GREEN VOLT

Green Volt Floating Wind Project – A Critical Environmental Assessment

Group 2

Agenda

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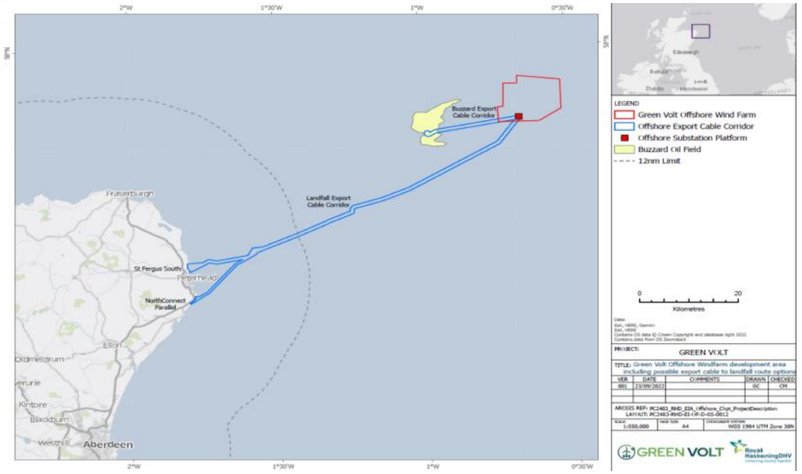
*Sources can be found in the written report and are cited according to APA7

Green Volt Offshore Development – Pushing Renewable Boundaries Amid Ecological Concerns

Green Volt – Advancing UK Floating Wind Development

Green Volt – Offshore Wind Network



Key Facts:

- **Distance to Shore:** ~80 km
- **Power** Output: 560 MW
- **CO_2 Savings:** ~39 $MtCO_2e$ avoided over lifetime
- **Budget:** Estimated £3–4 billion

Project Overview

Phase 1

- Site surveys and lease secured (2022)
- Offshore and onshore consents submitted (2023)

Phase 2

- 35 floating turbines and 35 km of cabling built
- Installation of anchors, cables, and substations (2025–2028)

Phase 3

- 560 MW power to O&G and UK grid
- Turbines recycled and seabed restored post-2063

- **First commercial-scale floating offshore wind farm** in the **UK** with 35 semi-submersible floating turbines
- Backed by **Flotation Energy** and **Vårgrønn**, combining UK-based and Norwegian offshore wind expertise
- Supplies direct **clean power to offshore oil & gas platforms**, cutting platform emissions by up to 70%
- Exports surplus energy to the UK National Grid, delivering up to 560 MW, enough to **power ~800,000 homes over its 35-year lifetime**

Alternative Considerations to Green Volt

Alternatives considered included fixed-bottom turbines, full grid electrification of oil & gas platforms, continued diesel/gas generator use, and delayed offshore transition for cost savings

➡ Disregarded due to technical infeasibility in deep waters, high infrastructure costs, and net-zero goals

Sources: Green Volt (2023), Galparsoro Iza et al. (2022)

Legend: In Progress

Aligning Offshore Innovation with Scotland's Strategic Marine Protections and Environmental Standards

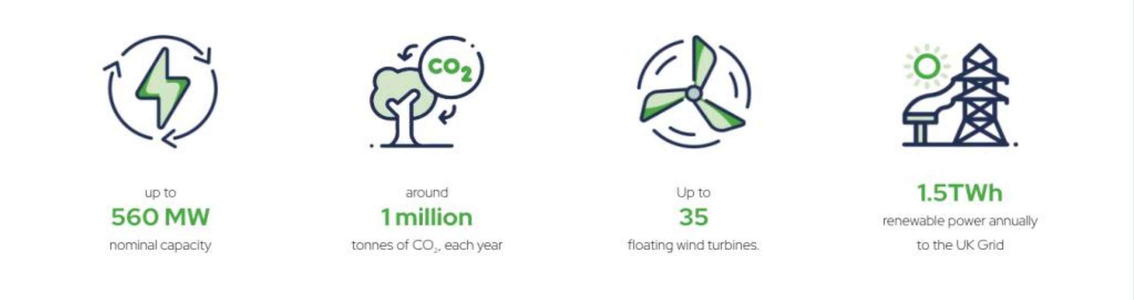
Strategic and Environmental Assessments of Green Volt

Strategic Environmental Assessment

- **Strategic Environmental Assessment (SEA)** was conducted in 2021 under the **Sectoral Marine Plan for Offshore Wind Energy (Scotland)** to evaluate environmental risks across offshore wind areas.
  - Identified E3 as a suitable zone with moderate seabird sensitivity and oil & gas interactions
  - Recommended biodiversity and peatland safeguards, which translated into mitigation targets in Green Volt's EIA

