

## Our Strategic Plans to Build a Reliable Transmission Network for a Low Carbon Environment in Future



December 8-9, 2011, EPRI Workshop, Manchester University, UK  
Ziming Song

# Drives, Challenges and Tasks

---

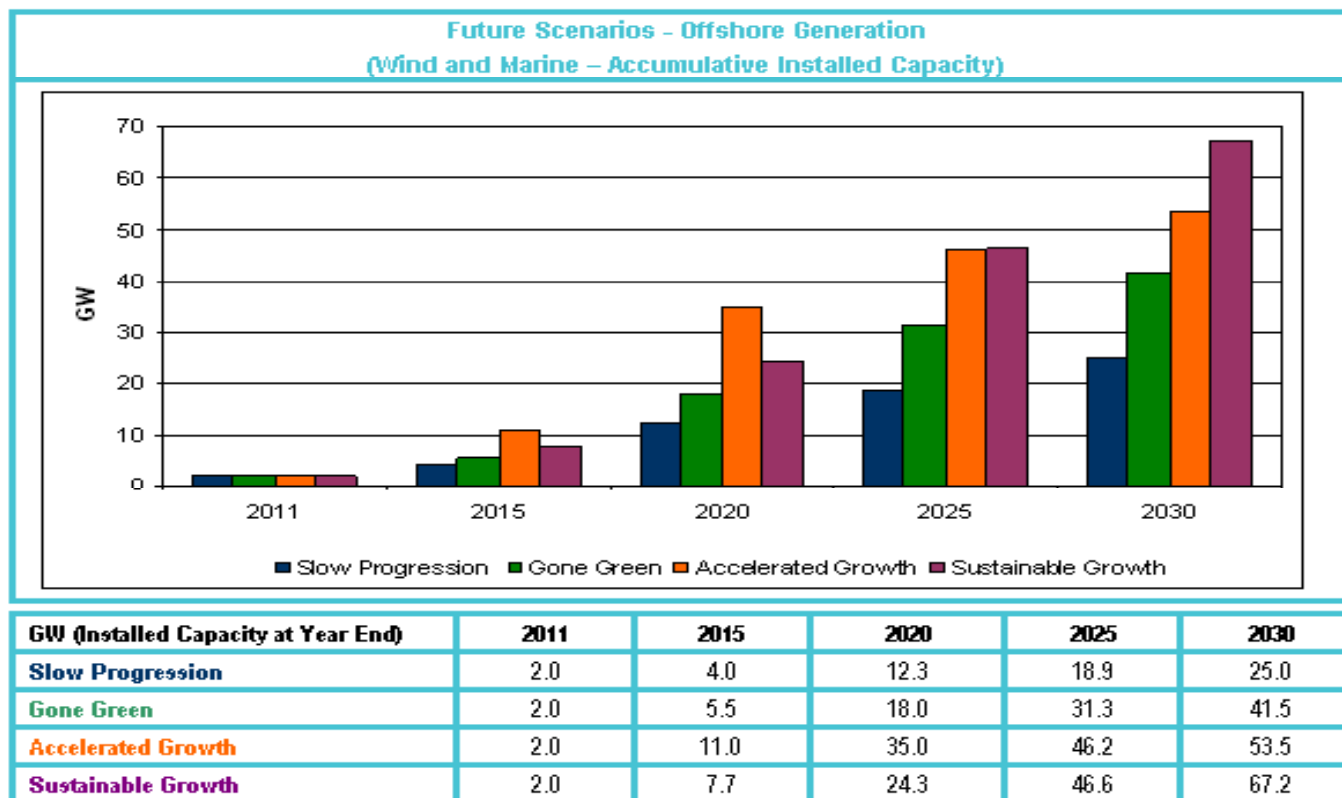
## ■ Drives and Challenges

- To meet the EU 2020 Environment targets
- On generation – up to 30% of electricity from renewable sources
- On demand – a 20% cut in energy consumption by improving energy efficiency, many uncertainties (embedded generation, EV, demand response etc.)

