Joint Ofgem/DECC Offshore Transmission Coordination Project

2nd Expert Workshop:

Network scenarios

6 May 2011

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1. Welcome – a quick update

- **Previous workshop outputs presented to OTCG on 18 April:**
  - General agreement on issues raised at expert workshop
  - Views given on materiality/prioritisation
  - Secretariat's summary report to be published on website next week

- **Consultants appointed**:
  - TNEI/PPA Energy: Providing assistance on grid configuration and asset delivery
  - Redpoint: Providing support on regulatory and commercial issues

- **Evidence collection for Work stream 2 now commencing:**
  - Asset optimisation scenarios

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Today's Agenda

1. Welcome & introductions
2. Work stream 2: Introduction and Presentation by TNEI/PPA Energy
3. Presentation by NETSO – work to date and Q&A

Coffee break 11:05-11:20

4. Workshop session 1: Identifying the key steps in the process for delivering offshore transmission assets.
5. Workshop session 2: Identifying the critical elements to enable co-ordinated action
6. Close

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2. Introducing Workstream 2

- The work stream is being undertaken to provide us with a better understanding of the technical feasibility, costs and benefits of certain proposed grid configurations.

- We need to establish how these costs and benefits change against different demand scenarios. We want to understand the incremental cost of different network configurations -this helps to give a view of the cost and value of 'optionality'

- We also want to gain a view of the feasibility of the delivery of different configuration scenarios.

- This is not an exercise in central planning:

    - The outputs of this work will be used to help make an assessment of any additional measures to help maximise the benefits of co-ordination.

    - The grid configurations that are ultimately delivered will be based on the regulatory environment and private sector investment decisions.

- Consultant's role

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Workstream 1: Asset Delivery

Offshore Transmission Coordination Group

Graeme Bathurst
Technical Director
TNEI Services Ltd

Neil Pinto
CEO
PPA Energy

Newcastle, Manchester, London

Part of the Petrofac group

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Introduction

- Specifically the Asset Delivery team has:
  - A strong understanding of offshore transmission technologies, their maturity, cost base and applicability
  - A detailed understanding of the OFTO process, transmission system development and network operations
  - A firm appreciation of the challenges and barriers to the large scale development and integration of offshore wind
  - An extensive understanding of the planning, environmental constraints, and consenting requirements for the development of windfarms and network infrastructure

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Appreciation of Scope

- **Appreciate the issues of coordinated offshore network planning:**
  - We have recently been through a similar exercise with ISLES
  - We are currently performing export solution optimisation for a number of OFWs
  - We have access to the experience and knowledge in the German offshore wind arena on BorWin1 and DolWin1 HVDC

- **Key issues to consider with offshore transmission are:**
  - There are a set of technology driven maximum link capacities
  - Assessments of project timing to assess the risk of asset stranding
  - ODIS states integrated approach possibly a no-regret option
  - There may be conflicts between optimisation for offshore wind, system reinforcement and international interconnection

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Proposed Methodology

- ODIS systems used as starting point given timescale & complexity of the problem
- The overall analysis approach will be staged in the following manner:
  - Gather and review relevant existing available information
  - Establish generation scenarios and implement in a simple Excel model
  - Establish feasible network scenarios to achieve required export
  - Overlay practicalities and timing implications
  - Assess construction options including phased build, pre-investment, etc
  - Assess impact of project sensitivities such as generation projects falling away or being significantly delayed due to external issues

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Stage 1 – Evidence Gathering

- Evidence base likely to include:
  - National Grid (SYS, ODIS), ENTSO-E (supergrid & north sea grid), Eirgrid (offshore grid studies), TenneT-Germany (offshore guidelines including standardisation of voltage and block size)
  - Crown Estate (Round 1,2,3 zones, East Coast Network Technical Feasibility Study, Round 3 connection study, West Coast Offshore Wind Grid Issues), Marine Scotland (STW),
  - ISLES, Desertec, Friends of Supergrid
  - Information from Round 3 developers on their concept connections
  - Information from OEMs such as ABB, Siemens and Alstom Grid
  - Contribution from other OTCG stakeholders

Stage 2 – Development of Scenarios

- Indicative generation scenarios developed bottom-up with timings based on EMR
- CapEx modelling done on a unit-cost basis
- Asset optimisation scenarios to consider the following key points:
  - location and capacity ranges of the offshore wind resources and possible onshore network connection points
  - timing of the project developments, connection requirements, network reinforcements, onshore generation, interconnectors, etc
  - characteristics and readiness of network technology
  - required level of system reliability and security of supply (SQSS)

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Stage 3 – Analysis of Scenarios

- We believe that the key project assessment criteria includes:
  - Life-cycle project cost including CapEx, OpEx and capitalised losses
  - Degree of network security, availability and inherent redundancy
  - Network capacity phasing and exposure to generation project delays
  - Identification of strategic pre-investment requirements for concept configuration, construction timescales and supply chain availability
  - Relative benefits and materiality of procurement led efficiencies
  - Interaction with planning and consenting process and sensitive landscape and foreshores

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Stage 4 – Conclusions

- Focused on presenting the key findings from the option optimisation scenarios and analysis in a clear final report
  - Key outputs to feed into Regulatory and Economic work-package

- Presentation to Industry:
  - Interim Report Summer 2011
  - Final Report Autumn 2011

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ODIS & Coordinated Solution Update

OTCG Expert Group

Offshore Development Information Statement (ODIS)

