North Sea Commission Presentation

Dr. Richard Blanchfield
Head of Development UK
3rd October 2018
NorthConnect

• Connecting Renewables
NorthConnect is a project set up to develop, consent, build and operate an HVDC electrical interconnector between Peterhead in Scotland and Simadalen in western Norway.

- **665 km**
- **1400 MW**
- **1st Commercial Power 2024**

**Partners:**
- Vattenfall
- Lyse
- Agder Energi
- ECO
**Energy Security**

Crucial role of interconnectors in EU integrated energy market. Increased security of supply and cost-effective use of renewables. ‘Black Start’ capability for Scotland.

**Balancing Mechanism**

Stabilise Scotland’s grid from imbalances of a highly fluctuating, wind dominated system. Relieve grid constraints (very high costs to consumers) at the border.

**Flexible Storage**

Tapping into Norway’s ‘Flexible Storage’ (84TWH) will help us meet our targets of increasing renewable energy use and reducing Carbon emissions in Scotland and the UK.

**Electricity Pricing**

Greater opportunities for trade and balancing fluctuating supply and demand will contribute to downward pressure on average wholesale electricity prices for GB.
## Summary of Overall Project Schedule

### Development

<table>
<thead>
<tr>
<th>2018</th>
<th>2019</th>
<th>2020</th>
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<td>Aug</td>
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- **DC Cables**: Design / Manufacture / Deliver
- **Converter Stations**: Pre-Wks?
- **Cable & Converter Stations Procurement**: ITT
- **Enabling Works Procurement**: PQQ
- **Construction Management Planning, Ramp-Up & Readiness**: ITT
- **Marine Licence, Planning & Norwegian Remaining Consents Secured**: Pre-Wks UK?
- **Ofgem FPA Regulatory Process**: FID
- **Business Case, Legal Structuring & Financing**: Financing finalisation

### Construction

<table>
<thead>
<tr>
<th>2020</th>
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<td>Q2</td>
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</tbody>
</table>

- **DC Cables**: Design / Manufacture (min 12mth lead)
- **Converter Stations**: Foundations / Buildings
- **Earthworks / Platforms / Services**: Electrical Install
- **Load/Install Campaigns**: HDD Window
- **Offshore Window**: 1st Commercial Power
- **Pre-Wks UC**: Jan-24

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**Co-financed by the European Union**

**Connecting Europe Facility**
DC Cable Manufacture & Installation

- Manufacturing in factories in lengths matching the capacity of the cable laying vessel, approx. 150 km.
- Cable approx. 15cm dia. and 50kg/m weight.
- Cable laying vessels typically 600 m/hr.
- Cables will wherever reasonable be protected to minimise the risk of failure due to external impact.
- Repair times in the range of 1 to several months.

Supply chain e.g.’s:
- Guard vessels
- UXO’s
- Diving services
- HDD
- Onshore civils
- Crew and vessel services

Trenching

Cable

Rock Placement

Lay Vessel

Horizontal Directional Drilling

Co-financed by the European Union
Connecting Europe Facility
Converter Stations & AC Cable Installation

- 400 kV HVAC cable buried from Peterhead substation to the Fourfields converter station.
- 1400MW Converter station located at Fourfields.
- 1400MW Converter station at Simadalen in Norway.
- Lump sum EPC contract, includes:
  - Design
  - Civil & Buildings construction
  - Mechanical & Electrical Installation
  - Commissioning and Testing

Supply chain e.g.’s:
- Electrical installation/wiring
- On-site civils / foundations
- Building architecture/erection
- Building services (HVAC, etc.)
- Equipment, materials and small MEICA (outside HV envelope) associated with a large plant
- Heavy transportation (350t)
Direct Contracts & Services – Delivering a €2bn Project

- Direct Works: Archaeological work, peripheral landscape mitigation at Fourfields (planting, shelter, signage etc), ground investigation
- Legal, insurance and warranty inspection / supervisory services
- Investigations and Surveys: Onshore and offshore – marine surveys, environmental surveys and support
- Consultancy: Construction management and supervisory services, Engineering and environmental consultancy contracts, due diligence work, quality inspections and testing
- Office facilities and supplies, IT / software, HR support
- Market trading and asset management including trading technology, communications and asset management systems
Creating a Local Legacy

- £10k p.a. and increasing Local Legacy Fund
- Bed nights and food / catering services
- Temporary signage/printing services
- Transportation/vehicle maintenance
- Operational cleaning and maintenance
- Community engagement
- Training and apprenticeships
- Academic research
- Educational support for STEM
Questions?
Integrating national and regional coastal litter initiatives;
SCRAPbook and the East Grampian Coastal Partnership – Turning the Plastic Tide