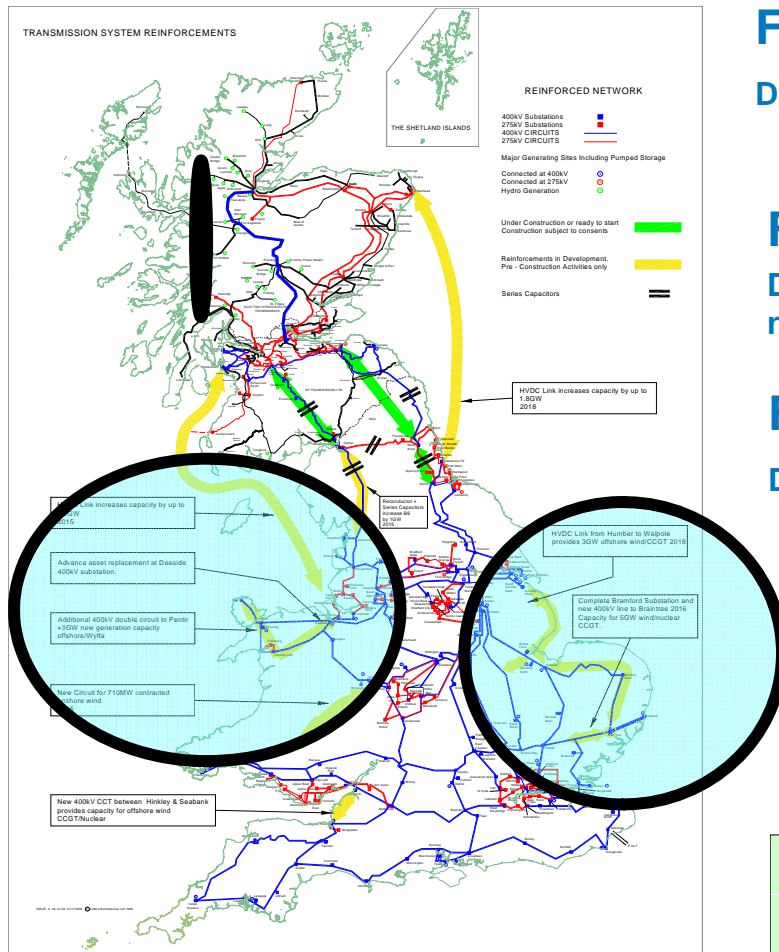
## ■ Tasks

- Reinforce the existing network and vastly extend it to connect offshore wind farm generations
- Respond to the changes from active DNOs – many uncertainties
- Extensively use power electronic devices, state-of-art technologies, and innovative approaches

