Electricity Transmission

HVDC Assets Life Cycle Assessment (HVDC - LCA)

ET Innovation

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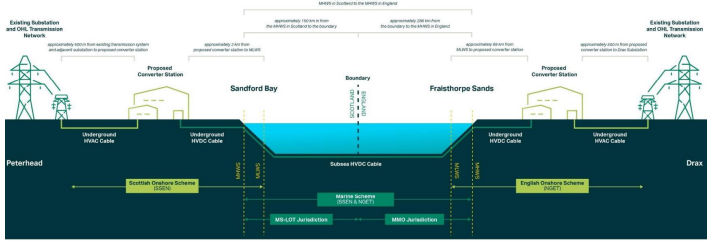
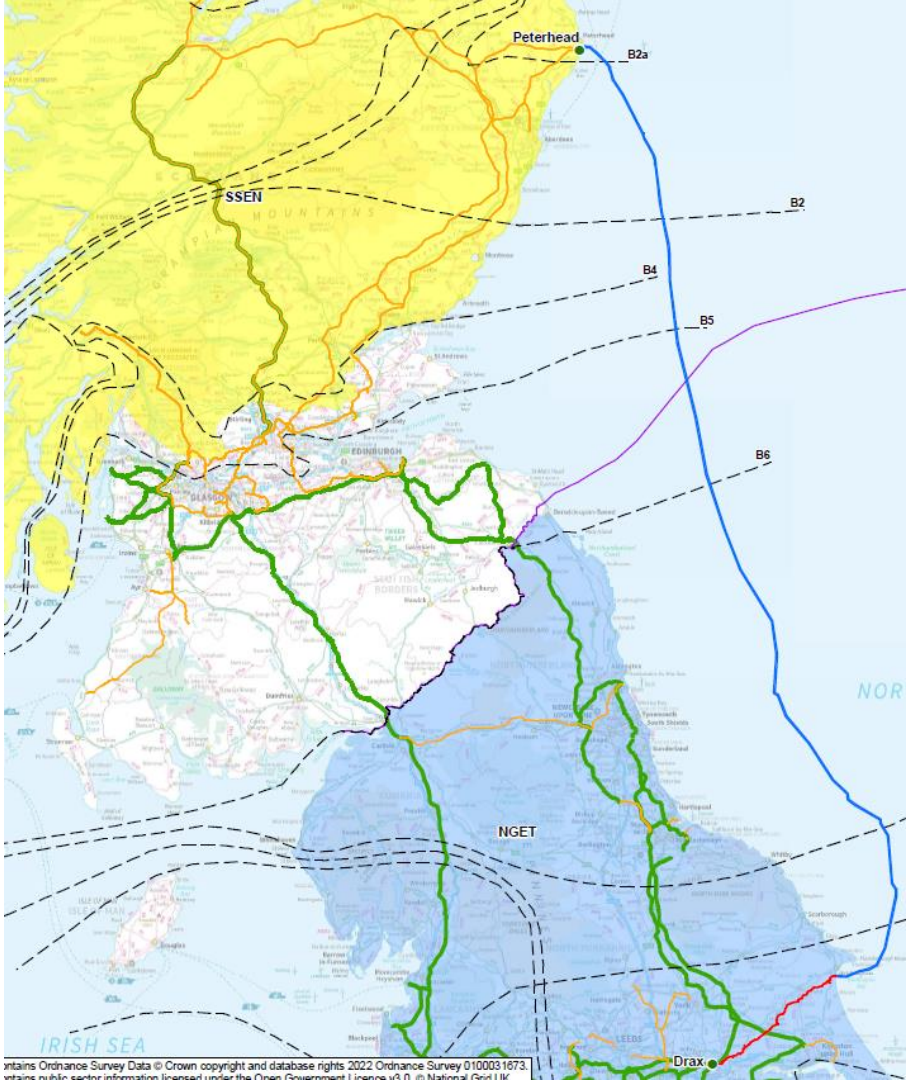
nationalgrid

