

Moray Firth Offshore HVDC hub Knowledge sharing seminar, Glasgow 20th July 2015

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the European Union



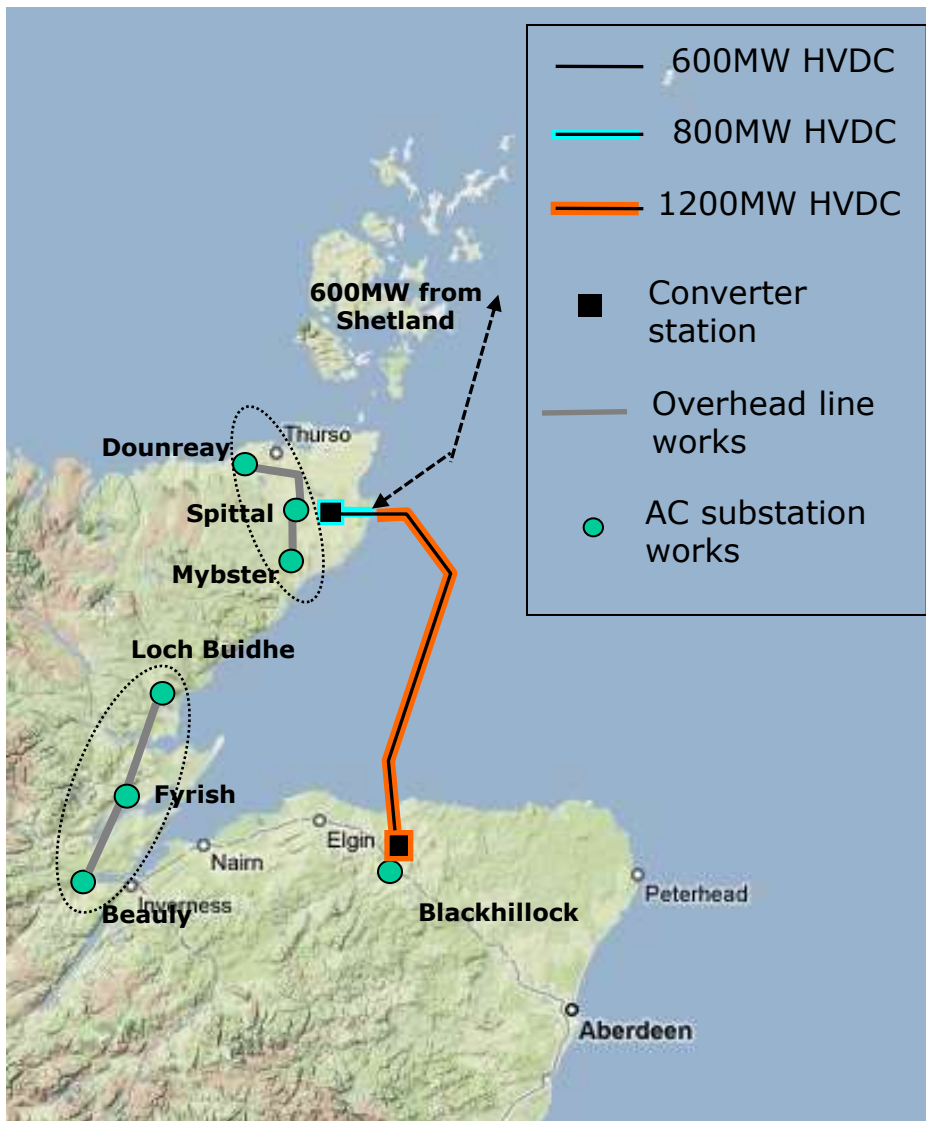
Agenda

- Project overview, Paul Neilson
- Offshore substation platform FEED (Front End Engineering Design), Brian Mitchell
- Multi-terminal HVDC specification, Yash Audichya
- The National HVDC Centre, Simon Marshall
- Conclusions and Q & A

North of Scotland



Caithness transmission reinforcement



NOW, at July 2015

- ~£1bn package of works
- Ofgem approval July 2014
- HVDC link, Spittal – Blackhillock is a central element with provision to accommodate 600MW Shetland HVDC link
- Caithness-Moray HVDC scheduled commissioning 2018

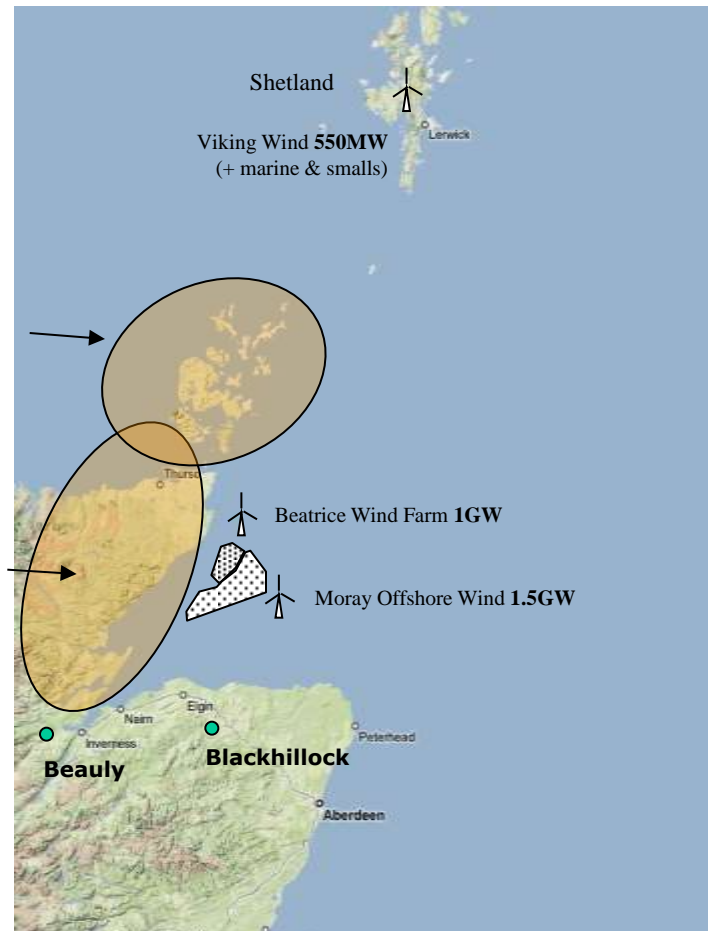
But what did we know in 2009 when calls were invited for the European Energy Programme for Recovery (EPR)?