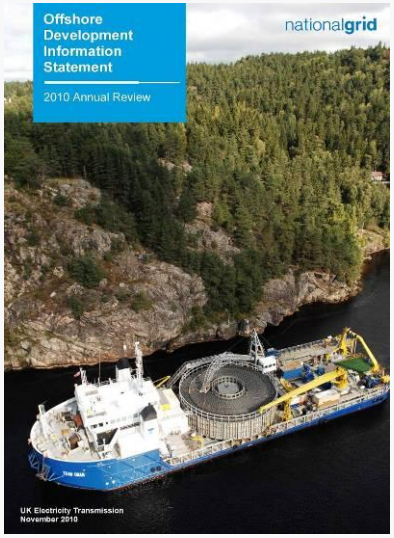
A Coordinated Solution

- The main purpose of the Statement is to facilitate the achievement of the coordinated development of the onshore and offshore electricity transmission system.
- It includes a wide range of information relating to possible development of both the offshore and onshore transmission systems:
  - generation scenarios,
  - applicable technology,
  - offshore transmission design and onshore transmission co-ordination.
- Supported by technical and economic analysis and sets out options for reinforcing both the offshore and onshore and transmission networks that demonstrate the way in which the UK can achieve its challenging renewable energy target.

Not a plan

- Presents current information but no obligation to follow suggested designs or recommendations

Stakeholder Engagement



Stakeholder Engagement

Technology

Industry Workshop (April 2011)

Focus on technology advancements which may be required to facilitate offshore generation: feasibility and deliverability.

Positive indicators (from suppliers) that advancement highlighted in 2010 ODIS were plausible and deliverable within ODIS time span.

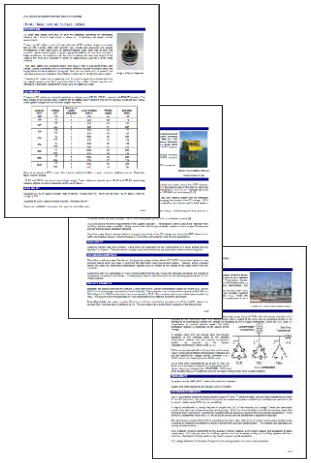
Future Scenarios

Industry Consultation (February/April 2011)

Engagement with industry on which future scenarios should be put forward for selection and inclusion in 2011 Statement.

Scenarios and sensitivities selected will form the basis of the transmission design analysis and subsequent outputs.

Technology Development



Technology

Research & Development

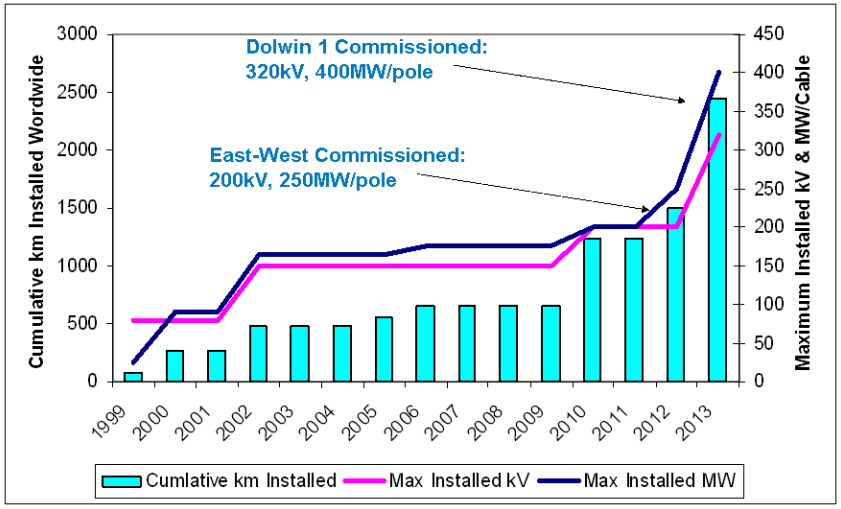
Ongoing research into state of the art technology and future growth requirements which may offer efficiencies through larger capacities, greater reliability and increased control options.

Technology Evolution

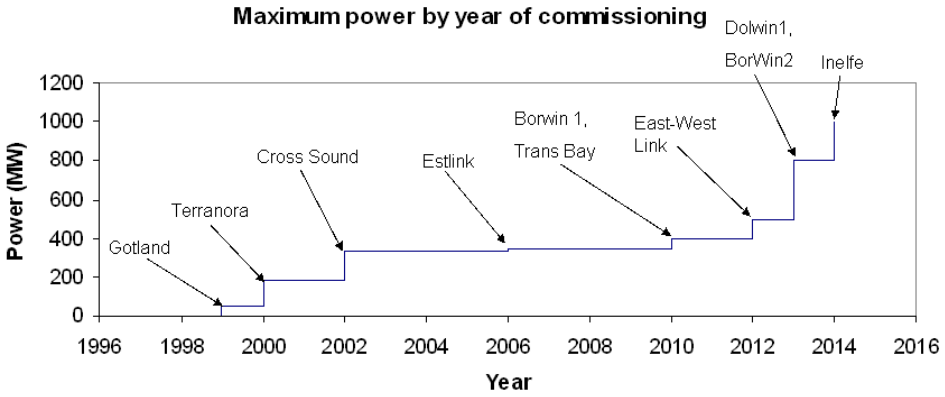
Manufacturers confident of larger HVDC VSC converters and cables will be available in the short to medium times.

