everoze

Offshore Wind and Hydrogen Opportunities for the Island of Ireland

A report for InterTradeIreland

experts | evolving | energy

14/03/2025

Table of contents

Document control

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Executive Summary

Project overview

InterTradeIreland (ITI) commissioned Everoze to undertake a study to explore how best to support economic opportunities arising from the offshore wind and hydrogen industries across the island of Ireland.

Recognising the region's strategic position and abundant wind resources, both the Irish and UK governments have set ambitious offshore wind expansion targets to drive decarbonisation, energy security, and industrial growth.

The development of offshore wind and hydrogen supply chains presents significant economic potential, particularly for SMEs and regional industrial clusters.

However, challenges such as infrastructure constraints, skills shortages, and fragmented policy landscapes must be addressed.

This study examines how ITI can strategically support an all-island approach to tackling these barriers and unlocking cross-border collaboration, ensuring that Ireland and Northern Ireland capitalise on the growing global demand for renewable energy technologies.

The reporting in this document follows the structure in which the work was carried out, with five discrete work packages framed by a series of research questions.

Executive Summary

Work packages overview

WP1: Policy review

Work package 1 aims to:

1. Provide sufficient context and detail for a non-expert reader to understand the policy environment and participate in policy conversations.
2. Identify and highlight key policy topics and debates most relevant to the project's goal, focusing on those where policy change is likely to constrain or enable an all-island approach to offshore wind and enabling industries.

Findings highlight the ambitious targets for offshore wind expansion across the island, the need for substantial upgrades to grid infrastructure, and the importance of cross-border cooperation and energy market integration. It also discusses the challenges and opportunities in port infrastructure development and the role of various actors and institutions in the policy landscape.

WP2: International comparison

Work package 2 provides international comparisons relevant to the offshore wind and hydrogen supply chain. The work is structured around key focus areas, including:

1. **Renewables for Energy Export in Denmark,** exploring Denmark's strategies for managing a high renewables grid and the challenges of becoming a green energy exporter.
2. **Supply Chain Support in Scotland,** emphasising Scotland use of expert support and business transformation programmes, grant programmes, and the role of clusters.
3. **Port Investment & Growth Centres,** examining the role of ports and growth centres in supporting the offshore wind supply chain. It includes case studies of the Port of Montrose, Port of Blyth, and Port of Esbjerg
4. **USA State Collaboration Models,** focusing on the two East coast clusters of states around Maryland and New England.

WP3: SME opportunity mapping

Work package 3 identifies opportunities for SMEs across the island of Ireland in the energy transition, with a focus on the offshore wind sector. Key findings include information on:

- **Market Leaders** with commercial success in offshore wind
- **Opportunity Areas** where there is significant strength in the Irish supply chain
- **Geographic Focus** – the respective strengths of Northern Ireland and Ireland
- **Benefits to SMEs** including carbon emissions reduction, ESG considerations, innovation, resilience and cost reduction

In this section, the opportunity for green hydrogen production from offshore wind across the island of Ireland is identified as likely to exceed the time horizon of InterTradeIreland and therefore is not the focus for the recommendations. This could be revisited if there are significant changes to the policy and subsidy environment, or costs can be significantly reduced in the sector.

Executive Summary

Work packages overview

WP4: Overcoming barriers and maximising opportunities with a cross-border approach

Work package 4 identifies and categorises barriers to developing an offshore wind industry across the island of Ireland. Starting from an initial long list of barriers, the outputs were co-created with InterTradeIreland through a workshop to prioritise ITI's focus areas:

Constraints with a Clear Role for ITI: including floating wind technology development, skills development, local content rules, supply chain support, and clustering and growth centres.

Constraints Requiring Informed Positions: including storage and flexibility technologies and grid challenges.

Constraints with No Clear Scope for ITI: areas such as marine spatial planning, energy demand, electricity prices, and consenting.

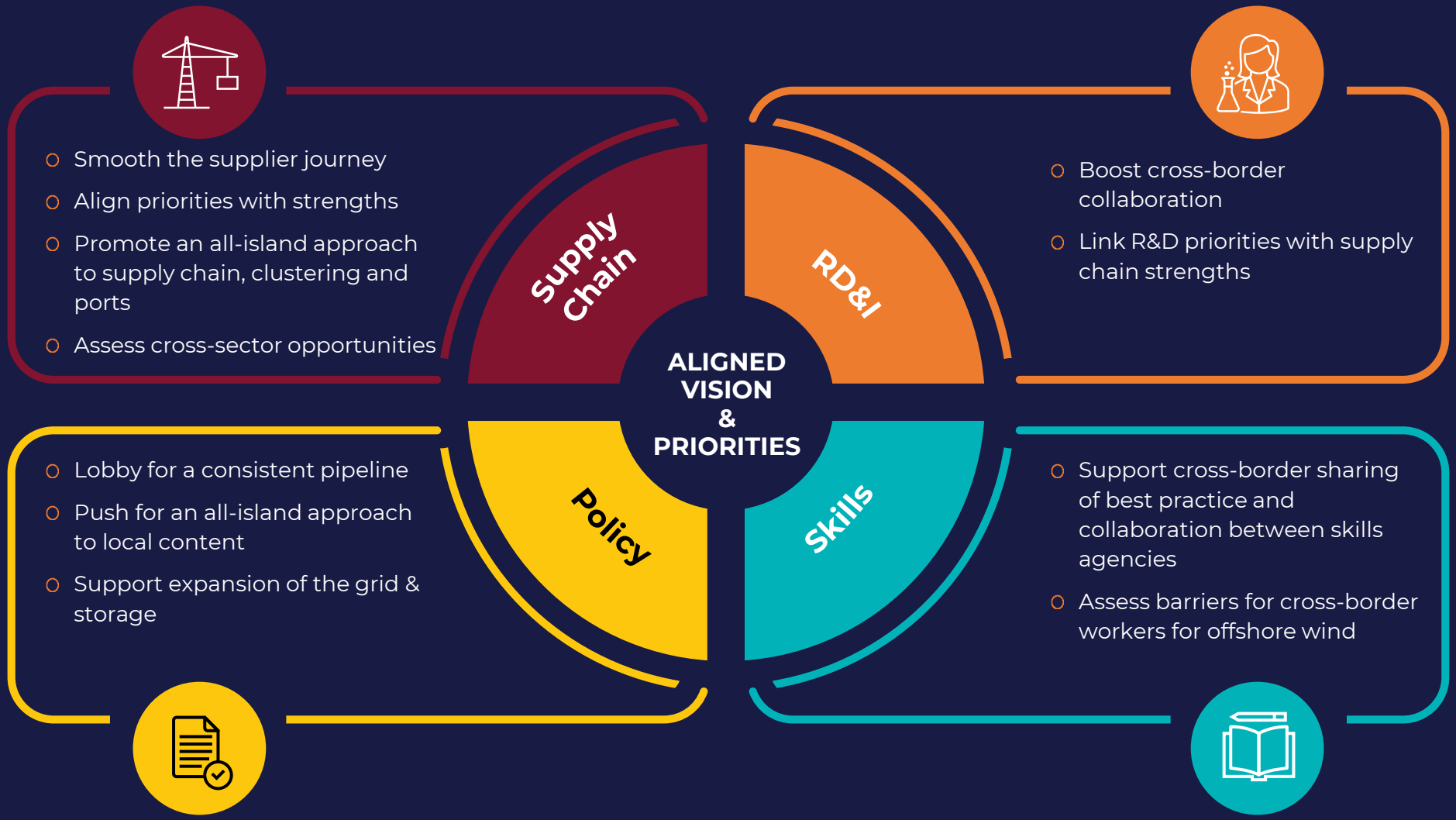
WP5: Synthesis, recommendations and final report