Sophie Green (SCRAPbook) & Crawford Paris (EGCP)
October 2nd 2018
Outline

• Introduction and background to the SCRAPbook project (Sophie)
• Overview of current SCRAPbook progress (Sophie)
• Overview of EGCP coastal litter project – turning the plastic tide (Crawford)
• Conclusions and future direction (Crawford)
SCRAPbook Background

• Launched April 2018
• Consortium of three charities – unique position to deliver full litter mapping work flow
• Using aerial imagery to increase coverage and efficiency of litter mapping
• First opportunity for a national scale coastal litter data set
• Volunteer engagement – in classifying and cleaning
• Added value data set – ‘collect once use many times’
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
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<th>K</th>
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<td>Drummeddan bay</td>
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<td>small bay / cliffs</td>
<td>Clagie bay</td>
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</tbody>
</table>
“Maps are like campfires – everyone gathers around them, because they allow people to understand complex issues at a glance, and find agreement about how to help the land.” ~ Sonoma Ecology Center
Progress to date

• We have flown just over 50% of the mainland coastline
• Continue to inform beach cleaning operations and find the best ways of doing these
• Engage with the media and scientific community to share our finding
• Continue to inform beach cleaning operations and find the best ways of doing these......
• Turning the Plastic Tide started August 2018 and officially launched 22nd September 2018
• Two-year initiative to reduce beach litter in the North East of Scotland through supporting community volunteer beach cleaning and education

Aim:

To raise awareness of beach and marine litter issues and to create a coherent network beach cleans in the north east utilising the power of local communities.
Priority Beaches

- Litter Category
- Issues
- Partners
- When?

<table>
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<tr>
<th>Beach</th>
<th>Litter Cat</th>
<th>Issues</th>
<th>Possible Partner</th>
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<td>Battery Head/Seaton</td>
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<td>St Fergus/Grave yard</td>
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<td>Community Council</td>
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<tr>
<td>Ugie North</td>
<td>2</td>
<td></td>
<td>Golf Club / Pick Up Peterhead</td>
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<td>Phead Power Station/Community</td>
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<td>Boddam</td>
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<td>Council</td>
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<td>A90 Layby</td>
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<td>Cruden Community Council; Cruden</td>
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<td>Steep Access Path</td>
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Priority Beach: Muchalls
Priority Beach: Muchalls
Beach Clean/Community Projects

Sandford Bay Beach Clean: *Turning the Plastic Tide* Project Launch
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Litter Picking Hubs

Examples from elsewhere
Litter Picking Hubs

What we are doing
Turning the Plastic Tide
Moving Forward

Establishing a region-wide beach cleaning community that is working towards a common goal!

What next?
• Engaging with schools and interest groups
• Building social media and volunteer network – collaboration
• Relationship with the press
• Tackling priority beaches
Thank you!

Scrapbook project
To stay on the news there was a report on Scrapbook project they have plans that scan the beaches of Scotland and find the dirtiest beaches so they clean them up because a dolphin could get its head into the crisp and sausage.
The role of Regions in North Sea MSP

Rhona Fairgrieve

Boddam, Aberdeenshire – 3 October, 2018
Good morning!
NorthSEE

• EU Interreg North Sea Region project (2016 – 2019)

• Cross-border & transboundary MSP with particular focus on:
  ➢ Shipping
  ➢ Energy
  ➢ Ecology

• Role of Regions – project to add context
Scope

• To clarify role(s) of Regions in national MSP
• To get a better understanding of regional interests in national approaches to MSP
• To better equip Regions to be part of MSP processes

What do North Sea Regions need in order to be able to participate effectively in MSP processes?
Regions – many & varied
Background research

- How MSP is done in the North Sea countries – differently!
- Role of Regions/regional authorities & relationship to national MSP authority
- Regions’ priorities relating to marine/maritime interests
- Useful contacts?
Anticipated project outcomes

• Involving the Regions of the North Sea Commission in MSP in a more constructive way
  – Links between MSP & regional interests: land/sea interactions, policy alignment, etc.

• Exchange of knowledge & experience
  – What’s my Region’s role?
  – Are there mutual ambitions, goals & agendas between Regions?
  – What are the main bottlenecks?
  – Can the problem areas be overcome?