Promoting standardisation of assets

Extruded HVDC Cables



HVDC Offshore Projects



Offshore Transmission Network Feasibility Study

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Objectives and Scope

- Validate outcomes from the network design work and propose potential onshore and offshore routes for cable corridors
- Develop theoretical and practical consenting framework for offshore network and related infrastructure

Joint Integrated Feasibility Study

Deeper investigation of the qualities of an integrated offshore network taking into account:

- Different offshore generation growth scenarios

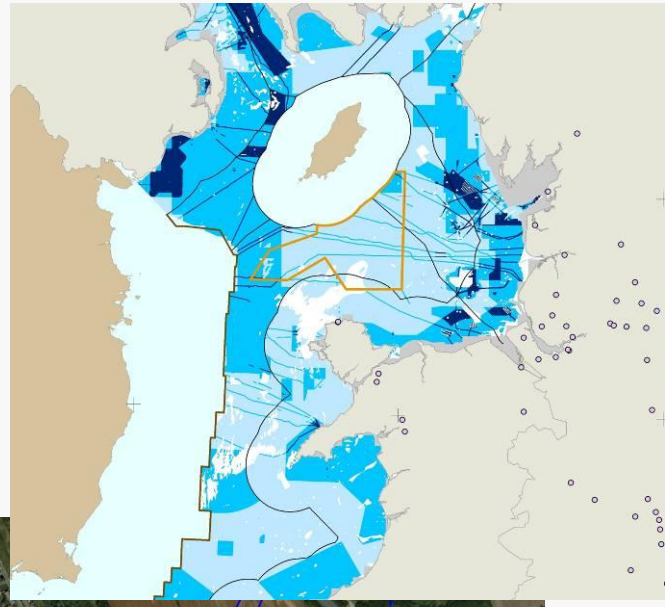
- Offshore constraints such as seabed conditions and environmental designations

- Supply chain requirements

- Investment requirements

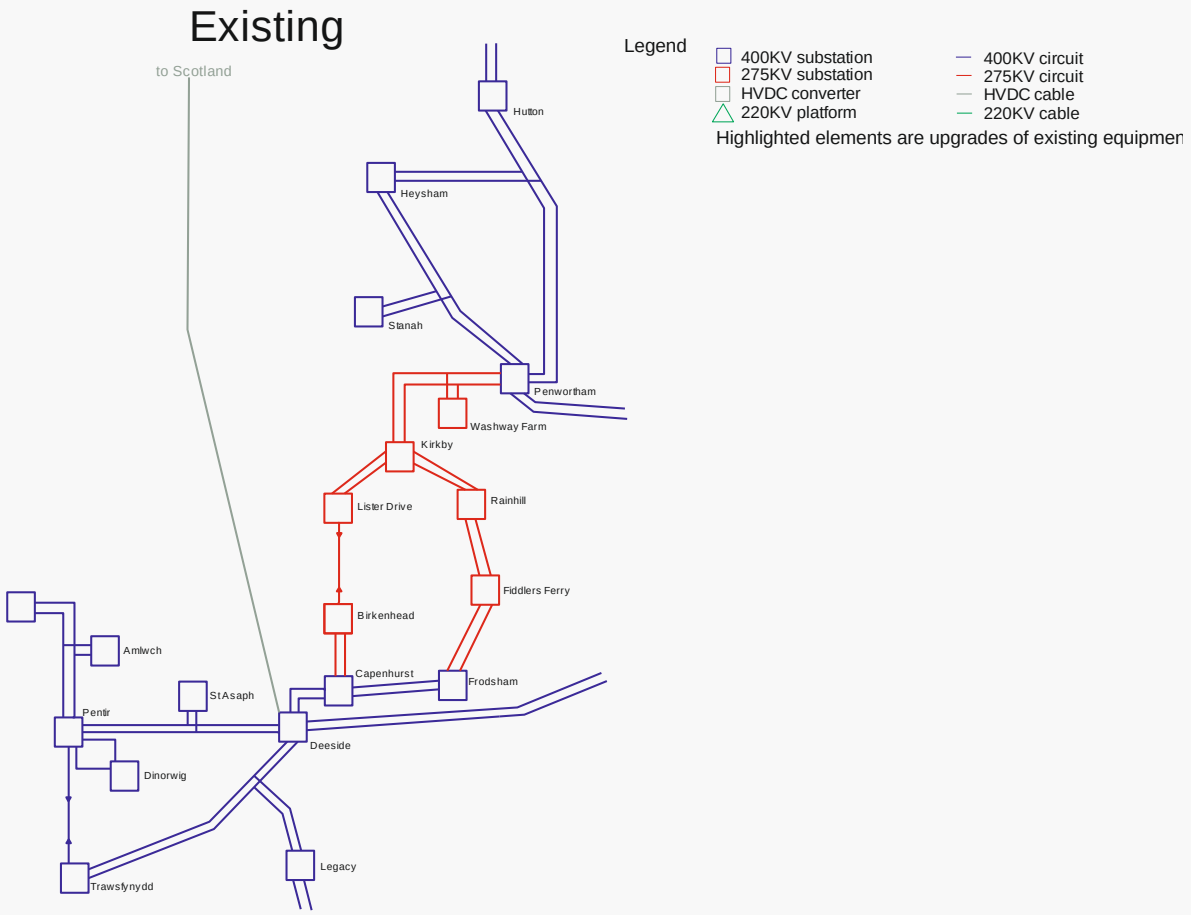
- Chronology of development stages

- Onshore connection options and requirements



Staged Development

Producing development stages which can be delivered on time to meet connection requirements, allow future expansion and avoidance of possible stranding.