Work package 5 provides a strategic roadmap for InterTradeIreland to foster an all-island approach to a thriving offshore wind sector, driving economic growth and sustainability across the island of Ireland.

Key recommendations include:

- Developing a robust local supply chain and enterprise ecosystem.
- Promoting cross-border collaboration and innovation.
- Supporting the expansion of grid infrastructure and storage capabilities.
- Aligning research and development priorities with supply chain strengths.
- Facilitating best practice sharing and skills development across the island.

Overview of recommendations for InterTradeIreland



Top Recommendations

Map support schemes and funding for supply chain companies both sides of the border

Evidence base: *WP1 (policy review), WP3 (SME opportunity mapping)*

Relevant stakeholders: *OWGP, InvestNI, DETE, Enterprise Ireland, Gael Offshore Network, NIMO.*

Key output*: *database of funding streams*

First milestone: *terms of reference for mapping exercise*

Links to other recommendations: *Feeds into (2), contextual input for (13)*

Identify gaps in supply chain support mechanisms

Evidence base: *WP1 (policy review), WP3 (SME opportunity mapping)*

Relevant stakeholders: *OWGP, InvestNI, DETE, Enterprise Ireland, Gael Offshore Network, NIMO, UK Gov DBT.*

Key output: *shortlist of focus areas for supply chain policy*

First milestone: *gap analysis of support schemes against supplier needs*

Links to other recommendations: *Draws on output from (1)*

Develop an all-island offshore wind cluster

Evidence base: *WP1 (policy review), WP4 (overcoming barriers and maximising opportunities)*

Relevant stakeholders: *See clusters map on page 56 of WP1 Policy review report.*

Key output: *cluster implementation plan*

First milestone: *defined focus and objectives for all-island cluster*

Links to other recommendations: *draws on output from (7)*

Align supply chain priorities to supply chain strengths

Evidence base: *WP2 (international comparison), WP3 (SME opportunity mapping), WP4 (overcoming barriers and maximising opportunities)*

Relevant stakeholders: *InvestNI, DfE, DETE, Enterprise Ireland, Gael Offshore Network, NIMO.*

Key output: *re-aligned supply chain programmes*

First milestone: preliminary *statement of priorities*

Links to other recommendations: *input to (5), input to (15)*

Align research priorities across the island of Ireland & link to supply chain strengths

Evidence base: *WP4 (overcoming barriers and maximising opportunities)*

Relevant stakeholders: *Universities across the island, DECC, DETE, DfE, InvestNI.*

Key output: *position statement on revised research priorities*

First milestone: *comparative analysis of research priorities and supply chain strengths*

Links to other recommendations: *input to (9)*

Key outputs provided as examples only, appropriate outputs may differ

Top Recommendations

Promoting cross-border research collaboration, with industry, government agencies and academia

Evidence base: *WP4 (overcoming barriers and maximising opportunities)*

Relevant stakeholders: *Universities across the island, DECC, DETE, DfE, InvestNI.*

Key output: *targeted campaign*

First milestone: *statement of research collaboration benefits*

Links to other recommendations: *draws on (7) & (8)*

Support cross-border sharing of best-practice and collaboration between skills agencies

Evidence base: *WP4 (overcoming barriers and maximising opportunities)*

Relevant stakeholders: *Skillsnet Ireland, Northern Ireland Skills Council (NISC), DfE.*

Key output: *best-practice guidelines*

First milestone: *statement of skills collaboration benefits*

Links to other recommendations: *draws on (5) & (7)*

Help SMEs navigate local content policies

Evidence base: *WP1 (policy review), WP3 SME opportunity mapping*

Relevant stakeholders: *The Crown Estate, DESNZ, DETE, DECC, DfE.*

Key output: *SME local content toolbox*

First milestone: *assessment of local content landscape*

Links to other recommendations: *draws on (2) & (7)*

Develop an all-island vision statement

Evidence base: *WP1 (policy review), WP2 (international comparison), WP3 SME opportunity mapping, WP4 overcoming barriers and maximising opportunities)*

Relevant stakeholders: *InvestNI, DfE, DETE, DECC, Enterprise Ireland.*

Key output: *landmark report*

First milestone: *define overarching objectives and audience*

Links to other recommendations: *can act as a framing document for other recommendations*