Northeast Scotland - Existing and planned generation in 2009/10

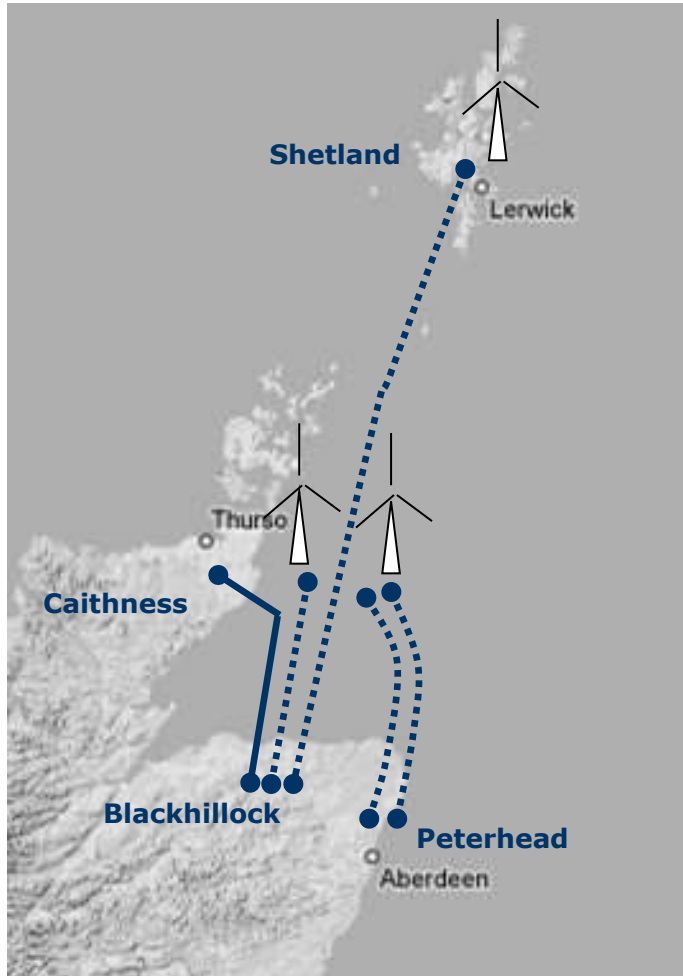
Orkney waters marine sites
1.2GW (500MW contracted)

Existing and planned generation
north of Beaulieu to 2020,
1.9GW (includes Pentland Firth
marine connecting directly to
mainland)

(+ 0.5GW not contracted)