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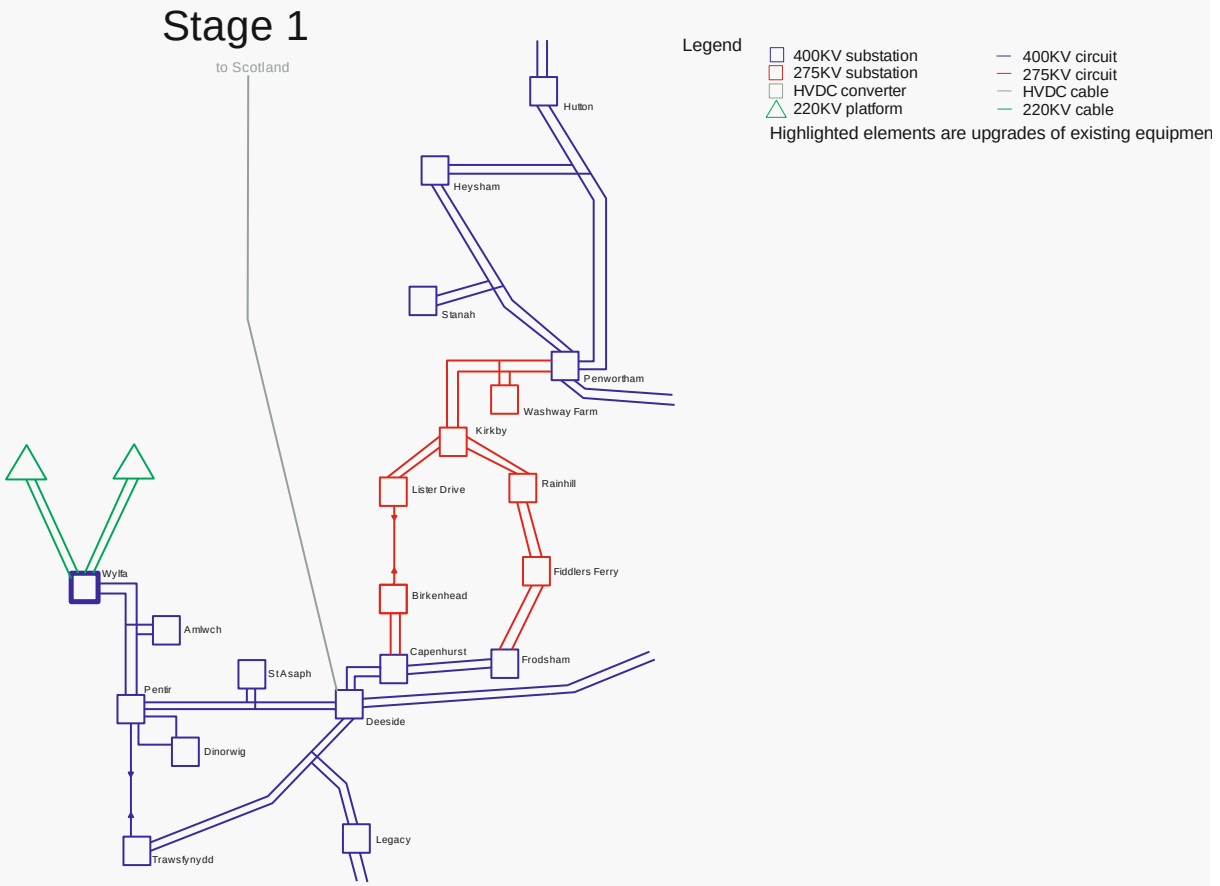

Note. Some onshore reinforcements will be driven by onshore developments

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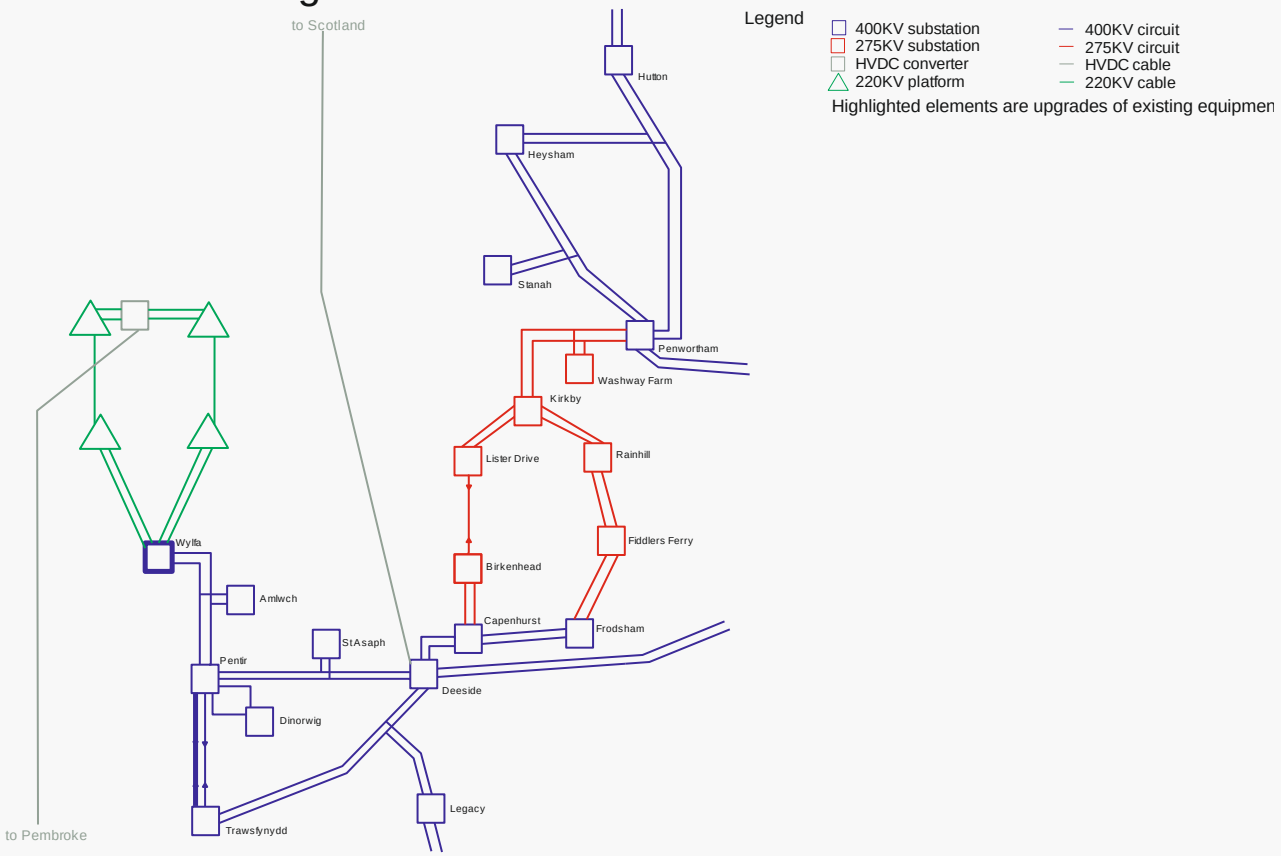
Stage 2