Policy review

WP1

WP1: Table of contents

Document control

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AUTHORS	Oscar Fitch-Roy and David Thomason
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A	Draft report for input to other work packages	31/10/2024
B	Draft shared with client	17/12/2024

Glossary of terms

Commonly occurring acronyms used in this report

ABP - An Bord Pleanála: The Irish national planning authority responsible for development consents.
CRU - Commission for Regulation of Utilities: Regulator for the electricity and natural gas markets in Ireland.
DAERA - Department of Agriculture, Environment and Rural Affairs: A Northern Ireland department involved in the consenting process for energy projects.
DAO - Distribution Asset Owner: Entities responsible for owning and maintaining lower voltage distribution networks.
DECC - Department of the Environment, Climate and Communications: Oversees offshore wind strategy and energy policy in Ireland.
DfE - Department for the Economy: Handles industrial and energy policies, including offshore wind in Northern Ireland.
DfI - Department for Infrastructure: Deals with infrastructure-related consents in Northern Ireland.
DMAP - Designated Marine Area Plan: Defined areas for offshore wind development and other marine activities.
EIAR - Environmental Impact Assessment Report: Required documentation for planning consent in Ireland.
ESBN - ESB Networks: A subsidiary of ESB Group managing the transmission and distribution network in Ireland.
GCA - Grid Connection Assessment: Initial step for grid connections in Ireland's Phase 1 offshore wind projects.
GCI - Grid Connection Information: Preliminary grid connection details for Phase 2 offshore wind projects in Ireland.
GNI - Gas Networks Ireland: Owner and operator of Ireland's natural gas transmission and distribution systems.
MAC - Marine Area Consent: Grants developers rights to progress projects within DMAPs in Ireland.
MARA - Maritime Area Regulatory Authority: Responsible for seabed tenure and related consents in Ireland.
NDP - Network Delivery Portfolio: Multi-year grid development plan in Ireland.
NIEN - Northern Ireland Electricity Networks: Manages the transmission and distribution network in Northern Ireland.
NMPF - National Marine Planning Framework: Ireland's overarching framework for marine spatial planning.
ORESS - Offshore Renewable Energy Support Scheme: Auction mechanism supporting offshore wind projects in Ireland.
RED III - Renewable Energy Directive III: European Union directive focused on renewable energy integration.
SEA - Strategic Environmental Assessment: Required environmental assessment for planning and DMAPs.
SEMC - Single Electricity Market Committee: Governing body of the Single Electricity Market.
SEMO - Single Electricity Market Operator: Manages the all-island electricity market of Ireland and Northern Ireland.
SOEF - Shaping Our Electricity Future: An initiative by Eirgrid and SONI to modernize the electricity grid.
SONI - System Operator for Northern Ireland: Responsible for grid operations in Northern Ireland.
TAO - Transmission Asset Owner: Owners of high-voltage transmission infrastructure.
TSO - Transmission System Operator: Entities responsible for the operation and development of electricity transmission systems (e.g., Eirgrid, SONI).
UR - Utilities Regulator: Northern Ireland's electricity and gas market regulator.

WP1: Policy review

Purpose and context:
This document is provided as the main deliverable under Work Package 1 as described in section 4.2 of proposal ITI001-P-01-A.

The report provides an overview of significant policy activity in Ireland and Northern Ireland relevant to the project. The project's overarching goal is to identify and act on opportunities to enhance and capture cross-border opportunities associated with the transformation of the energy system on the island of Ireland. This transformation is expected to be driven by the expansion of offshore wind and enabling technologies such as green hydrogen production. The report has two complementary aims:

1. Briefing : To provide sufficient context and detail for a non-expert reader to understand the policy environment with a view to navigating and participating in policy conversations
2. Analysis: To identify and highlight key policy topics and debates that are most relevant to the project's overarching goal – that is, those topics where policy change is most likely to constrain or enable an all-island approach to offshore wind and enabling industries

Data are drawn from three sources. First a literature review, primarily of government documents is used to document the formal status of key policy initiatives. Second, Everoze experts provide contextual information that may not be immediately visible in the public record. Finally, the responses to the consultation exercise are used to 'fill in' gaps and provide additional depth.