Environmental Impact Assessment

- **Environmental Impact Assessment (EIA)** was conducted in 2022–2023 to assess offshore and onshore impacts
  - Building on this, we carried out a detailed analysis of potential impact on soil, water, air, and socio-economic conditions



Sources: Marine Scotland, 2021, Green Volt, 2023a, Crown Estate Scotland, 2024, Green Volt, 2023b, Bonn et al., 2014, WWF Scotland, 2023

Current Measures Fall Short – Strengthening Mitigation Through Evidence-Based Recommendations

Earth Impacts – Disruption of Soil, Peatland, and Seabed Integrity

Expected Impact

Onshore

- 🔴 **Soil compaction** reduces drainage and productivity
- 🔴 **Topsoil erosion** along 35km cable route
- 🔴 **Class 1 peatland disturbed**
- 🔴 **Agricultural land lost** to substation

Offshore

- 🔴 ~4.5 million m³ **sediment disturbed**
- 🔴 **Mooring and anchoring** systems may cause long-term seabed trenching
- 🟡 **Scour protection** creates artificial reefs

Planned Mitigation Measures under EIA:

- HDD and rerouting to reduce surface and seabed disruption
- Sediment modelling used to predict turbidity effects
- Soil reinstatement, erosion control mentioned, and peatland risk vaguely defined without hydrological data

- **Current mitigation lacks specificity & modelling depth**

Recommendations

1 **Low-Impact Mooring Systems**

- Use semi-taut or tension-leg moorings to reduce long-term seabed abrasion and sediment disruption

2 **Hydrological Modelling for Peat Stability**

- Assess water flow and degradation risk in Class 1 peat to validate low-impact claims and guide routing

3 **Long-Term Monitoring of Seabed Structures**

- Track ecological changes around scour protection to detect invasive species and habitat shifts

Sources: Li et al., 2024, Dai et al., 2022, Halecki et al., 2018, Bonn et al., 2014, Scalenghe & Marsan, 2008, Taormina et al., 2018, Maxwell et al. 2022, Carbon Trust, 2015, Langhamer, 2012, Degraer et al., 2020,

Legend: 🟢 Positive Impact 🟡 Moderately Negative Impact 🔴 Negative Impact

Managing Water Quality Requires More Than Baseline Protections and Generalised Modelling

Water Quality Impacts from Offshore Infrastructure

Expected Impact

- **Sediment disturbance** from trenching & anchoring reduce water clarity & may release contaminants into the environment
- **Disruption of water stratification & nutrient cycles** lead to eutrophication & low-oxygen zones
- **Electromagnetic fields** (EMF) from subsea cables may interfere with electro-sensitive marine species
- **Chemical pollution risks** arise from potential spills of fuel, lubricants, or drilling fluids

Planned Mitigation Measures under EIA:

- Sediment modelling, target cable routing, & spill prevention measures aim to protect sensitive environments Use of Horizontal Directional Drilling (HDD) and water-based drilling fluids to reduce disturbance
- Burial of cables at depths of 0.6-1.5 m to minimize EMF exposure

- **Current mitigation lacks specificity in monitoring, fluid handling, and EMF safeguards**

Recommendations

1 **HDD Contingency Protocols**

- Develop site-specific emergency plans to address potential fluid release events and protect benthic ecosystems

2 **Adaptive Habitat Monitoring**

- Implement seasonal water sampling and cable route reassessment to adapt to dynamic marine environments

3 **Chemical Transparency**

- Publicly disclose the chemical makeup of drilling fluids and assess environmental risks through toxicity testing

Sources: Galparsoro Iza et al., 2022, Taormina et al. 2018, GreenVolt, 2023a, Lian et al. 2022, Van Hal et al. 2017, Wilson and Elliott , 2009, Hermans et al., 2023, Łazuga, 2024, GreenVolt, 2023b, CrownEstate-Scotland, 2024,

Legend: Positive Impact | Moderately Negative Impact | Negative Impact

GHG Gains Must Be Matched by Monitoring and Circular Design Commitments

Air and Wildlife Pressures from Floating Wind Deployment

Expected Impact

- **Chemical Emission** arise mainly (70%) during construction due to steel and cement production as well as maintenance vessels
- **Turbine noise** create Ornithological Disturbance that impairs bird communication and anti-predator behaviour

Planned Mitigation Measures under EIA:

- Use of recycled steel and low-clinker cement to reduce embodied emissions
- Decommissioning plan includes turbine recycling and material recovery
- Bird protection via SPA safeguards, habitat restoration, and funding schemes

- **Gaps remain in lifecycle emissions benchmarking, rare-earth material planning, and monitoring**

Recommendations

1 **Lifecycle Emissions Benchmarking**

- Provide comparative carbon metrics against fossil fuel baselines to validate climate benefit

2 **Rare-Earth Material Recovery Strategy**

- Define clear recycling routes for turbine magnets and composite components at end-of-life