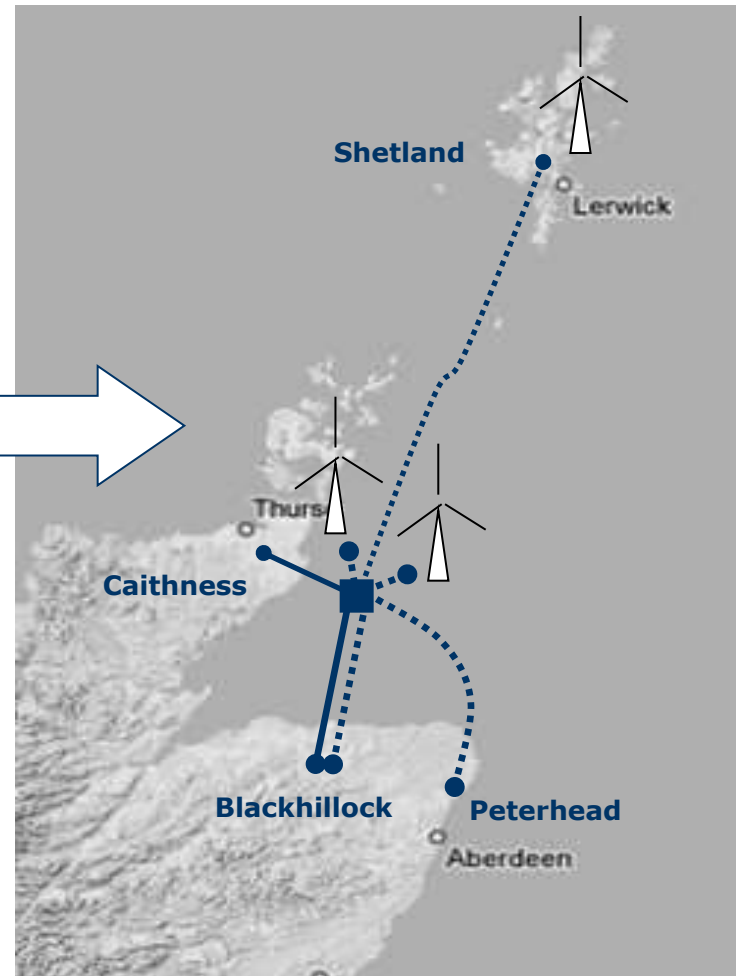
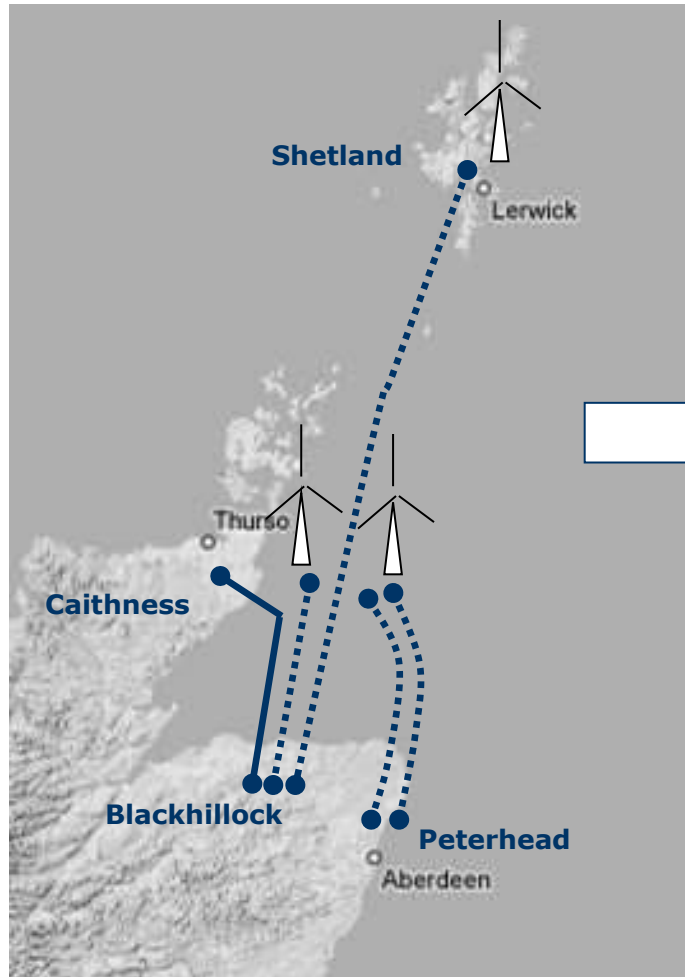


Regional transmission solution based on radial, dedicated connections



What is the offshore HVDC hub about?

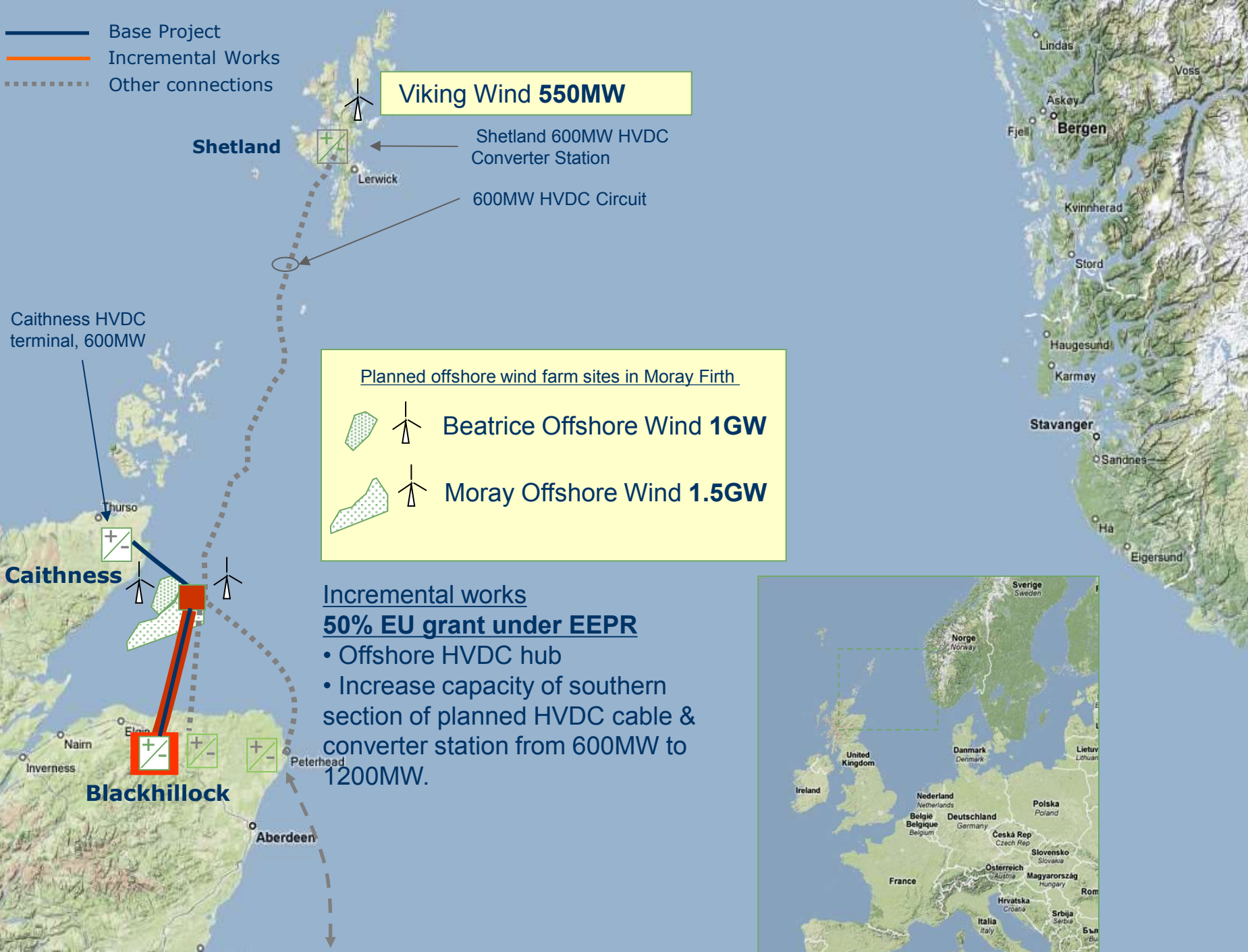
Radial, dedicated connections vs optimised, flexible transmission solution.