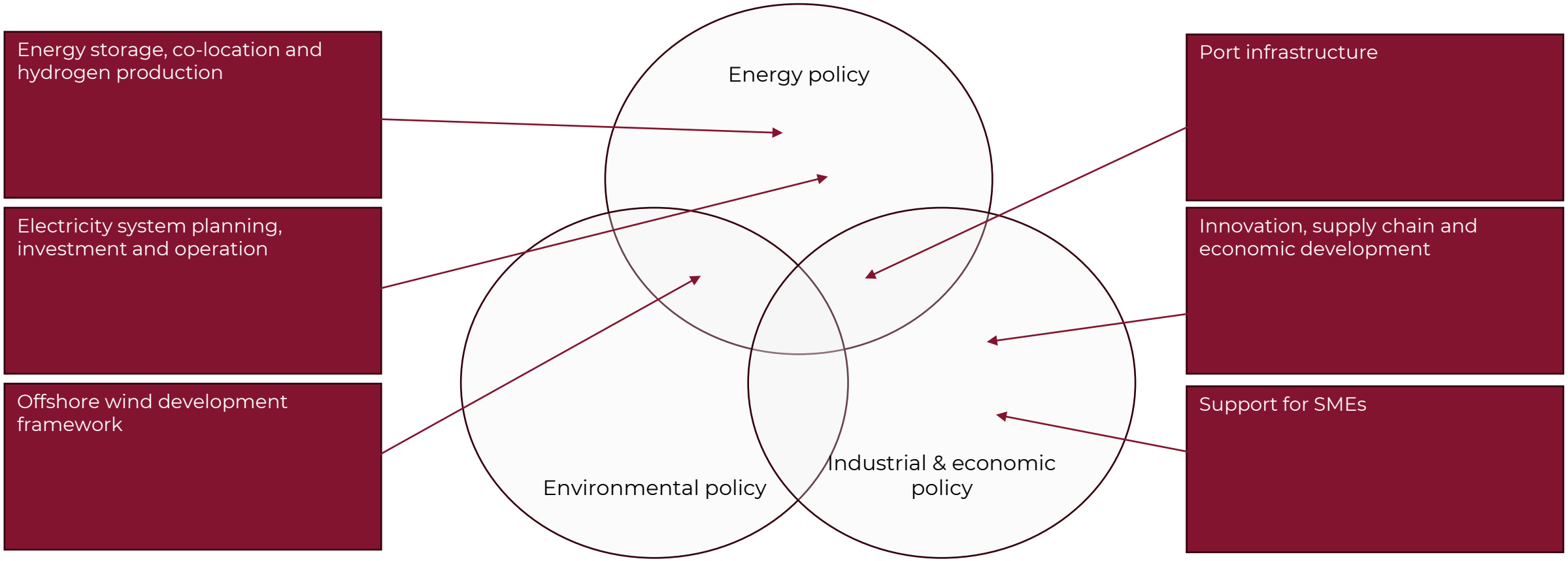
1

Methodology and overarching policy context

Methodology (1)

Policy areas of interest

The study covers six topics straddling three major policy domains: energy policy, environmental policy and industrial & economic policy.



Methodology (2)

The analysis in this report uses two important governance concepts:

1. Functional categories (*the what*) – the general tasks or functions that are necessary within an area of policy, regardless of the jurisdiction. Establishing clear functional categories allows us to compare policy dynamics across borders
2. Actors (*the who*) - the agents, departments, companies and other bodies or institutions that fulfil a particular function in a particular jurisdiction or market
3. Instruments (*the how*) - the legal, economic, organisational or other tools and mechanisms through which the functions are carried out

For each of the policy areas, information is set out as in the figure below:

Overarching policy context

Energy policy in both Ireland and Northern Ireland is centered on rapidly expanding renewable energy sources, particularly offshore wind, to meet ambitious 2030 and 2050 climate goals. Alongside this growth, policies are advancing the infrastructure needed to integrate large volumes of renewables, such as upgraded grid systems. A coordinated industrial strategy also aims to capture economic opportunities from the renewable transition by developing a domestic supply chain and attracting investment in the green economy.

Climate Commitments and Decarbonization Goals

- Both Ireland and Northern Ireland are committed to reducing greenhouse gas emissions significantly and 80% of electricity to be generated from renewable sources by 2030 and achieving net zero by 2050.
- Ireland's Climate Action Plan sets a legally binding goal of reducing emissions by 51% by 2030 and reaching net-zero emissions by mid-century.
- Northern Ireland's Climate Change Act aligns with the UK's net-zero by 2050 target.

Economic Opportunities and Industrial Strategy

- Powering Prosperity - Ireland's Offshore Wind Industrial Strategy seeks to position the country as a leader in offshore wind, aiming to attract industry players and establish supply chains that can serve both domestic and international markets.
- Industrial and energy policies also focus on co-locating renewable energy sources with industries through initiatives like green energy parks, which will enable direct access to renewable power and support sectors like data centres, hydrogen production and green tech manufacturing

Cross-Border Cooperation and Energy Market Integration

- Ireland and Northern Ireland share an all-island electricity market known as the Single Electricity Market (SEM), which enables energy trading and cross-border electricity flows.

Grid Modernization

- The transformation of the energy system requires substantial upgrades to grid infrastructure to support integration of renewable energy sources and ensure stability, security, and resilience in the system.
- EirGrid and SONI, the system operators for Ireland and Northern Ireland respectively, are key players in grid modernization efforts. They are tasked with overseeing significant upgrades and expansions of both the onshore and offshore transmission networks as part of initiatives like the Shaping Our Electricity Future Roadmap

EU and UK Policy Alignment

- For Ireland, EU energy and climate directives provide overarching guidance and regulatory requirements.
- Northern Ireland aligns with the UK's energy policies post-Brexit, though the shared grid requires significant coordination on topics such as energy market rules and interconnection standards.

