity-based anchors, suction piles, pin piles	Not confirmed	Options under consideration minimise potential underwater noise impacts compared to pin piles (note pin piles will be required for substation)
Landfall Export Cable Corridor	Potential options between Windfarm Site and Aberdeenshire	Co-located alongside NorthConnect HVDC Link	Minimises cable crossings Avoids disposal sites Avoids key benthic habitats of Southern Trench MPA; muds of high geodiversity value are avoided by the Offshore Export Cable Corridor Much of the Offshore Export Cable Corridor follows the NorthConnect HVDC Link cable route (consented) for which data is already present
Landfall location	Various potential landfall locations north and south of Peterhead	St Fergus South or NorthConnect Parallel landfall options	Location is close to New Deer to minimise offshore and onshore export cable routes Avoids key benthic habitats of Southern Trench MPA; muds of high geodiversity value are avoided Avoids key onshore constraints where possible (quarries, designated sites, residential areas, landowner acceptability etc)
Landfall technology	Open trenching and HDD	HDD	Avoids potential impacts to important coastal receptors (ecologically designated sites, beach disturbance, cliff disturbance, golf course and populated areas)
Marine terminus of HDD	Various potential locations north and south of Peterhead	Outwith the boundary of the Southern Trench MPA	Avoids direct impacts to the MPA; muds of high geodiversity value are avoided by the Offshore Export Cable Corridor
Timing of works at landfall	All months	HDD at NorthConnect Parallel Landfall will be timed to avoid April – August	Avoids bird breeding season and therefore avoids disturbance to cliff nesting species at NorthConnect Parallel Landfall option location

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