Evolution of the UK Electricity Transmission: Challenges and Opportunities in Impact Assessment

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Overview

1. ‘State of Play’
2. Technical Solutions
3. Key Challenges (Inc. IA)
4. Forward Look
5. Conclusions
State of Play

An aging transmission network - geared toward a “conventional” energy system

**Urgent** need for decarbonisation

Successes in Offshore Wind (UK and Ireland), plus increasing growth of FOW

50 GW of offshore wind by 2030?

Greater penetration of renewables on the network

Changes in consumption (electric vehicles / electrification of heat for e.g.)

UK Government – full decarbonisation of the electricity system by 2035
State of Play

- **Past**: electricity flows from large transmission-connected generation to the end consumer
- **Future**: wider range of decentralised, low-carbon energy sources connected in a sophisticated way
State of Play

<table>
<thead>
<tr>
<th>Past</th>
<th>Future</th>
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</thead>
<tbody>
<tr>
<td>![Past Image 1]</td>
<td>![Future Image 1]</td>
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<tr>
<td>![Past Image 2]</td>
<td>![Future Image 2]</td>
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<td>![Past Image 3]</td>
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<td>![Past Image 4]</td>
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<tr>
<td>![Past Image 9]</td>
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Credit (L to R): UKCA; Drax Power; BBC; Walker, E; Sizewell C / CGN; Narec Dist. Energy [Decerna]; Rolls Royce Group; Xodus Group
State of Play

- Increasing challenges of balancing up renewable and low-carbon generation with the demand centres
- Taking Scotland as an example, frequently on an energy (electricity) surplus
- Renewable electricity = ~97% of Scotland's gross electricity consumption
- However, significant onward planned growth of OWF in Scotland...

Credit: Scottish Renewables (2023) (Link)
Solutions

Investment in upgrade to the transmission system

Combination of onshore and offshore reinforcement

So-called ‘Great Grid Upgrade’

Wide range of UK HVDC reinforcement
Solutions

Onshore reinforcement + offshore

National Grid ESO ‘Pathway to 2030’ sets out a vision for a new network to support movement toward net zero

‘Holistic Network Design’ – onshore and offshore design that can facilitate UK ambitions for offshore wind
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Solutions

HND: Recommendations identified previously

HND: New network needs to be identified

HND: Full set of major network requirements recommended

Credit: National Grid ESO
Key Challenges for Impact Assessment (IA)

• In UK and Ireland, transmission upgrades in the Marine Environment require Marine Consent
• Requirement for supporting Environmental Impact Assessment or non-statutory equivalent
• Often long infrastructure length = myriad environmental interactions
• Critical for IA to achieve a balance between various environmental, technical and commercial considerations
• Following slides consider challenges in further detail
• IA is not in isolation – other wider challenges therefore considered alongside...
Key IA Challenges

Congestion

Increasingly more complex to identify and plan transmission

Routing - how to find the best on-balance solution amidst such a ‘busy’ offshore environment?

Wide range of other sea users – all important to consider...

Need to ensure a careful and balanced consideration at the earliest stage – laying the foundations for a Just Transition
Key IA Challenges

**Data Acquisition and routing**

Variable & challenging seabed

Routeing process can help to avoid many constraints

Not possible to avoid ‘everything’

Data used to inform investigations into burial likelihood etc., which can help inform IA (where programme permits)

Best **on-balance** solution from an environmental, technical and commercial perspective
Key IA Challenges

Consenting

• Time to compile Environmental Assessment
• Increasing emphasis on protecting our marine environment, inc. designated sites
• Regulatory experience of transmission growing, but still relatively immature (compared to OWF, for e.g.)
• ‘Regulatory burden’ – UK marine environment increasingly busy
• Proportionality in IA – balanced decision making is absolutely critical
Key Technical Challenges

Practical Installation Factors

• Physical installation process – highly complex
• Harsh and demanding offshore environment
• Range of installation tools and methodologies to complete
Key Technical Challenges