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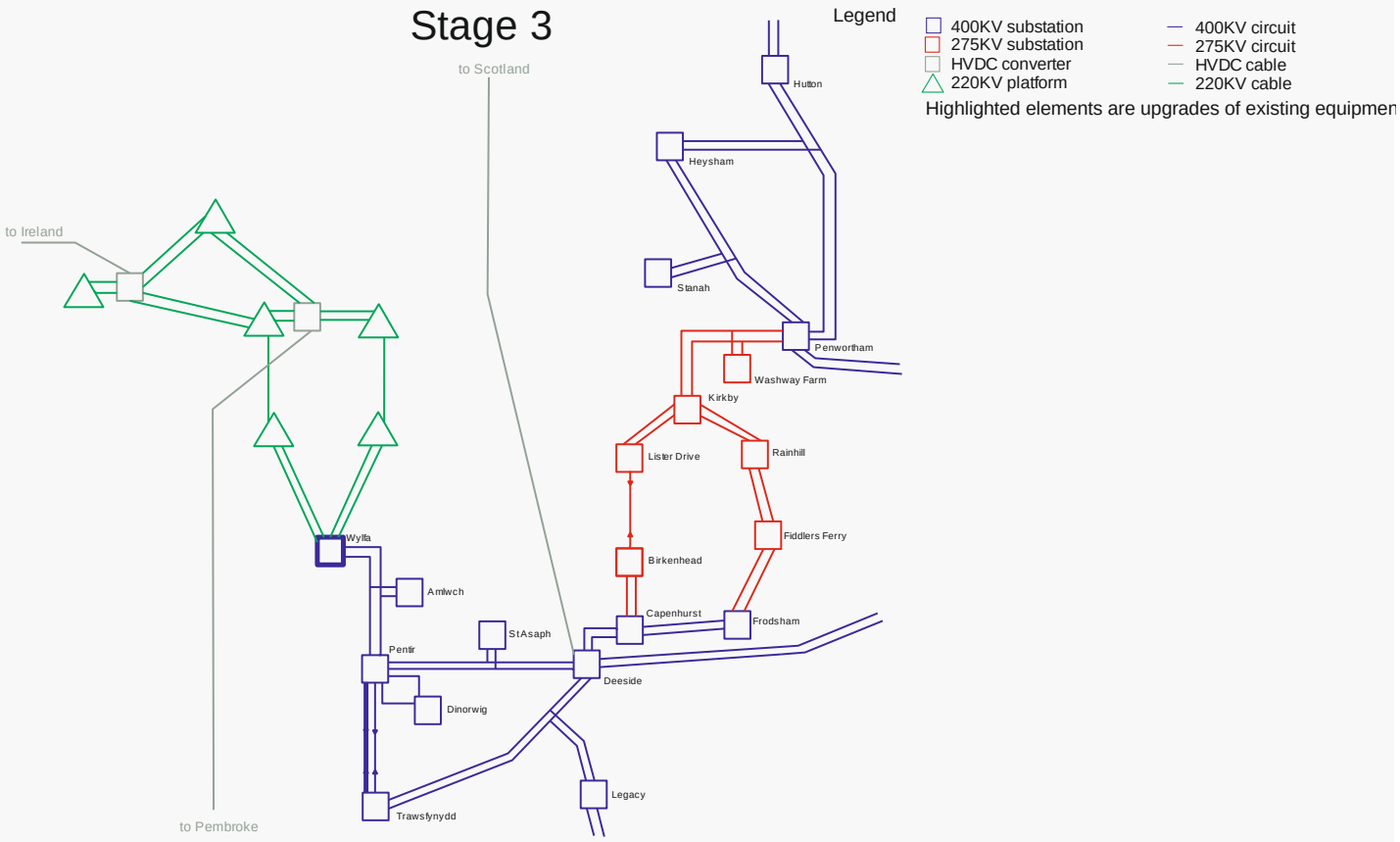