Southern

Energy
Power Distribution

- Base Project
- Incremental Works
- - - Other connections



Viking Wind 550MW

Shetland 600MW HVDC Converter Station

600MW HVDC Circuit

Planned offshore wind farm sites in Moray Firth

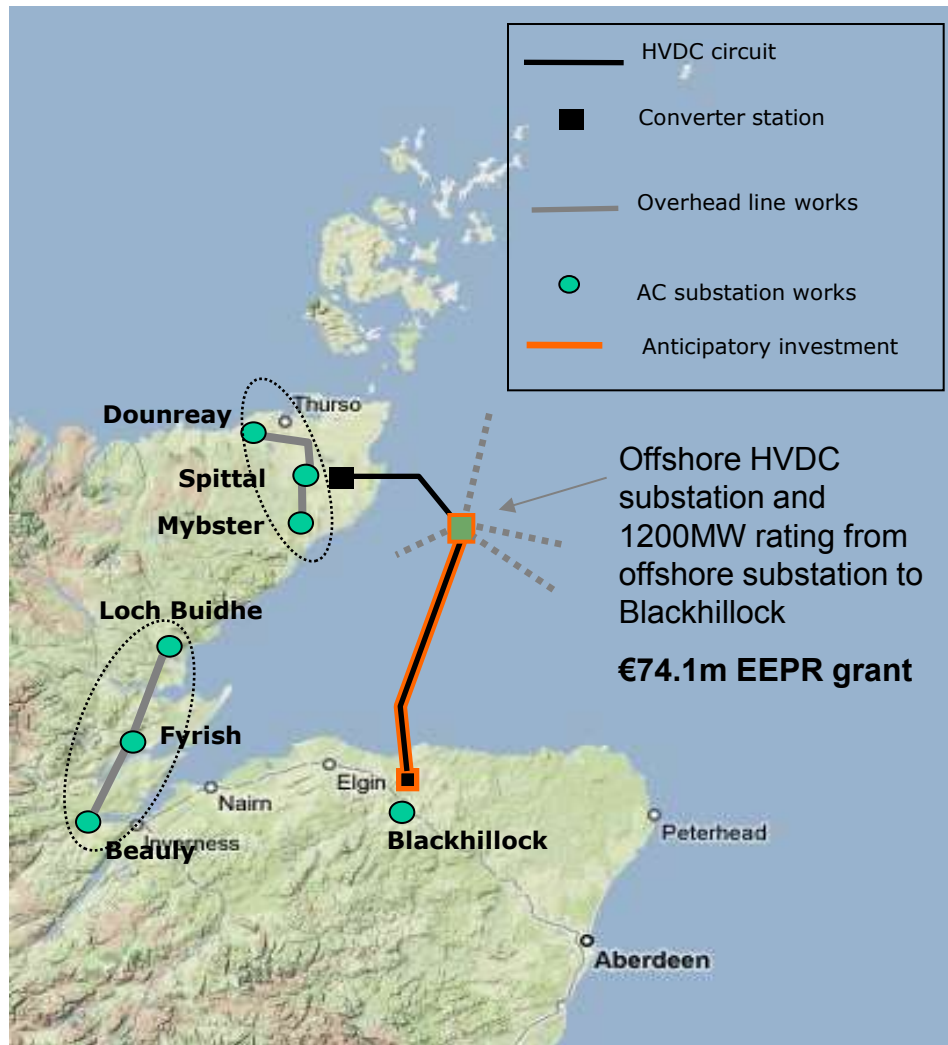
Beatrice Offshore Wind 1GW

Moray Offshore Wind 1.5GW

Incremental works
50% EU grant under EEP
 • Offshore HVDC hub
 • Increase capacity of southern section of planned HVDC cable & converter station from 600MW to 1200MW.