2

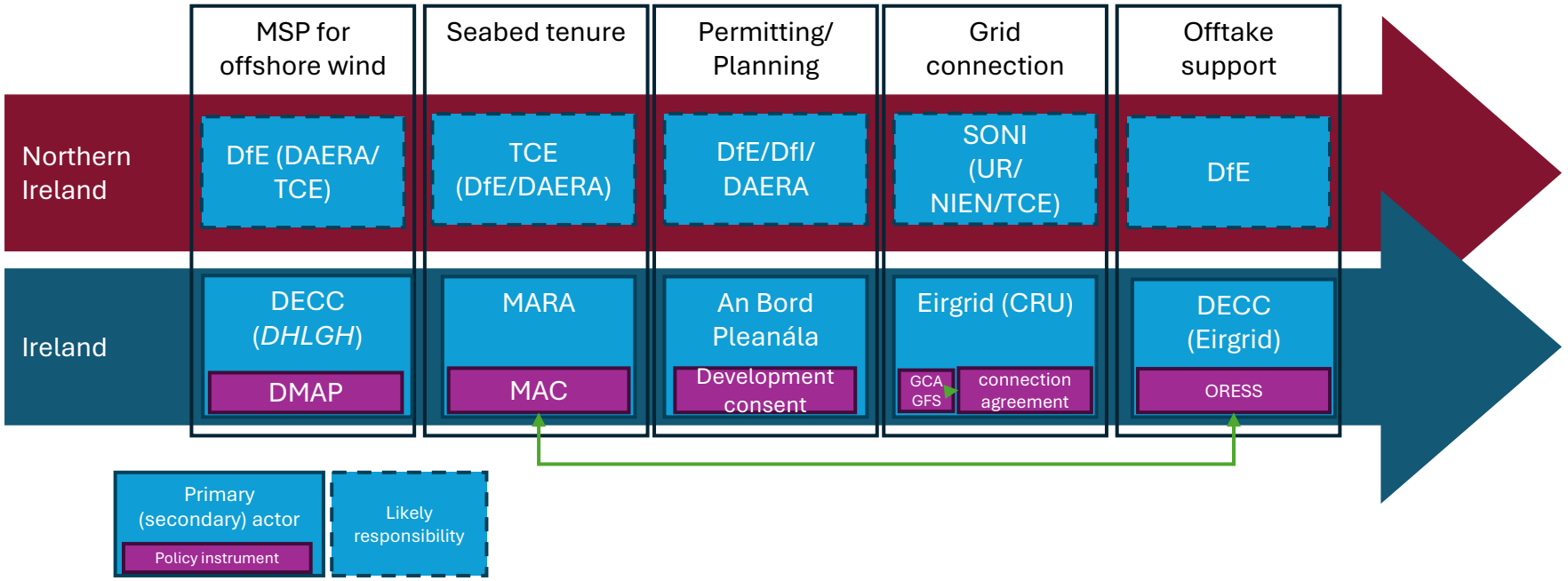
Offshore wind development framework

Offshore wind development framework

Introduction and summary

Taking offshore wind projects from inception to investment and construction requires a relatively stable policy and regulatory framework that allows projects to move forward incrementally and predictably. Although a wide range of approaches has been seen to-date, an effective offshore wind development framework in any jurisdiction fulfils five distinct but interconnected functions:

1. **Marine spatial planning:** identifying areas for offshore wind development considering technical and environmental suitability as well as constraints such as other sea users and environmental sensitivity
2. **Allocation and management of seabed tenure:** providing the legal and/or commercial basis for developers to access the seabed
3. **Planning/Permitting:** the necessary permits and consents to undertake the construction and operation of an offshore wind farm
4. **Grid connection**: agreements necessary to connect an offshore wind farm to the onshore electricity system
5. **Offtake support and power market integration:** any regulatory mechanisms intended to improve project economics and/or bankability through, for example, offtake or price guarantees



The development framework in Northern Ireland is underdeveloped compared to Ireland with no established policy instruments in key areas of the process. Policy development in Ireland is towards a more coherent and coordinated approach with a more centralised role for the State, especially DECC. In Northern Ireland, the offshore wind development framework is less developed, but active policy development is ongoing. For this reason, the above diagram identifies where the responsibility is likely to sit, however this may still evolve.

Supporting 'local content' through the development framework

Industry and socio-economic development is an increasingly important policy driver for the energy transition, especially offshore wind.

The project development process provides opportunities to shape procurement decisions toward local supply at key junctures such as seabed allocation and offtake auctions.

However, domestic policy must also conform to international legal constraints such as the EU internal market rules governing the provision of state-aid to domestic firms, and the World Trade Organisation General Agreement on Tariffs and Trade (GATT)

Ireland

- As an EU Member State, Ireland is required to integrate some requirements of the Net Zero Industry Act (NZIA), designed to implement the goals of the Green Deal Industrial Plan (GDIP)
- The NZIA aims to support manufacturing scale-up in EU member states by requiring national governments to consider the use of certain qualitative 'pre-qualification' criteria including 'resilience' - defined as the non-reliance on third party (non-EU) suppliers for critical elements of project delivery
- The NZIA came into force in June 2024, but the detailed requirements for how it will be implemented through auction design is not expected until March 2025
- Ireland may implement the resilience requirement through the future ORESS and/or a new competitive allocation process for Marine Area Consents (MAC)

Northern Ireland

- Northern Ireland does not currently have any policies in place to explicitly enable offshore wind local supply diretly through the development framework
- In the UK, however, both The Crown Estate and Crown Estate Scotland have increased the importance of clear plans for promoting local supply in their seabed leasing processes, although these do not go as far as a local content requirement
- The UK's offtake auction, CfD allocation, is undergoing reform with the intention of supporting investment in domestic supply chains through a minimum investment in qualifying facilities and the ability to access public finance to top up investment plans through a Clean Industry Bonus (CIB)

OFFSHORE WIND
DEVELOPMENT FRAMEWORK

Ireland

Offshore wind development framework: Ireland

Policy objectives and targets

Ireland has ambitious targets for offshore wind expansion. The targets are based on a recognition that Ireland's geographical location and sea area provide a potential energy resource that far exceed the country's needs.

The Future Framework for Offshore Renewable Energy[1] reaffirms earlier policy commitments made domestically[2] and with international partners[3] to operational offshore wind capacity of:

- 2030: 5GW
- 2040: 20GW
- 2050: at least 37GW

The stated motivations for offshore wind in Ireland are the decarbonisation of the Irish economy in line with legal obligations, ensuring Ireland's energy security, and the development of new industrial opportunities (both for energy users in Ireland and exporters).

The government of Ireland frames its approach to offshore wind policy in terms of three phases. The current phase is the implementation of the 'Future Framework' policy.

	Policy objective	Enabling regulation and legislation (potential future actions in italics)
Phase 1 (2020-2021)	Ensure delivery of six developer led existing projects which had largely stalled due absence of regulatory framework	• National Marine Planning Framework • Marine Area Planning Act 2021 • Offshore Renewable Energy Development Plan II(OREDP I) • MAC allocation • ORESS 1 • ABP as independent planning body for OSW
Phase 2 (2021-2023)	Accelerate deployment and secure remainder of 5GW needed for 2030 target Introduction of a plan led regime	• Establishment of MARA • Offshore Renewable Energy Development Plan II (OREDP II) • Establishment of DMAP approach to planning • ORESS 2.1+
Future Framework and enduring regime (2024-)	Enduring regime for sustainable offshore wind industrial growth	• ORESS successor instrument • Closer integration with industrial policy • Competitive allocation of MAC • Integration of MAC, ORESS and grid connection processes

[1]https://www.gov.ie/en/publication/0566b-future-framework-for-offshore-renewable-energy/
[2]https://www.gov.ie/en/publication/f3bb6-policy-statement-on-the-framework-for-phase-two-offshore-wind/
[3]https://circabc.europa.eu/ui/group/9198696f-e42c-4a88-b4f1-7a1788eb9b7c/library/082173b4-8d19-4c4b-aaa4-7612daf879c0/details

Offshore wind development framework: Ireland

Institutional context: key actors and roles

- Overall responsibility for offshore wind strategy and policy in Ireland is held by the Department of the Environment, Climate and Communications (DECC).
- However, to meet ambitions will require essential land-sea planning interaction and coherence of policy and plans across terrestrial (NPF, RSES, City and County Development Plans) and maritime plans (NMPF, DMAPS).
- Significant and ongoing effort has been invested in streamlining and coordinating the offshore wind development process in Ireland. An outcome of the reforms has been to consolidate the central decision-making role played by DECC and the Environment Minister.