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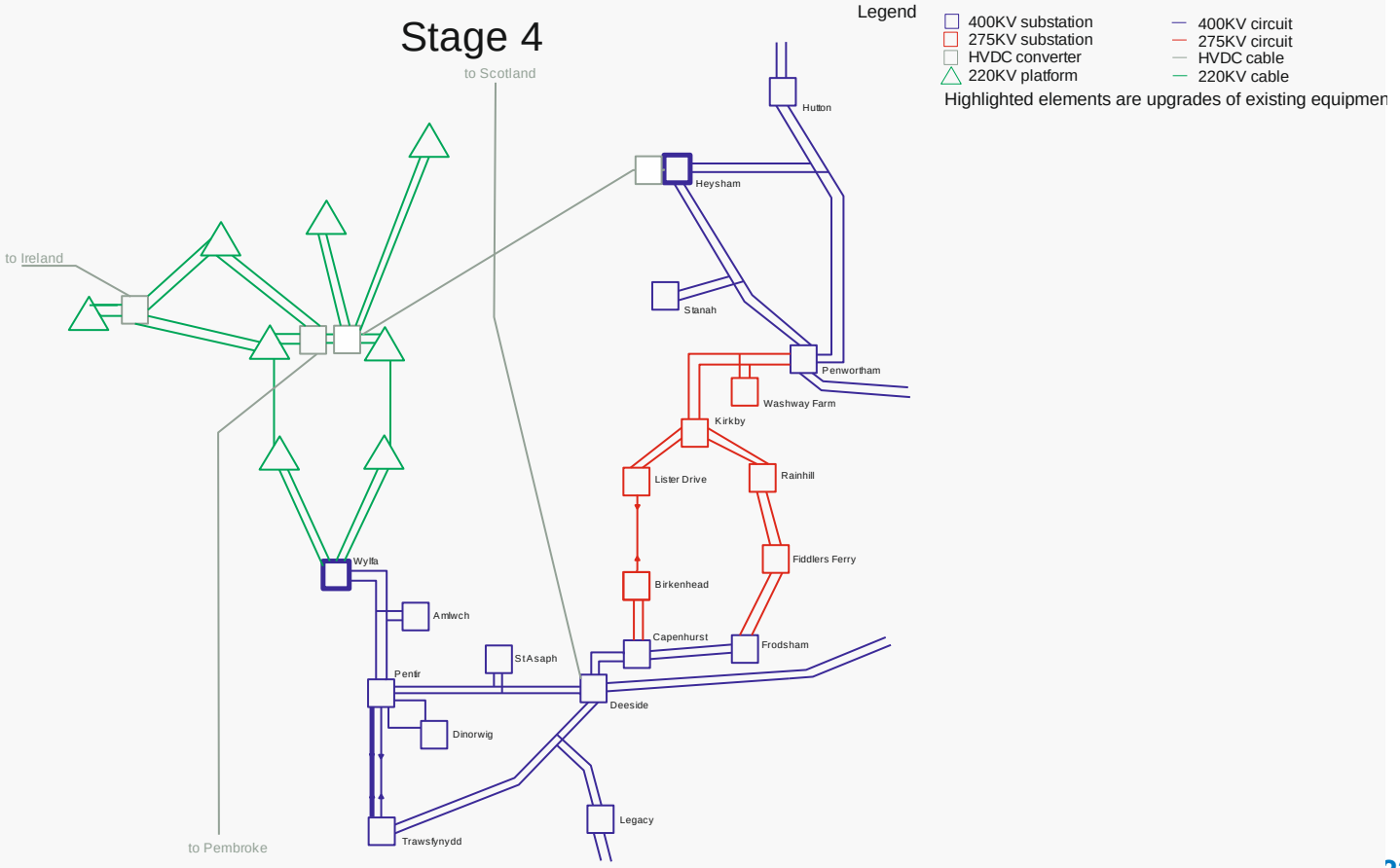

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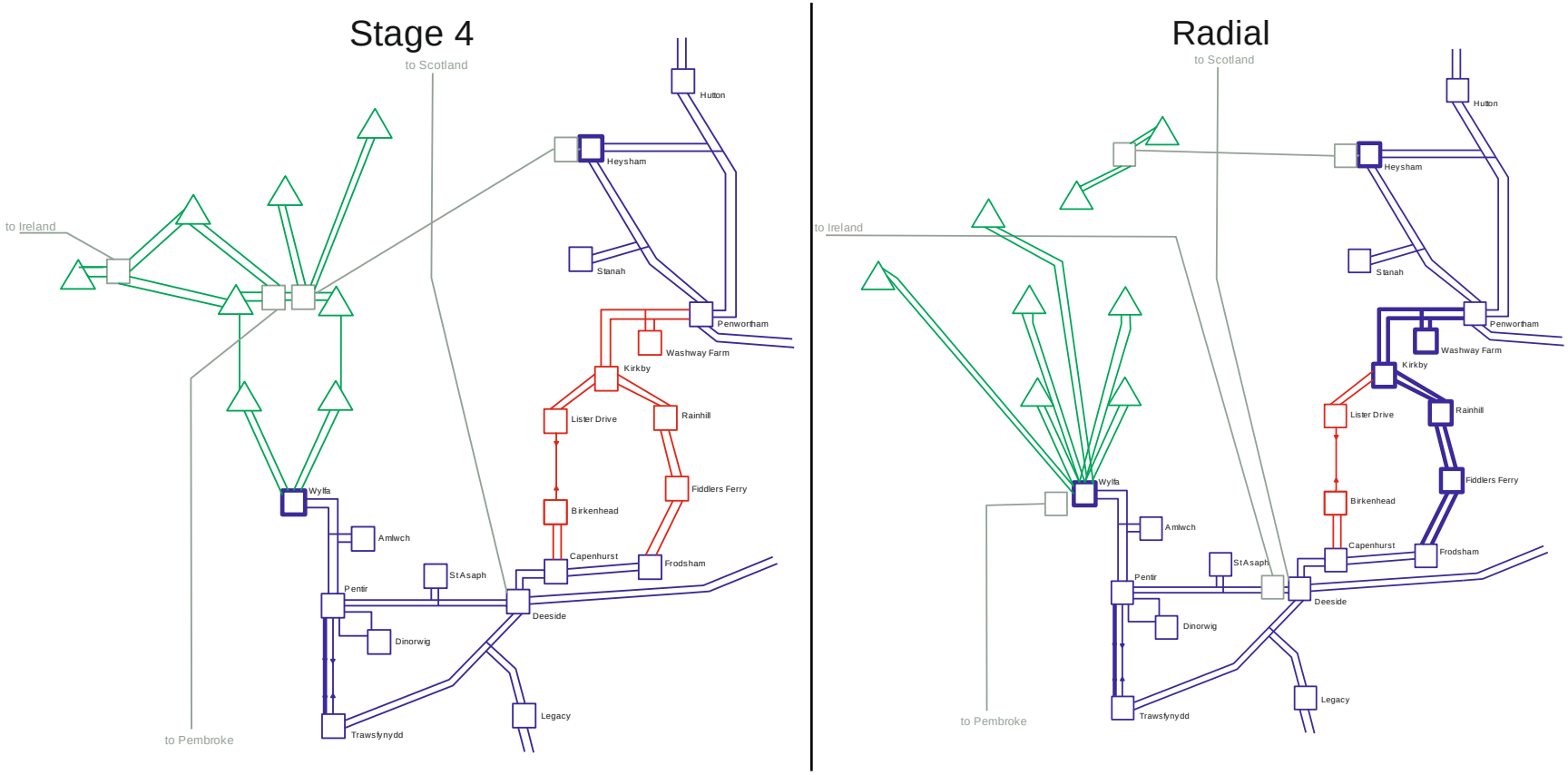