Offshore HVDC substation “hub” and EEPGR grant 2009

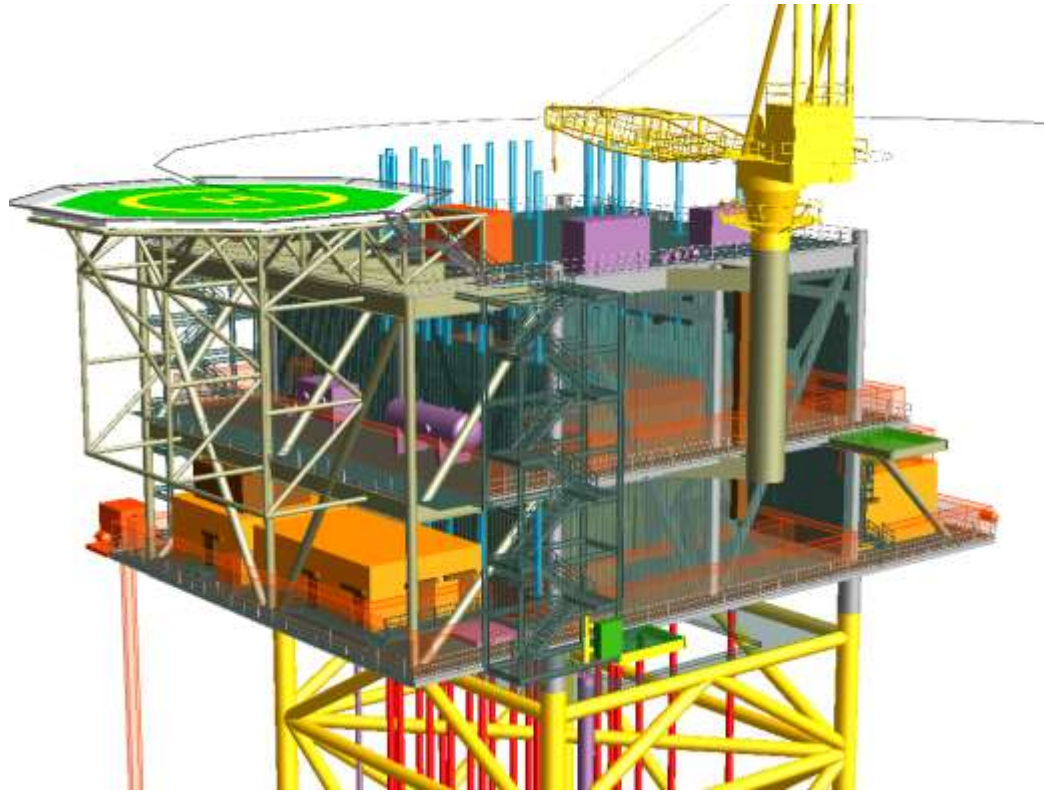


“Anticipatory” investment:

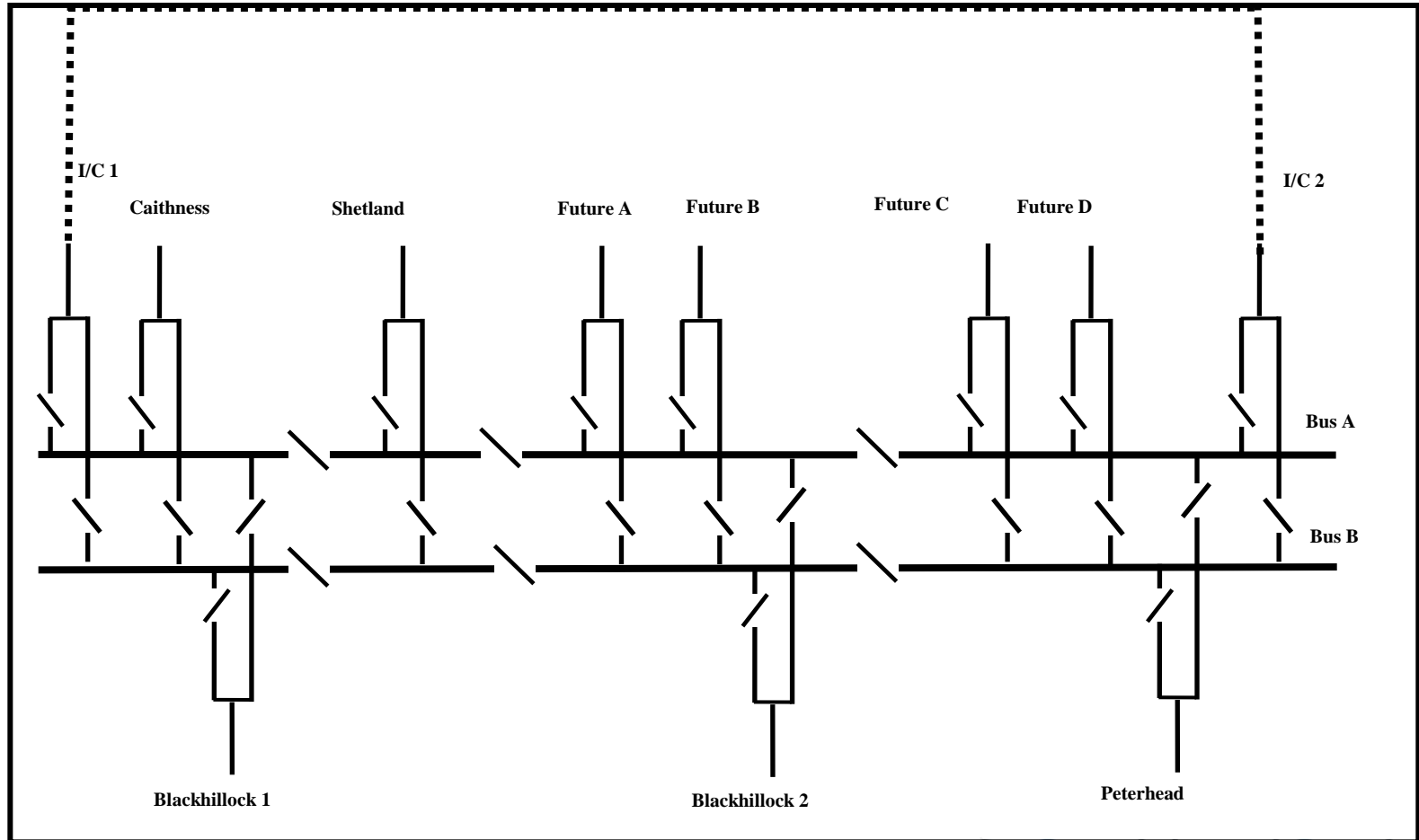
Incremental rating	£74m
Offshore HVDC hub	<u>£150m</u>
Total	<u>£224m</u>