3 **Avian Monitoring Program**

- Implement real-time tracking and post-installation surveys to assess flight behaviour, disturbance, and species displacement

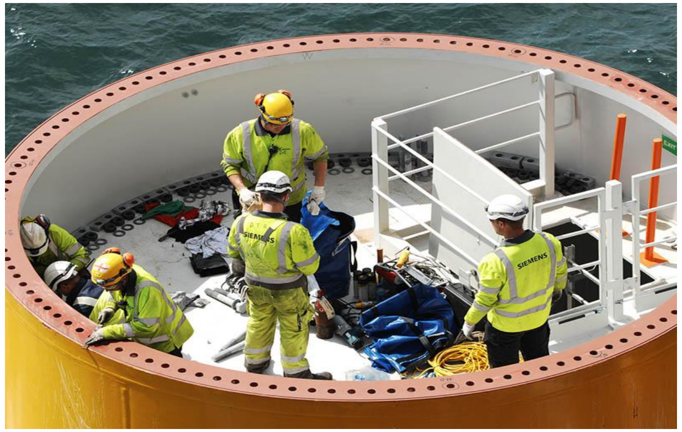
Sources: Environments, 2024, Green Volt, 2023, Thomson & Harrison, 2015, Department for Transport, 2019, United Nations Economic Commission for Europe [UNECE], 2022, Kikuchi, 2000, Petersen & Fox, 2007, Danish Energy Agency [DEA], 2013

Legend: Positive Impact Moderately Negative Impact Negative Impact

Maximizing Regional Gains While Proactively Mitigating Uneven Social and Economic Outcomes

Unlocking Regional Growth and Community Value

Expected Impact



- 🟢 Significant **economic boost** during construction and operation phases
- 🟢 Strengthening of regional **supply chains and job creation**, especially in Aberdeenshire
- 🔴 Social risks include **uncertain port siting**, which can impact fisheries, tourism, local services, and community infrastructure
- 🟡 **Absence of a defined community benefit scheme** raises concerns about long-term equity and reinvestment in local areas

Planned Mitigation Measures under EIA:

- Stakeholder engagement with fishing communities and councils
- Intention to support regional development and local infrastructure use
- Indirect benefits through offshore wind strategy alignment – no defined local reinvestment plan

- **Community benefits remain undefined: long-term equity and impact tracking are missing in EIA**

Recommendations

1 **Community Benefit Fund**

- Launch a dedicated program supporting local housing, job retraining, and promotional tourism campaigns

2 **Local Procurement Commitment**

- Secure Scottish SME involvement in supply chains to maximize regional economic retention

3 **Long-Term Impact Monitoring**

- Create a transparent framework to track, report, and adapt socioeconomic outcomes over time

Sources: BiGGAR Economics, 2023, RenewableUK, 2024, Financial Times, 2025

Legend: 🟢 Positive Impact 🟡 Moderately Negative Impact 🔴 Negative Impact

Executive Summary of the Green Volt Floating Offshore Wind Project and its Environmental Implications

Unlocking Regional Growth and Community Value

Impacts on Earth

Soil compaction, peatland disturbance, and seabed disruption during cable and mooring installation

Impacts on Water

Turbidity from seabed works, altered stratification, and potential EMF and contamination effects

Impacts on Air

High GHG emissions during manufacturing phase with minimal emissions during operation - Seabird disruption is acknowledged

Impacts on Socio-economy

Strong job and supply chain potential with, however, unclear port use, absent community benefit scheme, and no socioeconomic monitoring

During Complete Lifecycle

Impact Dimension	Assessment*	Recommended Prevention & Mitigation Measures	Feasibility of Recommended Measures
Earth	Red, Black, Black	• HDD, erosion control, anchor rerouting – lacks peat modelling and soil restoration strategy	• Measures like HDD and erosion control are standard; peat modelling can be added with minimal route adjustments
Water	Red, Black, Black	• Sediment modelling, cable burial, spill control – lacks adaptive water monitoring and HDD contingency	• Core methods already planned; while monitoring and HDD backup require only procedural updates
Air	Red, Black, Black	• Low-carbon materials, habitat protection – no bird monitoring or rare-earth recovery plan	• Material choices and habitat steps are supplier-ready; bird tracking and recycling need operational planning
Socio-Economic	Black, Yellow, Black	• Stakeholder engagement – needs benefit scheme, procurement policy, impact tracking	• Schemes and policies are administratively easy to adopt without changing project design

The Green Volt project demonstrates strong potential for clean energy and economic value, but to ensure long-term sustainability, targeted improvements in environmental safeguards, community benefit strategies, and adaptive monitoring are essential

*Preliminary assessment based on existing reports and measurements

Legend: Positive Impact (green) · Moderately Negative Impact (yellow) · Negative Impact (red)

GREEN VOLT

We Appreciate Your Time and Interest!

Group 2