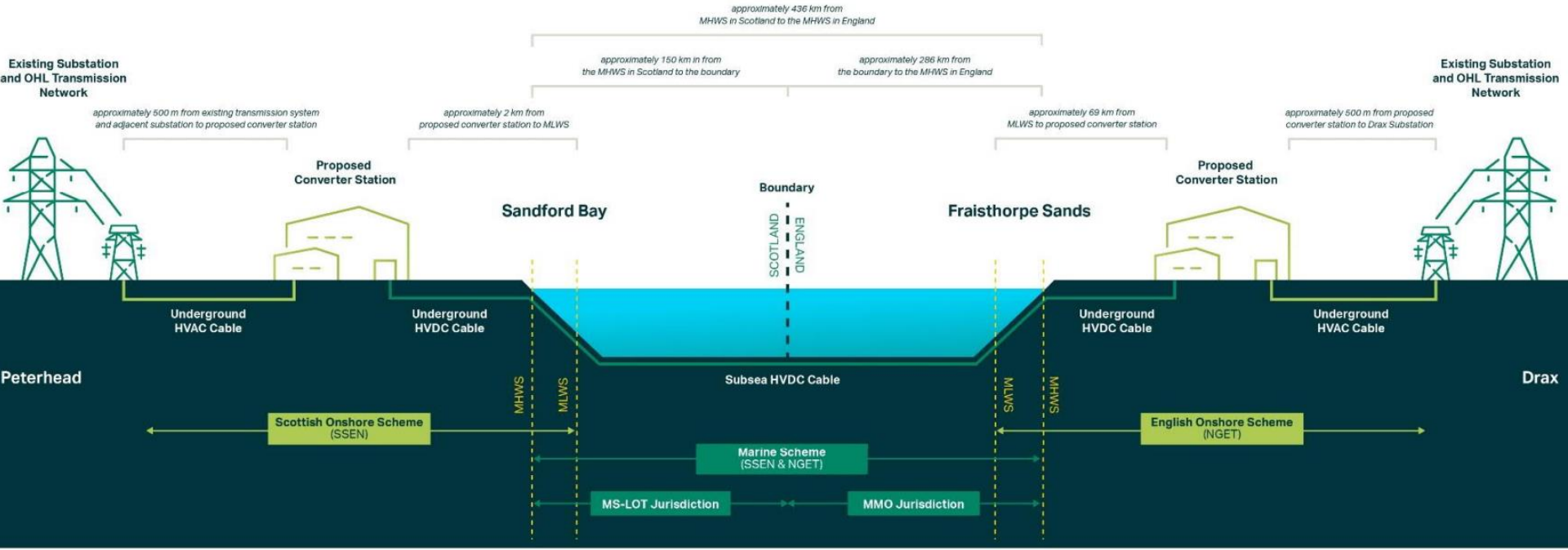
Background

NGET and SSEN are jointly developing a subsea HVDC Link between Peterhead in Aberdeenshire and Drax in North Yorkshire.





Background


approximately 436 km from MHWS in Scotland to the MHWS in England
approximately 150 km in from the MHWS in Scotland to the boundary
approximately 286 km from the boundary to the MHWS in England
Existing Substation and OHL Transmission Network
approximately 500 m from existing transmission system and adjacent substation to proposed converter station
approximately 2 km from proposed converter station to MLWS
approximately 69 km from MLWS to proposed converter station
approximately 500 m from proposed converter station to Drax Substation
Existing Substation and OHL Transmission Network
Proposed Converter Station
Boundary
Sandford Bay
SCOTLAND
ENGLAND
Fraisthorpe Sands
Proposed Converter Station
Underground HVAC Cable
Underground HVDC Cable
Underground HVDC Cable
Underground HVAC Cable
Peterhead
MHWS
MLWS
Subsea HVDC Cable
MLWS
MHWS
Drax
Scottish Onshore Scheme (SSEN)
English Onshore Scheme (NGET)
Marine Scheme (SSEN & NGET)
MS-LOT Jurisdiction
MMO Jurisdiction

Why does this matter?