Actor	Functional responsibility	Key documents
Department of the Environment, Climate and Communications (DECC)	• Overall strategy and policy related to offshore wind development. • Design and implementation of ORESS auctions • Offshore Wind Delivery Taskforce (OWDT) • Maritime Spatial Planning, including preparation of Designated Maritime Area Plans (DMAPs) • Ministerial Marine Planning Guidelines • Maritime Area Planning Act 2021 (as amended)	• Future Framework for Offshore Renewable Energy • Policy Statement on the Framework for Phase Two Offshore Wind • National Marine Planning Framework (NMPF) • The Climate Action Plan 2023 • Marine Planning Policy Statement • South Coast Designated Maritime Area Plan for ORE
Department of Enterprise, Trade and Employment (DETE)	• Offshore Wind Industrial Strategy, a key objective for offshore wind policy	• Powering Prosperity - Ireland's Offshore Wind Industrial Strategy
Department of Housing, Local Government and Heritage (DHLGH)	• Planning and development, incl. planning legislation • National frameworks and guidance (NPF, Project Ireland 2040, regional/local plans) • Environmental protection (SEA, AA) and protected area designation	• Planning and Development Acts • SEA and AA Legislation • National Planning Framework (NPF)
Maritime Area Regulatory Authority (MARA)	• New agency of DECC tasked with allocating and managing seabed tenure	• The Maritime Area Planning Acts 2021 and 2022 (MAP Acts)
An Bord Pleanála (ABP)	• Assessment of applications and granting of planning permission (development consent)	• ABP does not have a specific policy document solely dedicated to offshore wind, it operates within the broader framework of Irish planning law and policy.
Eirgrid	• Investor-owned TSO, provides grid connection agreements to allow access to onshore grid	• Shaping our Electricity Future Roadmap Version 1.1
Commission for Regulation of Utilities (CRU)	• Regulates Eirgrid activity including related to grid connection process	• Offshore Grid Connection Pathway – Phase 2
EU Commission	• Assesses and approves state-aid policies including ORESS for compatibility with EU internal market (DG Competition) • New Net Zero Industry Act (NZIA) requirements for some 'non-price' criteria in offtake auction design • Requirements to expedite development timeline in member states.	• Guidelines on State aid for climate, environmental protection and energy 2022 (2022/C 80/01) • Regulation (EU) 2024/1735 of the European Parliament and of the Council • Renewable Energy Directive (RED III)

Offshore wind development framework: Ireland

Institutional context: key instruments and mechanisms

Marine Spatial Planning

- 'Phase 2' for offshore wind includes a transition to a 'plan led' approach to development compared to 'phase 1' which was more developer-led
- Planning for offshore wind is conducted within the National Marine Planning Framework (NMPF)
- Designated Maritime Area Plans (DMAP) are defined areas for specific activity such as offshore wind development
- DMAP designation requires environmental assessments including a Strategic Environmental Assessment (SEA) and Appropriate Assessments (AA)
- The Minister for the Environment, Climate and Communications is the competent authority for Maritime Spatial Planning in Ireland and as such has responsibility for preparing DMAPs for offshore renewable energy
- Ireland's first DMAP off the south coast (SC-DMAP) has enabled the first offshore wind site, Tonn Nua (900MW), to progress to auction.
- Six offshore wind planning applications are under consideration by An Bord Pleanála, representing Phase One of Offshore Renewable Energy (ORE) development.

Seabed tenure

- A Maritime Area Consent (MAC) issued by the newly formed agency, MARA, gives offshore wind developers a right to occupy the maritime area, subject to planning permission, and pursue relevant permits needed to progress a project within a DMAP.
- Holding a MAC incurs a levy or fee payable by developers to the state based on area during the development stage and a share of gross revenue in the operational stage
- Several early 'phase one' projects were issued MACs directly by the DECC Minister, but MARA now oversees an application process with a multi-criteria evaluation designed to ensure only viable projects can secure a MAC.
- Plans are expected for a transition to a competitive allocation of MACs based on a combination of price and non-price criteria

Permitting and planning

- To carry out survey work for an offshore wind site, a license is required from MARA
- To construct an offshore wind farm in Ireland, a developer must secure planning consent from ABP
- A MAC is prerequisite for consent applications
- The planning permission consent application process requires significant evidence, including an Environmental Impact Assessment Report (EIAR)
- Projects also require authorisation to construct an electricity generating station and permission to generate from CRU
- Under RED III, authorisation decisions should take no longer than 2 years for offshore projects located within a renewables acceleration area, and 3 years for those outside such areas
- Judicial reviews are a significant development hurdle in Ireland; even surveys have undergone judicial review.

https://www.gov.ie/pdf/?file=https://assets.gov.ie/292285/920df81d-7a78-4da5-ba3c-d6c480a21bd6.pdf

Offshore wind development framework: Ireland

Institutional context: key instruments and mechanisms

Grid connection

- State-owned national transmission system operator (TSO), Eirgrid provides commercial scale offshore wind projects with access to the onshore electricity system needed to deliver energy
- The process for connection is regulated by the Commission for the Regulation of Utilities (CRU)
- For 'phase 1' projects, the first step towards a grid connection was a Grid Connection Assessment (GCA) carried out by Eirgrid
- A GCA functions essential as a time-limited 'agreement in principle' to connect the project as well as detailing the cost and terms of the connection
- A valid GCA was a requirement to participate in ORESS 1 auction
- A formal connection agreement with Eirgrid is conditional on ORESS auction success
- Phase 1 projects are responsible for construction of the offshore transmission system between the project and onshore connection point
- For 'phase 2' projects, a Grid Connection Information (GCI) pack is issued prior to the ORESS 2 auction and final agreements later in the process
- For phase two projects, Eirgrid will finance and build the offshore transmission system, recouping investment through an offshore grid charge payable in addition to charges incurred through the use of the onshore network