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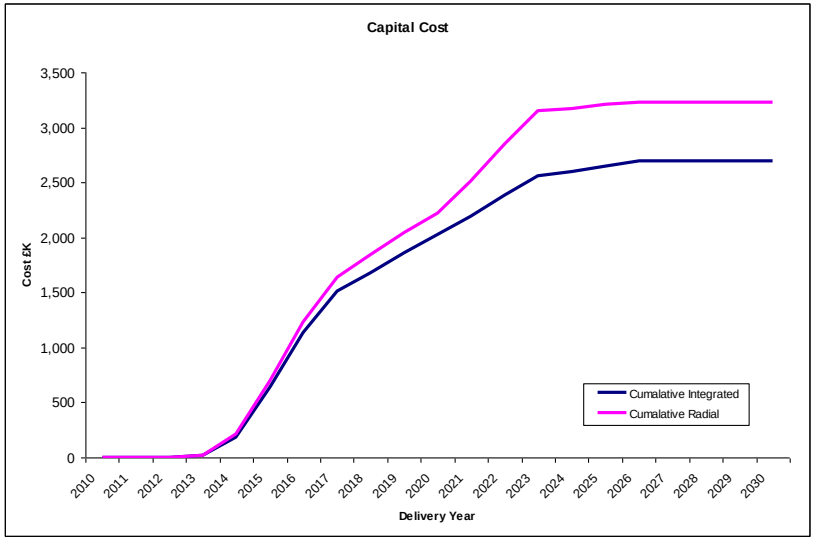
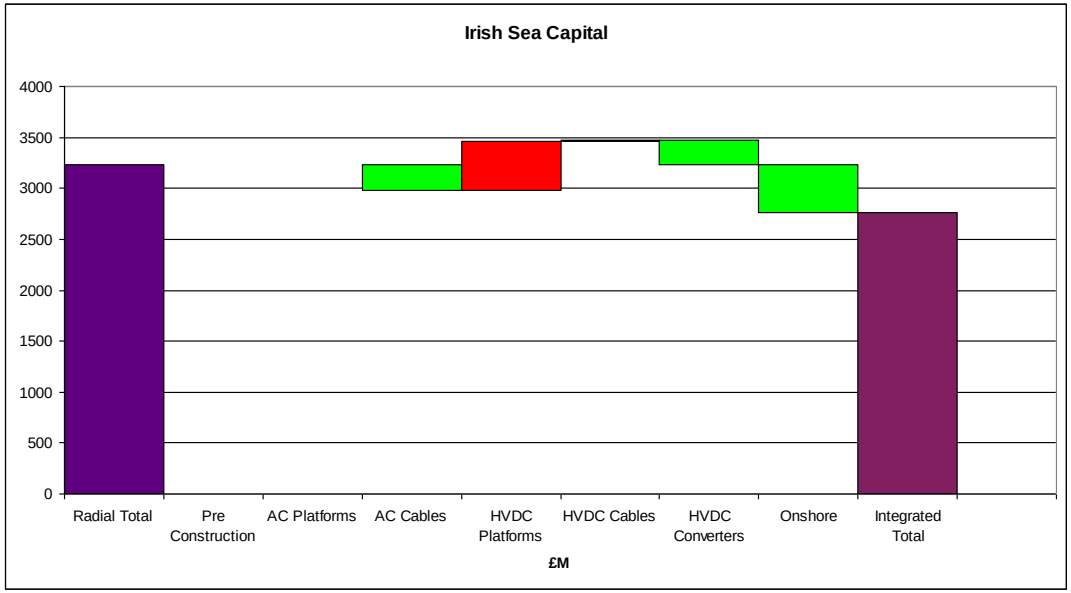
Capital Cost Comparison



Capital v time

Capital per item



2011 ODIS: Focus

Focus

Wider Stakeholder Engagement & Enhanced Information

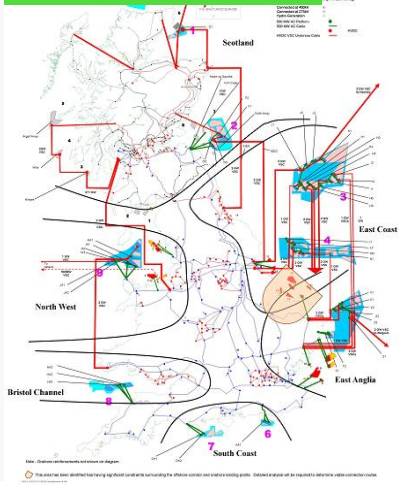
Emphasis on Statement's Aim and Revamped Presentation Layout