To reduce our impact, we first need to understand it

- Clear group and NGET commitments to reduce scope 3 emissions – As a responsible business we need to manage this.
- Assumptions for PC26 and business planning being made using data from onshore AC schemes.
- If we have a good granularity of the schemes carbon footprint, we can focus decarbonisation efforts where the most gains can be made.
- Large pipeline of future HVDC and marine projects in development. Including new technology such as offshore platforms.

Project Overview

- Funding: Network Innovation Allowance (NIA)
- Partner: DNV Services UK Ltd
- Duration: 06 months

Goal

Quantify the carbon baseline of HVDC to get high level understanding for EGL2 project on the environmental impact.

Develop an understanding on main contributors and indicate the highest contributors over HVDC lifetime.

Roadmap to Success

Base data for HVDC assets, associated equipment (e.g. air cooling and handling) and marine construction equipment (rock armour).

A better methodology for calculating emissions related to the construction of on-site buildings

Updated carbon tools for our supply chain to use that include the detail on HVDC assets and marine work

Roll out updated tools/methodology to existing projects and potential inclusion in HVDC framework

Understand our carbon hotspots and potential workstreams to decarbonise these

Influence the delivery of the 5 offshore link projects

Influence the development of future marine grids (inc platforms) and future offshore link projects

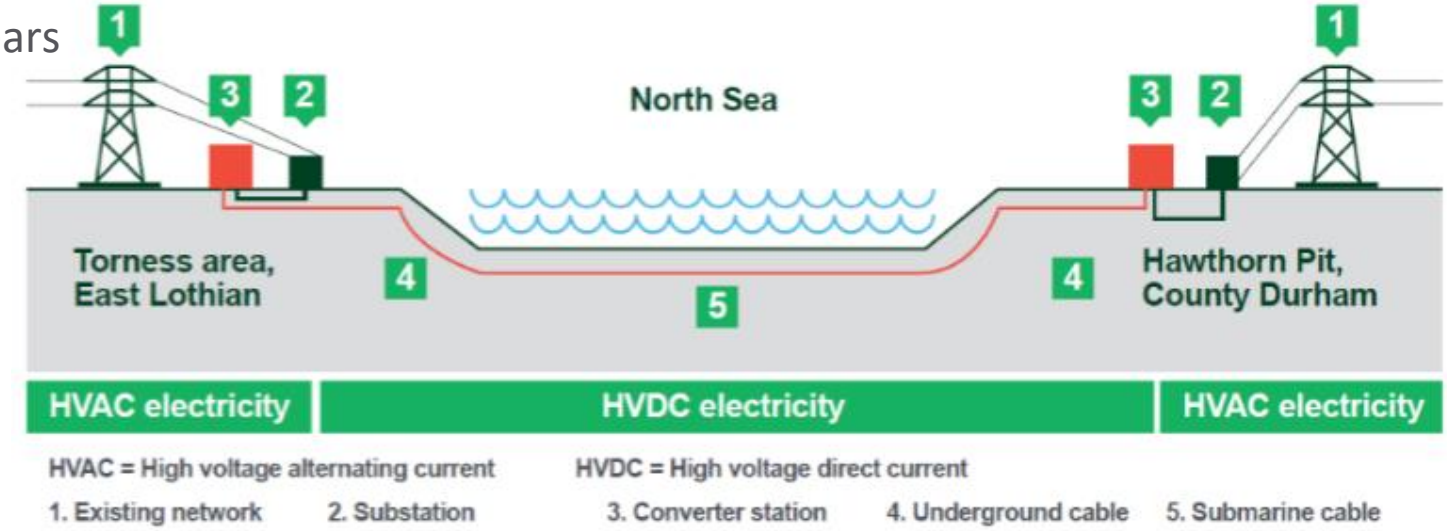
Methodology Testing

The results are based on a representative HVDC setup adjusted to bipolar configuration with 2 stations for an interconnector link.