Landfalling

• Transmission links require landfalls (i.e. the point where offshore meets onshore)
• How to locate a landfall in complex, often sensitive environments?
• Wide range of criteria which need to be considered...
Key Technical Challenges

**Landfalling**

- Selecting a landfall which is technically, commercially and environmentally viable?
- “Consentability”
- Locally acceptable
- Competition (volume of connections vs available space)
- Resilience for lifetime of the project
Key Technical Challenges

Logistical Factors

• Securing vessel availability - “competing” for availability
• Subsea cable manufacturing
• Constrained cable production & installation market
Wider Challenges

Pace

• Scale of these and other challenges significant but need to reinforce at pace
• For example, see below (and this is only one geographical section from the NOA!)

<table>
<thead>
<tr>
<th>Code</th>
<th>Option description</th>
<th>EISD*</th>
<th>RISD**</th>
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<th>Eligible for competition?</th>
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<td>2030</td>
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<th>Recommendation</th>
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<td>Windyhill-Lambhill-Denny North 400 kV reinforcement</td>
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<td>DNEU</td>
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<td>Hold</td>
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* EISD is currently based on the current regulatory and consenting process and acceleration.
Forward Look

Transmission System

• UK transmission reinforcement – ‘Great Grid Upgrade’
• Several ‘leading’ schemes (watch this space for schemes such as Eastern Green Link 1 and 2 which have all primary consents - early works have begun)
• Further emerging schemes, as recommended by the NOA
Forward Look

Innovation

• Emerging solutions, such as Multi-Point Interconnectors
• Development of significant volume of Offshore Wind in Irish Waters
• Growth of Floating Offshore Wind – how can this integrate into the evolving transmission system?
• Role of other technologies, such as Hydrogen and CCUS – relationship with transmission system?
• Use of data to help speed up development
Forward Look

Collaboration

• We are in a Climate Emergency
• The old “master-slave” system of Regulator and Applicant is no longer appropriate
• Vital for early and meaningful joint work (between developer, regulator and wider stakeholders)
• Involvement of coastal communities at an early stage
• Meaningful stakeholder involvement at outline routeing / optioneering, followed by detailed technical discussions throughout the IA process
• Sharing lessons learned and cultivating good practices within the industry (IEMA award this week!)
Forward Look

Resource Demands

• Complex infrastructure projects = significant and varied demands for people
• Major opportunity for those considering marine careers
• Existing and future demand for skilled individuals in the IA space
• How can industry help work with the regulator to help up-skill and develop too?
Forward Look

Pace

• Urgency of required upgrades
• In order to tackle the challenge at hand, urgent need for coordination
• More coordinated network? Shared landfalls?
• Whilst working at pace, need to do so whilst maintaining safety as the top priority
Conclusions & Key Takeaways

1. Embracing Challenge
2. Collaboration with Regulator
3. Pace
4. Opportunity
5. Ongoing Industry Actions
WE ARE COMMITTED TO USING OUR EXPERIENCE TO HELP DELIVER THE TRANSMISSION NETWORK OF TOMORROW.
Further Reading

• Future Energy Scenarios (‘FES’) – National Grid ESO (Link)
• East Coast Study – The Crown Estate (Link)
• Offshore Coordination Project – National Grid ESO (Link)
• The Great Grid Upgrade – National Grid (Link)
• Pathway to 2030 Holistic Network Design (‘HND’) (Link)
• Network Options Assessment (‘NOA’) / NOA Refresh (Link)
• Offshore Transmission Network Review (‘OTNR’) (Link)
• ‘Finding Space for Offshore Wind’ – The Crown Estate (Link)
• Information about the three UK transmission owners (Link)
• Carbon Trust CBRA Guidance – The Carbon Trust (Link)
• Xodus Interconnectors and Cables – case studies available on request (Link here; contact details follow below)
Let’s continue the conversation!
Post questions and comments in the IAIA24 app.

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