• Tools to address challenges
Question time…

- What do North Sea Regions need to be better able to participate in Maritime Spatial Planning?
  - Engagement with national process, if currently lacking?
  - Clear explanation of roles?
  - Better understanding of the national approach and where Regions fit?
  - National forum for exchange of ideas & views?
  - Resources? (Human, financial, legislative context)
  - Time?
Rhona Fairgrieve
Scottish Coastal Forum
rhona.fairgrieve@gov.scot
+44 (0) 131 244 2284
Terrestrial and Marine Planning in Aberdeenshire

Robert Gray, Head of Planning and Building Standards
Wendy Forbes, Team Manager
Terrestrial and Marine Planning

Onshore

- National Planning Framework
- Strategic Development Plan
- Local Development Plan

Marine Plans

Offshore

- National Marine Plan
- Licence Applications
- S36 Applications for Offshore Power Generation
Planning Policy
Strategic Development Plan
Strategic Growth Area – Aberdeen to Peterhead

Movement:
1. A952 to Fraserburgh Improvements
2. A90 (North) Corridor Improvements

Place:
3. Peterhead Town Centre Business Improvement District
4. Peterhead Port

Infrastructure:
5. North Connect Long Haven Bay (south of Peterhead) towards Hardangerfjord in Western Norway
6. Boddam - Carbon Capture and Storage Network and Thermal Generation
7. St Fergus Gas Terminal

Carbon Capture and Storage Infrastructure
- High Voltage Energy Transmission Network Lines
- Hywind Scotland
- Decommissioning Centre of Excellence
- Moray Offshore Renewable Power / Operations and Maintenance Base

Connections:
- Green Network Opportunities
- Improved Cross Boundary Connections for Active Travel/Green Networks
- Formartine & Buchan Way
- Strategic Bike Project
- River - Blue / Green Corridor
- Walking / Active Travel Opportunities/ Coastal Trail
Terrestrial and Marine Planning

Onshore

PLANNING POLICY
National Planning Framework
Strategic Development Plan
Local Development Plan

MARINE PLANNING
National Marine Plan
Marine Plans

DEVELOPMENT MANAGEMENT
Planning Applications
S36 Applications for Onshore Power Generation

MARINE LICENCING
Licence Applications
S36 Applications for Offshore Power Generation

Offshore
Moray East
- 1.1GW max installed capacity
- Max rated turbines 10MW
- Onshore cable (33km)
- 2 Substations (7.8ha)

Moray West
- 750MW capacity
- 6km onshore cable in Aberdeenshire
- 22km onshore cable in Moray
- Substation in Moray
Electricity Interconnector

- Subsea electrical transmission interconnector between UK and Norway (1.4GW)
- Landfall, cabling, onshore converter station
Hywind Scotland Pilot Park

• World first full scale floating turbine ‘Pilot Park’ - built
• Located in deep water
• 5 X 6MW floating turbines
• Onshore works – 1.5km onshore cabling to substation
Onshore Wind

Source: Aberdeenshire Council, Planning Applications 2003 - 2018

794 Approved Wind Turbine Applications
Onshore Solar

320 Solar Enquiries received + 160 Solar sites approved

Source: Aberdeenshire Council, Planning Applications 2003 - 2018
Essential Electricity Grid Reinforcements

• Increase capacity of overhead lines
• Increase voltages 275kv to 400kv
• New 400kv substations at strategic locations
• New Subsea HVDC link (Peterhead to North England)
Build Out Phase

**Low cost CO₂**
200,000 tonnes of existing, easy to capture CO₂ from the St Fergus Gas Terminals.

**Pipeline reuse**
More than £750 million cost savings from reuse of high capacity on and offshore pipelines.

**World class CO₂ stores**
Two large, well understood CO₂ stores with plenty room for growth.

CO₂ from H₂ production hub

Around 35% of all UK natural gas comes onshore at St Fergus - an ideal site for a major H₂ production hub. H₂ at St Fergus can be fed directly into the gas grid from blending and decarbonising gas.

Shipped CO₂ to Peterhead Port

Use of the deep water port at Peterhead to include CO₂ import facilities.

CO₂ from Grangemouth cluster and beyond

CO₂ from Grangemouth cluster piped to St Fergus through Feeder 10 - a natural gas pipeline ready for reuse.
Thank you
Hywind
Hannah Mary Goodlad
Asset Management, New Energy Solutions
We are Equinor
Turning natural resources into energy for people and progress for society

Competitive at all times

Transforming the oil and gas industry

Providing energy for a low carbon future
Embedding climate into our strategy

REDUCE EMISSIONS
3 million tonnes CO2 annually by 2030

GROW
15-20% of capex in new energy solutions by 2030

COMPETE
Stress test our portfolio to ensure that we are competitive in a low-carbon future

We believe a low carbon footprint is a competitive advantage, providing us with attractive business opportunities in the transition to a low carbon future.
Wind technologies and benefits of floating offshore wind

Resources
- Deeper, farther from shore
- Site flexibility
- Space availability

Jobs
- Domestic and export industrial opportunities
- Regional developments
- Build on O&G

Economics
- High capacity factor
- Higher scalability?
- Standardisation potential

New applications
- Electricity to population centers
- Power industry and O&G
- Recycle marine spaces
What is Hywind?