Development of Non Technical Summary Document

Greater integration with Europe (high level)

Enhanced information on connection options

Coordinated Solution



Coordinated Solution

Next Stage of Development
(subject to information being available)

Potential Offshore Corridor Routes

Technology Assumptions & Developments

Wider European Integration

North Sea Concept

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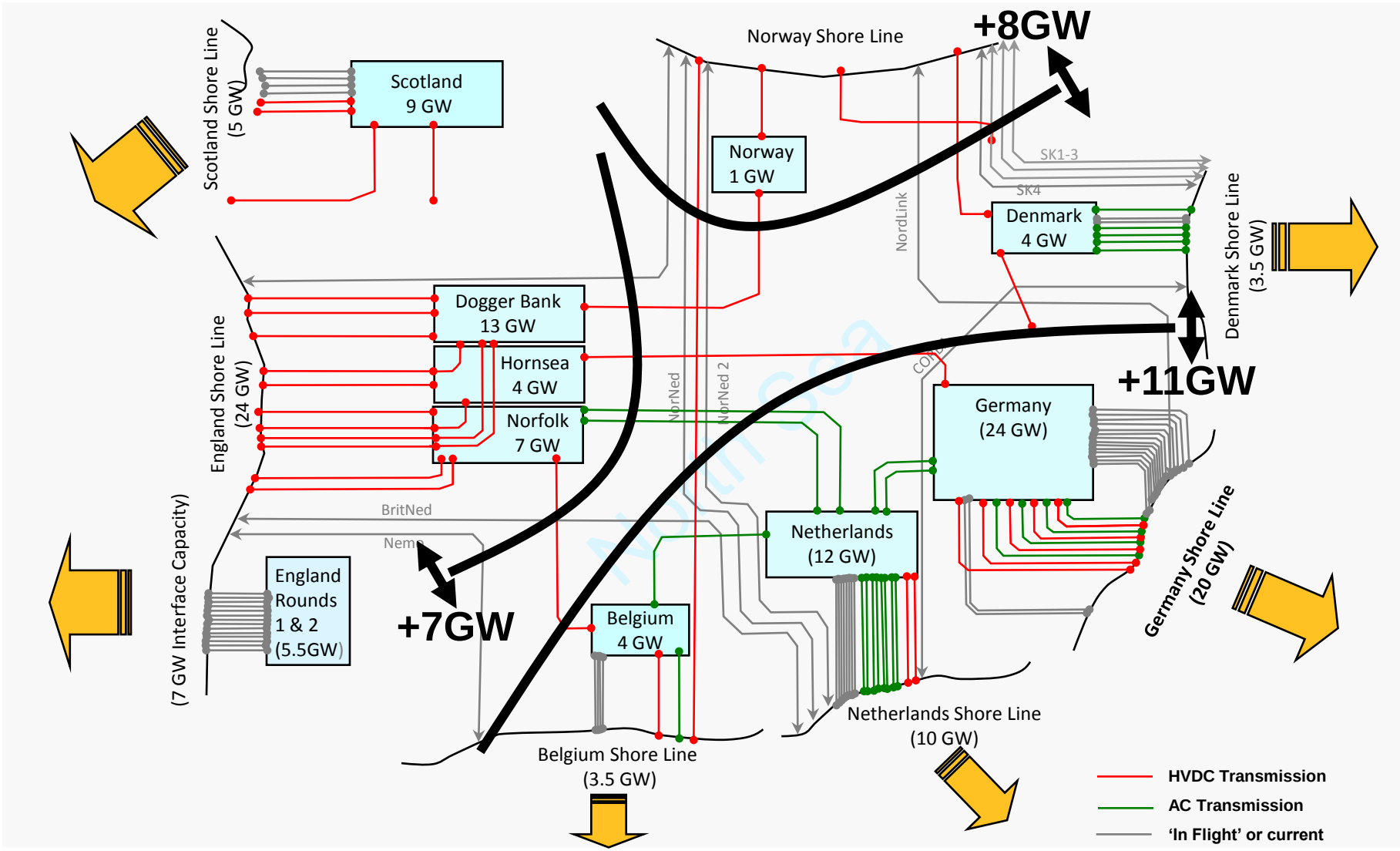
Efficient use of
Transmission Capability



Next Steps

2011 Statement

Future Scenarios

Finalising selection which will be communicated to industry (May/June).

Technology

Technology section will be reviewed and updated. Acquiring supplier input to ensure that the present and anticipated future status of the technologies represent market exceptions, aspirations.

Coordinated Solution

Finalisation and publication of next stage (feasibility) of the coordinated solution.

Publication: 30th September 2011

Q+A

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Workshop Structure

- Two separate workshops moderated by TNEI / PPA Energy
- Small group discussion
- Focus on technology not regulatory aspects
- Plenary session with report back from individual groups

Workshop Session 1 - Identifying the key steps in the process for delivering offshore transmission assets

- What are the developmental processes for the delivery of transmission hardware?
  - What is the sequence of steps (investments, planning/consenting, technology/hardware selection) that needs to be made to deliver a project?
  - How does this change against different co-ordinated outcomes?

Workshop Session 2 - Identifying the critical elements to enable co-ordinated action

- What elements (e.g technology/hardware) are common across different co-ordinated outcomes?
- Which of these are critical to co-ordination (i.e. what elements or decisions could constrain future development options)?