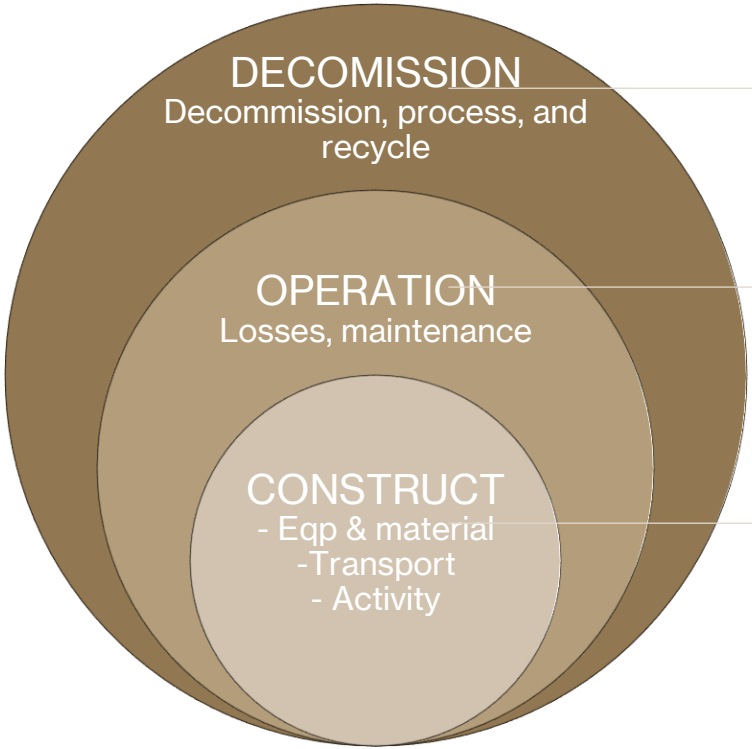
Converter Stations – 2

Cable – 120 km (100 km subsea)

Operation – 40 years



Results



Transport
Waste processing
Recycling
Disposal or Reuse

END OF LIFE
Sustainability, disposal, chemical admixture producers, Recycled products

Power Losses
Repair, replace, refurb
Operational energy use
SF6 leaks

OPERATE
Stand-alone operation by relevant owners

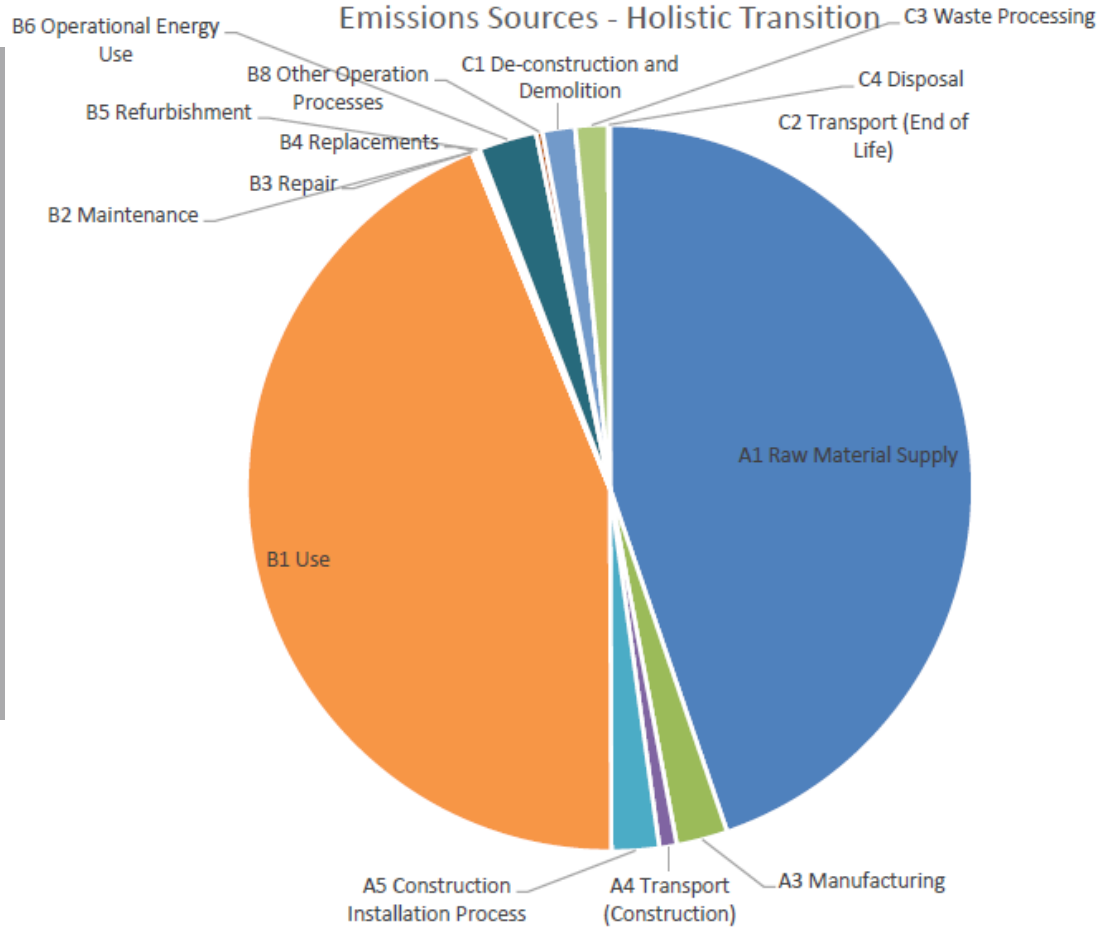
Converter station & Cables
Transport to Site
Construction activities