# Scenarios used for Future Network Planning Studies



# An overall picture of future network Reinforcement



## Focus on Scotland

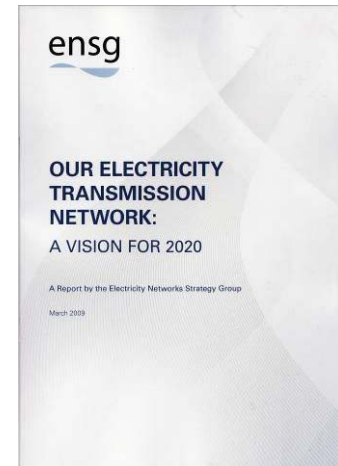
Driven by renewables

## Focus on East Coast

Driven by offshore renewables / nuclear

## Focus on South & West

Driven by nuclear/wind



**£4.76b Strategic Investment**

**£26b Offshore Investment**

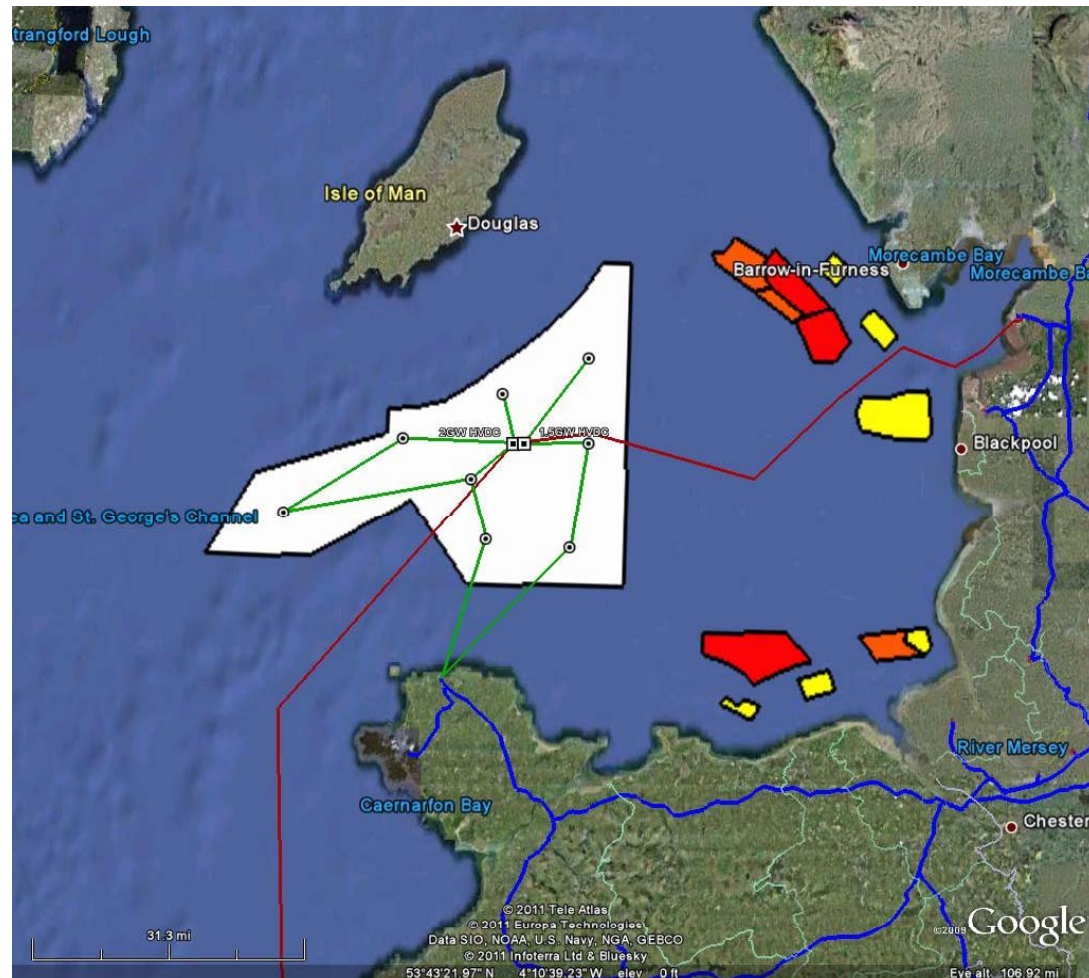
**£4b Asset Replacement**

1. Build more transmission capacity faster

1a. "Strategic Investment" in transmission – Technical Studies

1b. Regulatory Reform for Strategic Investment

# An Example of Offshore Wind-Generation Connection



# Cases for Reliability Assessments

## -- network level

---

- Adequate reserve for reliable and economic operations
  - How much reserve is required in light of a high percentage of wind penetration
  - How to manage the reserve to ensure demand can be met securely
- Demand modelling -- impact of active DNOs, embedded generations, EV, smart grid and real time management etc.
- Identify the determining factors/methods in reliability assessment among wind generation, active demand, interconnector etc.

# Cases for Reliability Assessments --Technologies and Operations

---

- Interconnection to countries in Europe
- New Technologies
  - HVDC – not only bulk power transfer, but dynamic control and voltage regulation to increase the stability margin
  - VSC – HVDC, connecting large scale wind-generation
  - SC – shorten the virtual distance of long lines
  - PMUs – monitoring the states of power flows in real time and providing co-ordinate measures against any likelihood of trouble
- Network Operations (forecasting, system analysis etc.)
- Energy storage at transmission level
- Simulation capability (specific models for new devices and network wide simulation studies)