EEPR Grant allocation (from 2009) €74.1m.

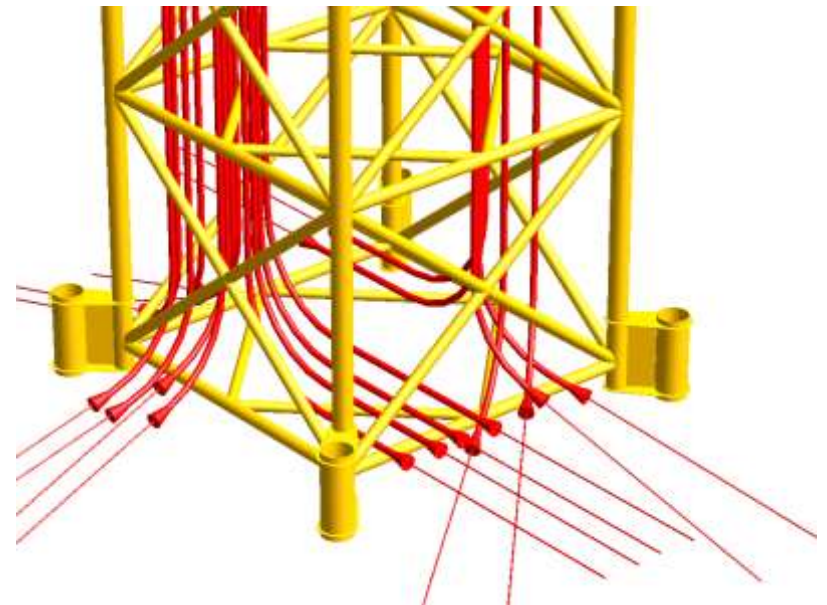
Moray Firth Offshore HVDC substation – Gas Insulated Switchgear



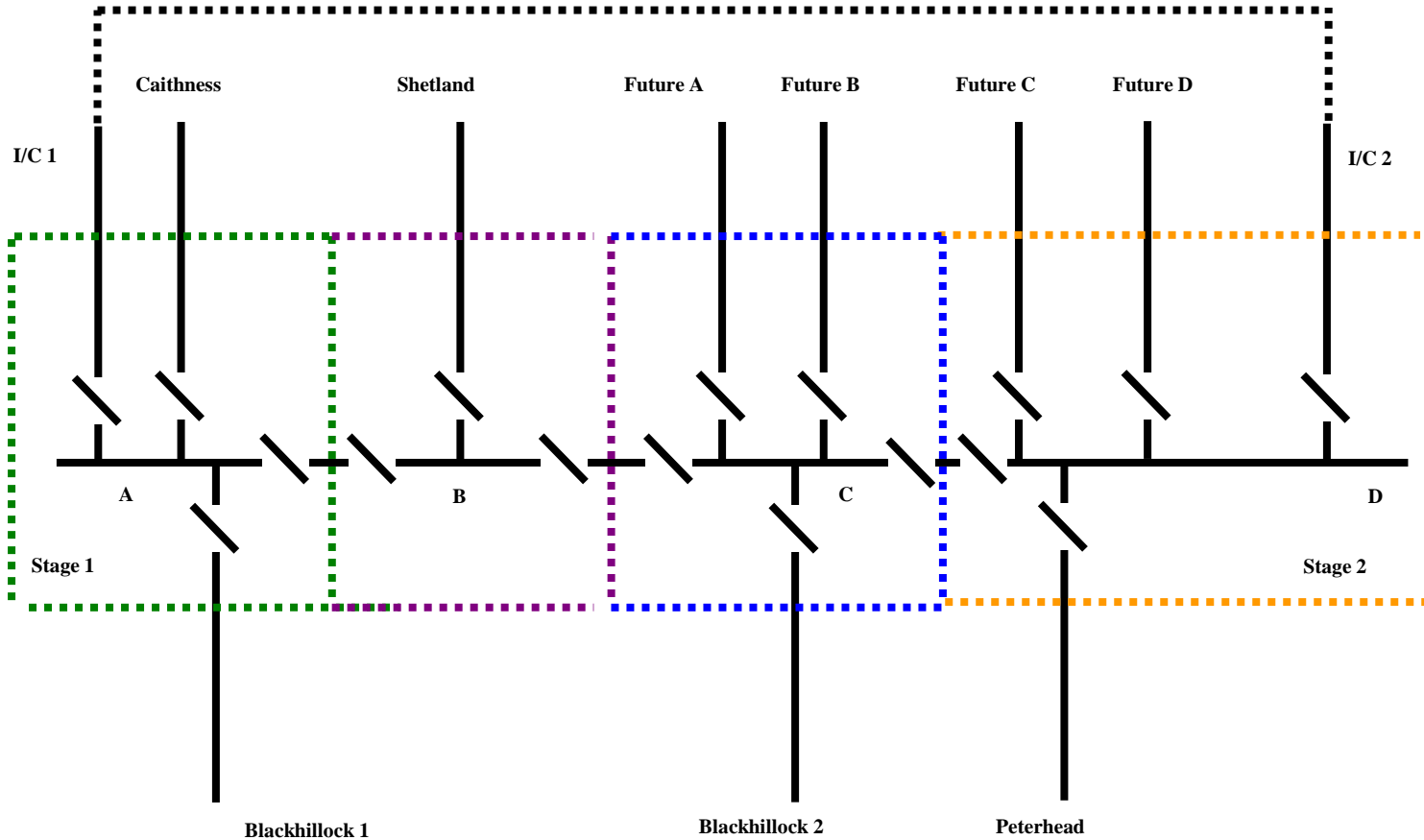
Schematic double busbar layout for offshore GIS