Power offtake support

- The primary policy instrument for ensuring project bankability is known as the Offshore Renewable Energy Support Scheme (ORESS)
- In common with similar policies in other European countries, ORESS is a 'reverse auction' in which qualifying projects compete on the basis of price to secure a 20-year contract for a fixed, partially index-linked price-per-unit of production with bids ranked in order from lowest to highest price until a capacity cap is reached
- The auction is designed by DECC and the key parameters are decided by the Minister
- Eirgrid delivers the auction and only projects that plan to connect to the grid in Ireland can participate
- As with all such market interventions, the ORESS system is subject to EU state aid policy (articles 107-109 of the TFEU), requiring adherence to guidelines and approval by the Commissions Directorate General for Competition (DG Comp)
- Ireland's state-aid approval is granted until 2025
- For future auctions, the EU Net Zero Industry Act may require specific prequalification criteria
- The first offshore auction, ORESS 1, was held in May 2023 with results published in June
- ORESS 1 secured contracts with four projects with a combined capacity of approximately 3GW at a price of €86.05/MWh
- The second auction, ORESS 2.1 is the first to be informed by a plan-led site selection process — the South Coast Designated Maritime Area Plan for Offshore Renewable Energy (SC-DMAP).
- ORESS 2.1 will solicit bids for 900MW projects within the South Coast DMAP
- Bidding projects must be eligible for a MAC and the winning bidder must secure a MAC before the ORESS award is finalised
- It is not yet clear whether future allocations will require an additional competition to secure a MAC
- Costs incurred by supporting offshore wind project revenues through the ORESS contracts are passed to electricity consumers through the Public Service Obligation (PSO) levy overseen by the CRU
- A stated policy aim is to enable pathways to alternative offtake arrangements that do not require state support. To this end, projects unsuccessful in the ORESS 1 auction were afforded a three-month window in which to conclude a private power purchase agreement (PPA) (note that ORESS projects must also market their output through PPAs and other contracts)

https://cruie-live-96ca64acab2247eca8a850a7e54b-5b34f62.divio-media.com/documents/CRU2022968-Offshore-Connection-Policy-Phase-1-projects-Decision.pdf
https://cruie-live-96ca64acab2247eca8a850a7e54b-5b34f62.divio-media.com/documents/Grid_Connection_Pathway_for_Phase_2_Offshore_Wind.pdf

OFFSHORE WIND
DEVELOPMENT FRAMEWORK

Northern Ireland

Offshore wind development framework: Northern Ireland

Policy objectives and targets

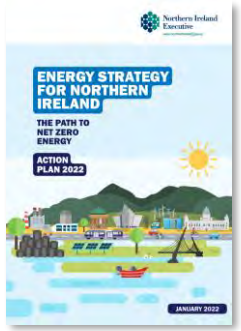
The Northern Ireland Executive has stated an ambition to see offshore wind generation in the waters around Northern Ireland. In 2023, the Department for the Economy (DfE) developed and consulted on a draft 'Offshore Renewable Energy Action Plan' OREAP designed to deliver on the commitment of the Energy Strategy Plan 2022 for '1GW of offshore wind from 2030'. The Climate Change Act (Northern Ireland) 2022 includes a commitment to ensuring renewable energy production equivalent to at least 80% of electricity consumption by 2030.

However, the creation of a development framework for offshore wind remains in the early stages and there is currently no viable pathway for an offshore wind project to proceed from prospect to construction and operations in Northern Ireland.

Nevertheless, progress is underway to establish a development framework, and it is possible to identify the likely institutional make-up of a potential framework by looking at which actors are currently involved and some of the implications of Northern Ireland's constitutional status.


Climate Change Act (Northern Ireland) 2022

Climate Change Act (Northern Ireland) 2022: renewable electricity production of at least 80% of consumption



Energy Strategy 2022: 1GW of offshore wind from 2030

Draft Offshore Renewable Energy Action Plan 2022

https://www.economy-ni.gov.uk/consultations/draft-offshore-renewable-energy-action-plan
https://www.legislation.gov.uk/nia/2022/31/contents/enacted
https://www.economy-ni.gov.uk/sites/default/files/publications/economy/energy-strategy-path-to-net-zero-action-plan.pdf

Offshore wind development framework: Northern Ireland

Institutional context: key actors and roles

From preliminary publications such as the OREAP, it is possible to draw some somewhat speculative assumptions about the likely functional responsibility for various aspects of offshore wind development in Northern Ireland.

The lack of experience of offshore wind development frameworks in the Northern Ireland Executive could mean a significant role for The Crown Estate as a source of knowledge and expertise across many aspects of the process. As 'landlord of the seabed', TCE has played a central role in establishing the UK's (England and Wales) position in offshore wind.