A standard offshore wind turbine placed on a ballasted substructure and anchored to the seabed.
Hywind Scotland – The World first floating wind farm

Installed capacity of park
30MW
Which is enough to power
20 000 homes

- Turbine
- Anchor
- Mooring line
- Electrical line

25km cable to shore

Peterhead
Scotland
Edinburgh
Hywind Scotland experience

Safety
- Zero HSE incidents

Performance
- Dynamic performance – within design parameters
- Capacity factor - above industry average
- Performance availability - above budget and industry average

Improvements
- Testing of advanced motion controllers
Continuing the innovation story with Batwind at Hywind Scotland

Floating Wind + Storage + Grid

- Mitigate variability and enhance the value of wind energy
- Respond to the need for integrated storage in future power systems
- Test business models to make storage commercially viable

1. Capture excess wind power
2. Reduce balancing cost
3. Increase revenue through price arbitrage
4. Deliver grid and power system services
Hywind Tampen – Floating offshore wind at Snorre and Gullfaks
Hywind Tampen – offshore wind farm in the North Sea

- 11 wind turbines between Snorre and Gullfaks
- Combined capacity of 88MW
- Concrete substructures and shared anchors
- Considerable CO2 emission reductions
Safety is our first priority

Large complex projects

Marine operations & maintenance

Leverage local presence & corporate capabilities

Technology & innovation
Hywind – Leading floating to industrial scale

Build on bottom fixed industry
Establish industry standards for floating
Streamline fabrication lines

Policy
Partnership
Supply chain
Equinor targets a Hywind levelised cost of energy of €40-60/MWh by 2030
Vast potential for floating offshore wind

Size of the prize
Total market:
12 GW in 2030

The big four
US West Coast
Japan
France
Scotland/Ireland

Better wind resources
Site flexibility
Standardisation potential
New industrial opportunity
2040 - Future applications

- Offshore windfarm
- Fish farming
- High voltage grid
- Oil and gas platform
- Gas
- Factory
- Data center
- Subsea installations

- Electricity to population centres
- Power O&G operations
- Fuel for Industry
- Other
Thank you

Hywind, September 2018
Marine Spatial Planning in Scotland

David Pratt
Head of Planning & Strategy
Scotland’s Seas

- 200 nautical mile Scottish Seas boundaries
- Civil Jurisdiction offshore activities boundary
- 12 nautical mile Scottish Territorial Seas boundaries
- Continental Shelf as defined in Continental Shelf Act 1964

- Land boundary with England
- Cities
- Towns

- Covers over 6 x Scotland’s land mass

62% of UK sea area

National Marine Planning area out to 200NM
Marine Scotland and The Crown Estate

Marine Planning and Licensing Authority

Seabed Leasing Agency
• Marine Scotland Act and Marine and Coastal Access Act provides legislative basis for a marine planning system in Scottish inshore (0 – 12nm) and offshore waters (12 – 200nm).

• Marine Policy Statement is the UK framework for marine plans and taking decisions.

• National Marine Plan translates the MPS into policy and spatial guidance for the Regional Marine Plans.

• Regional Marine Plans will provide greater spatial policy and guidance at a local level for inshore area (0 – 12nm).

Complies with the European Marine Spatial Planning Directive.
National and Regional Marine Planning

Scotland's National Marine Plan
A Single Framework for Managing Our Seas

Illustrative map referred to in the explanatory note to the Scottish Marine Regions Order 2015

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Argyll
Clyde
Orkney Islands
Shetland Isles
North Coast
North East
Forth and Tay
Scotland's Territorial Sea / Border

Marine Scotland
Planning Tools: NMP interactive (NMPi)
Nature Conservation MPAs and Wind, Wave and Tidal Draft Plan Options
NMPi Data sets - national and regional data layers

**National data sets**

- Overall Assessment (Atlas 2011)
- Physical Characteristics
- Clean and Safe
- Healthy and Biologically Productive
- Climate Change
- Administrative
- Regions
  - Solway
  - Clyde
  - Argyll
  - Outer Hebrides
  - North Coast and Orkney Islands (Pentland Firth and Orkney Waters)
  - North Coast
  - Orkney Islands
  - Shetland Isles
  - Moray Firth
  - North East
  - Forth and Tay
- North Marine Plan (2015)
- Draft National Marine Plan
- Aerial Photography