START
Construction companies, supply chain, developers, and infrastructure owners

Results: Carbon Baseline

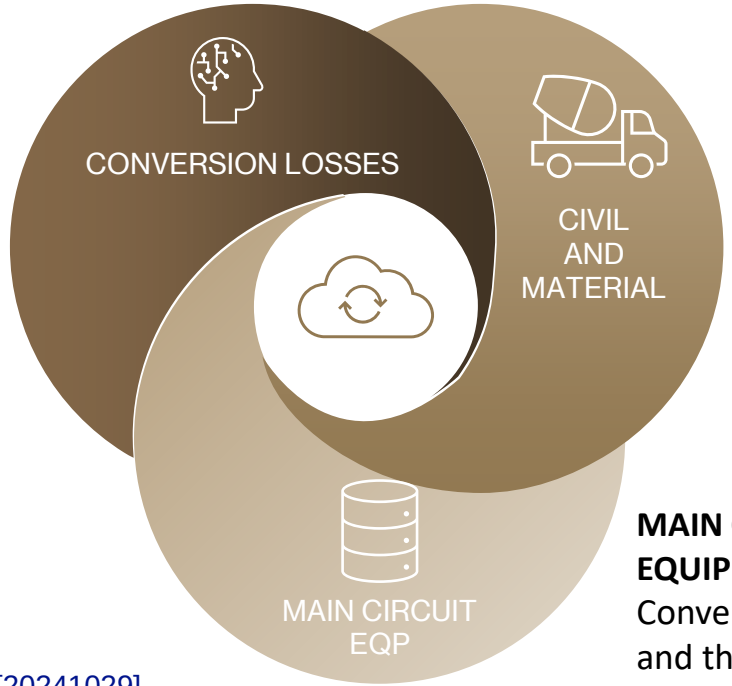
The CO2-eq emissions from one HVDC delivery with two stations and losses over 40 years are **approx. 760,708 tCO2e** during the whole lifetime.

The recycling of materials and equipment could prevent up to **10,160 tCO2e**.



Way Forward

CONVERSION LOSSES (43.86%)
The losses from converting AC to DC and back, are yet the main driver for the environmental impact.



CIVIL AND MATERIAL
Concrete has the major share of the climate impact from Civil and construction materials.

MAIN CIRCUIT EQUIPMENT (44.76%)
Converter Transformer and the Converter Valves.

Acknowledgements

DNV:

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