Moray Firth Offshore HVDC substation – Air Insulated Switchgear

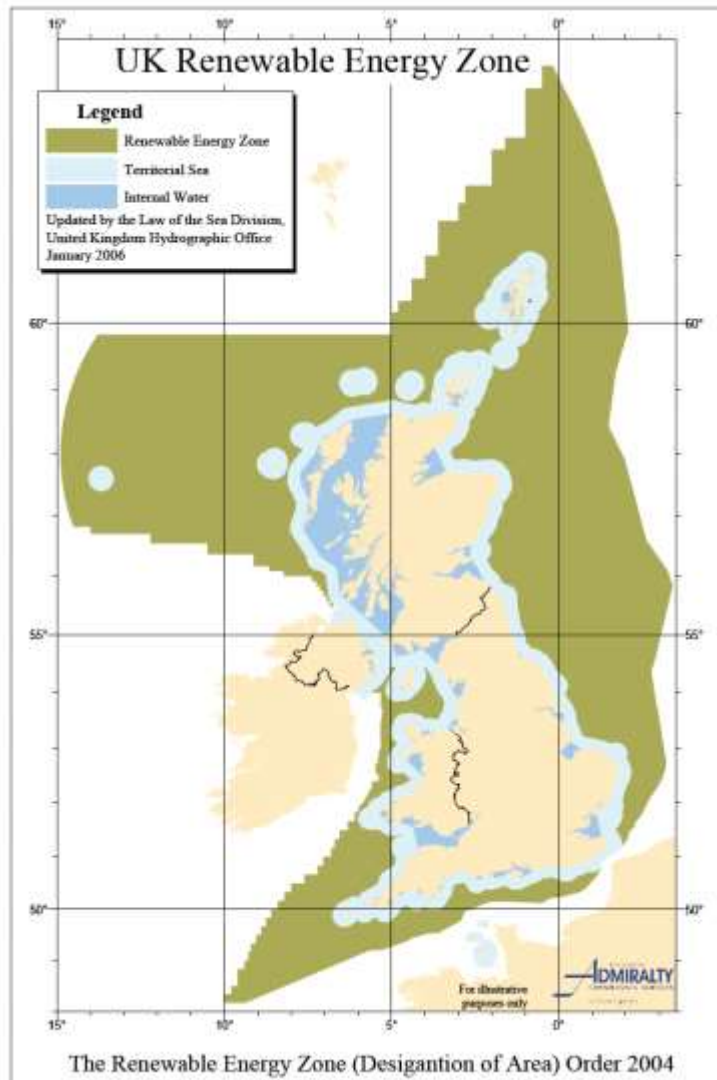


Schematic single busbar layout for offshore AIS



GB transmission

Onshore/offshore planning, ownership and licensing

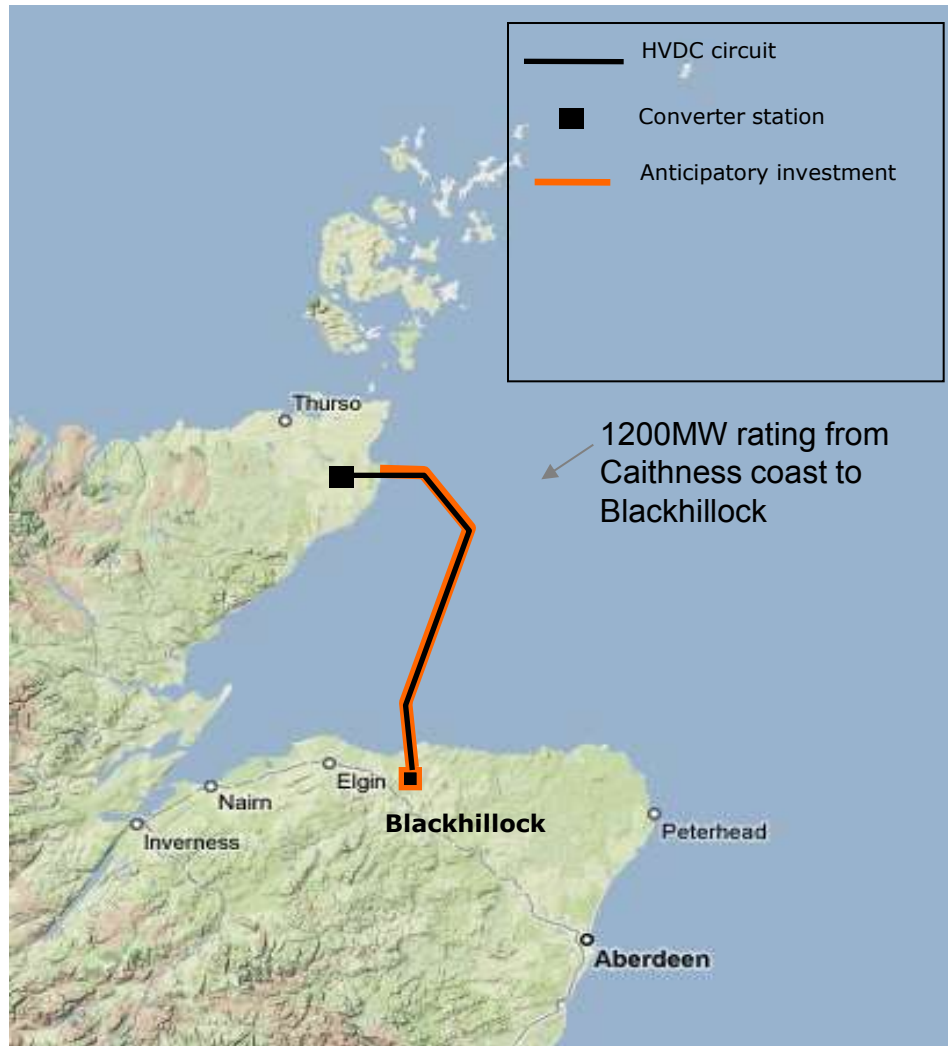


Future integrated approach to onshore/offshore transmission arrangements subject to Ofgem ITPR project

“Integrated Transmission Planning and Regulation”

www.ofgem.gov.uk

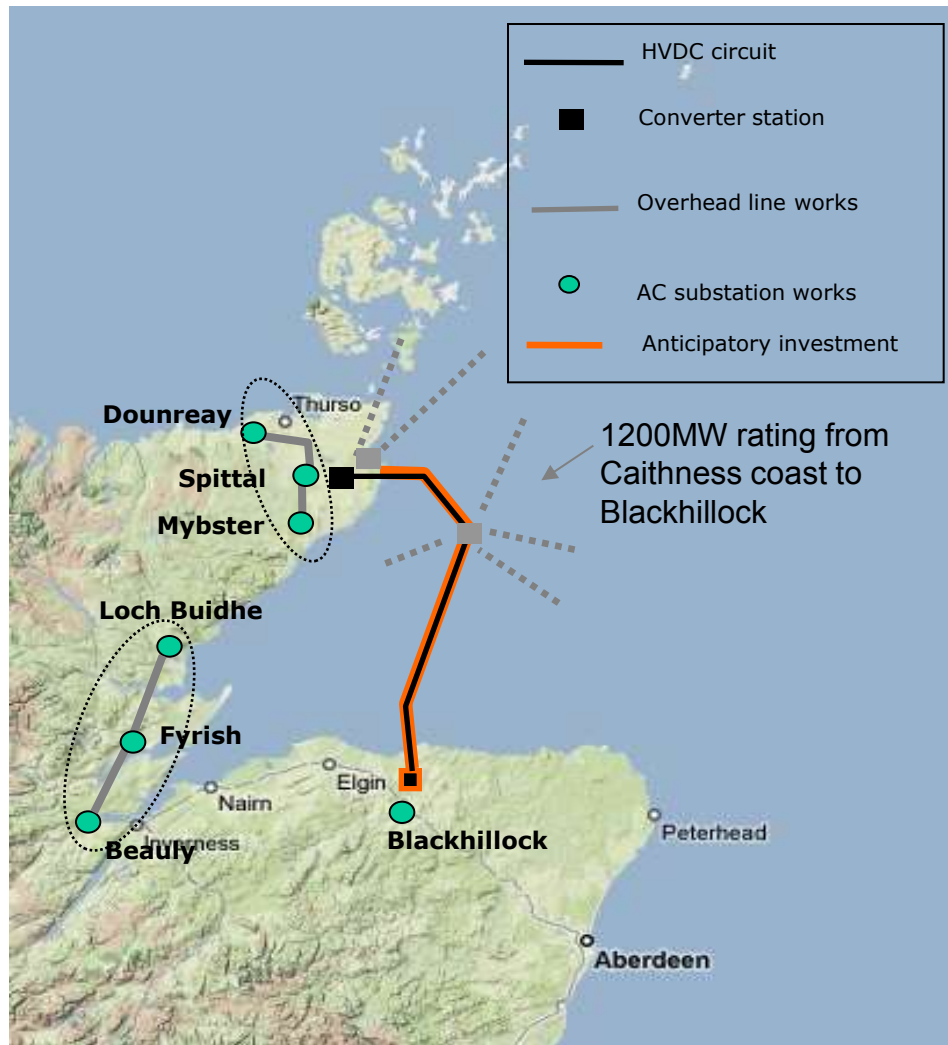
Alternative “anticipatory” investment 2012



Increase the extent of 1200MW HVDC cable

Defer offshore HVDC hub

Alternative “anticipatory” investment 2012



Reduces “Anticipatory” investment to **£99m**

Increases flexibility. Enables more transmission development paths to cover more future generation scenarios, including higher exports from Orkney and Caithness.

Allows for future inclusion of HVDC substation(s) if required;

- offshore in the Moray Firth
- onshore at Sinclair’s Bay
- or both.