**Regional data sets**

**NMP & draft NMP maps**

**Base layer data sets**
Blues Seas Green Energy – Offshore Wind Plan Energy - 2011

Consented Projects
- Inch Cape
- Neart na Gaoithe
- Beatrice

- UK DECC SEA 2 Zones
  - Seagreen
  - MORL

Dark Green Search Areas provided starting point for current process
Constraints Models

INDUSTRY

ENVIRONMENT

HERITAGE
RLG - Contents

Resource
Aquaculture
Aviation
Bathymetry and Seabed
Cultural Heritage
Defence
Environment
  Designated Sites
  Landscape Designations within Region
  Marine Mammals, Basking Sharks and Seals
  Seabirds
Fishing
  Commercial Fishing Regional Overview
  Areas of Search Interaction
  Fish Processing Activities
  Wild Salmon and Sea Trout

Infrastructure and Grid Provision
  Existing
  Future
Oil and Gas Planning
Ports and Harbours
Recreation
  Recreational Angling
  Recreational Boating
  Scuba Diving
  Sea Kayaking
  Small Boat Activity
  Surfing and Windsurfing
  Areas of Search
Shipping
Social
Supply Chain
Tourism
Initial Plan Framework - Areas of Search

Early Stage Consultation

- Initial Views / Concerns on Resource Areas
- Information – Verification / Data Gaps / Updates
- Outline Process – Key Steps / Future Consultation
Sectoral Marine Plans

Offshore Wind
Wave
Tidal

Planned Developments
Initial assessment of potential locations for deep water turbines

**Objective**: To investigate deep water sites where floating wind turbines could be installed.

Principal requirements:

- Depth between 80-120 m
- Wind resource > 9 ms$^{-1}$ (mean annual wind speed)
- Relative proximity to electrical substation or cable connection
- Relatively low wave activity
- Proximity to a harbour
- Low constraint level (potential interference with other users of the sea)
Potential T&D Deepwater Locations

Potential sites chosen

- East Shetland
- East Pentland Firth
- Inner Hebrides
- Moray Firth, Southern trench
- South East Aberdeenshire

Scale: 1:2,750,668

Legend:
- Suggested Floating turbine test sites
- Aberdeen Wind farm demonstrator
- STW Wind farm lease sites
- Round 3 Windfarm lease sites
- 12 Nautical mile line

Depth
- Shallow
- Deep
Scottish Offshore Renewables Research frAmeWork (SpORRAn)
Tiree ‘Scenario Mapping’

Tiree Onshore Scenario Mapping
Consultative Draft Report

Argylle & Bute Council
<table>
<thead>
<tr>
<th>Scenario 1-4</th>
<th>Projected needs</th>
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<td><strong>Houses on Tiree</strong></td>
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<td><strong>School Pupils</strong></td>
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<td><strong>Built Development</strong></td>
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<td><strong>Helicopter Flights</strong></td>
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<td><strong>Population Growth</strong></td>
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</table>
Scenario Mapping – East and North East Regions

Project Partners:
East Coast Renewables
Marine Scotland
The Crown Estate
SG Energy
SE / HIE

Project was focussed on Economic / Supply Chain Benefits & Implications for the Regions
The Low End

DEPLOYED CAPACITY 1,005 MW
TOTAL CAPITAL INVESTMENT £3,015
SCOTTISH INVESTMENT RETENTION £472

GVA IMPACT £693
EMPLOYMENT IMPACT 1,528

The High End

DEPLOYED CAPACITY 1,730 MW
TOTAL CAPITAL INVESTMENT £5,190
SCOTTISH INVESTMENT RETENTION £1,538

GVA IMPACT £1,420
EMPLOYMENT IMPACT 4,149

### Manufacturing

- WTG
- Blades
- Towers
- Foundations
- Substations
- Cable
- Land use
- Peak Employment

### Investment

- £

### Installation

- Vessel days
- Land use
- Peak Employment

### O & M

- Land use
- Peak Employment

**Scotland has no industry experience and no viable skill base**
**Scotland has parallel industry experience**
Scotland has industry presence, industry experiences and available facilities

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50 Blades
50 Towers
50 Foundations
1 Substation
150km Cable
60 acres Land Use
£700 Investment
£150 Investment

50 WTG
500 Vessel Days
£500 Investment
£100 Investment

Built in Scotland

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Questions?