Actor	Functional responsibility (assumed)	Key documents
Northern Ireland Department for the Economy (DfE)	• Overall offshore wind strategy and policy • Likely involved in future offtake contracting	• OREAP
The Crown Estate (TCE). A Statutory Corporation of the United Kingdom with ownership of and economic responsibility for Northern Ireland's seabed	• Acts as landlord of the seabed • Also likely to play a central role as a source of expertise (gained in England and Wales) and legitimacy	• Statement of Intent between DfE and The Crown Estate
Northern Ireland Department of Agriculture, Environment and Rural Affairs (DAERA)	• Key actor in the consenting process	• N/A
The Utility Regulatory for Northern Ireland (UR)	• Regulatory body for electricity networks, including the grid connection process	• N/A
The System Operator for Northern Ireland (SONI)	• Planning and operating Northern Ireland's grid, owned by Eirgrid although operationally independent	N/A
Northern Ireland Electricity Networks (NIEN)	• Maintenance, repair and construction of Northern Ireland's Grid, including connecting generating stations	N/A
The Northern Ireland Department for Infrastructure (DfI)	• DfI provides oversight and policy for onshore planning	• N/A

Offshore wind development framework: Northern Ireland

Institutional context: key instruments and mechanisms

Marine Spatial Planning

- Northern Ireland's overall Marine Planning is governed by an ongoing process run by DAERA
- As the responsible body, DfE is required to commission a Strategic Environmental Assessment and Habitat Regulations Assessment (SEA/HRA) for Offshore Renewable Energy in the Northern Ireland Marine Area
- A scoping report for consultation was provided by RPS group in September 2023
- The scoping report identifies the next step in the MSP process as resource identification and quantification however, the current status of this exercise is not clear

Seabed Tenure

- The Crown Estate (TCE), a UK Statutory Corporation is effective owner and landlord of the marine estate in England, Wales and Northern Ireland
- Seabed tenure for offshore wind farms is allocated through discrete 'leasing rounds' that function as auctions
- Offshore wind development in Northern Ireland is assumed to require a dedicated leasing round
- In January 2023, DfE and agreed a 'statement of intent' to develop offshore wind in Northern Irish waters which extend out to 12 nm.

Permitting and planning

- Necessary permits for offshore wind are expected to include:
  - DfE: consents relating to electricity generation stations, including offshore (article 39 consent)
  - DAERA: marine license
  - Local authority: planning permission for onshore elements (for projects of 'regional significance' DfI may act as approving body but this process has not been tested for offshore wind)
- The OREAP notes that DfI, DAERA and DfE will establish an MOU to work together to support offshore wind

https://www.daera-ni.gov.uk/articles/marine-plan-northern-ireland
Offshore Renewable Energy Action Plan - SEA Scoping Report (economy-ni.gov.uk)
https://www.economy-ni.gov.uk/news/department-economy-and-crown-estate-publish-statement-intent

Offshore wind development framework: Northern Ireland

Institutional context: key instruments and mechanisms

Grid connection

- Connecting to the transmission system in Northern Ireland involves an application to SONI under a process regulated by UR
- In 2013, UR consulted on a bespoke connection regime for offshore renewable generators, but this process did not provide clear conclusions

Power offtake

- Plans are being developed for a renewable electricity support scheme (RESS) proposed to cover a range of technologies including offshore wind
- The approach under consideration (the high-level design, HLD) is modelled on the GB CfD allocation process
- A notable difference from the ORESS in Ireland is the proposed method of price indexation in the contract terms

https://www.uregni.gov.uk/files/uregni/consultations/Connection_arrangements_for_offshore_renewable_generation_consultation_paper_-_March_2013.pdf
https://www.economy-ni.gov.uk/sites/default/files/publications/economy/Renewable-Electricity-Support-Scheme-response.pdf

3

Port infrastructure

Port infrastructure

Introduction and summary

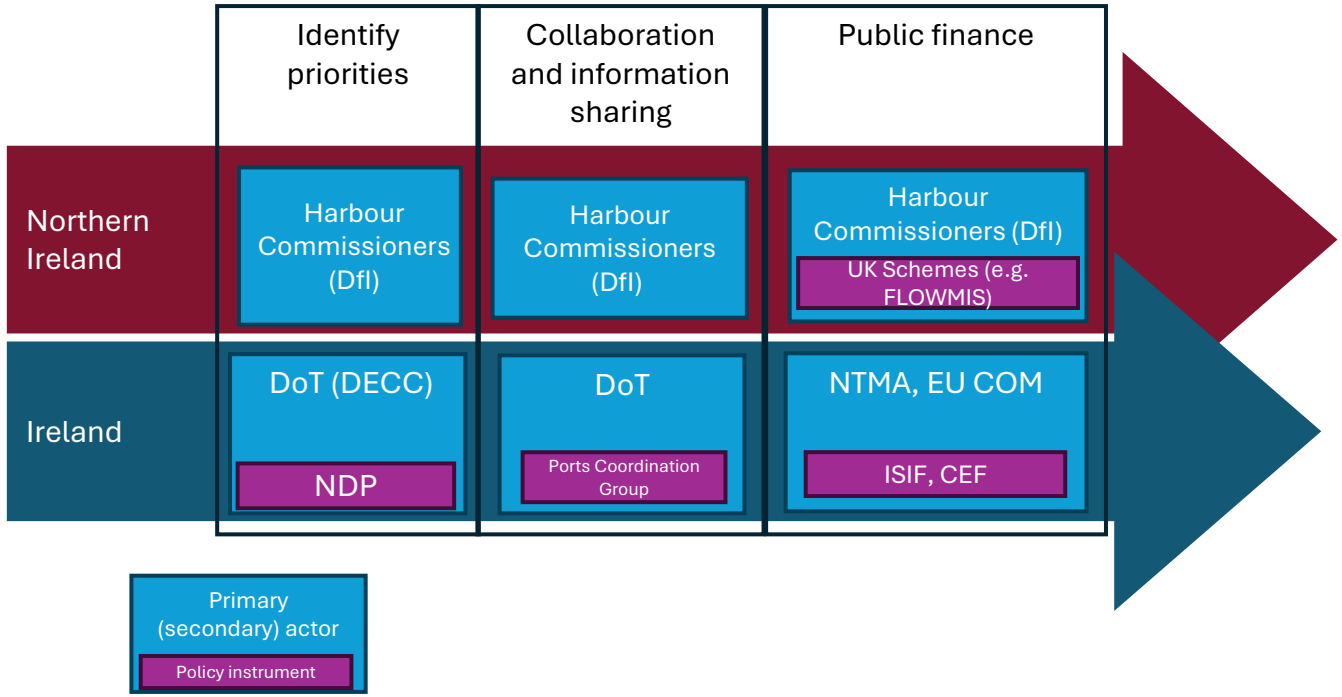
The island of Ireland lacks sufficient port infrastructure to enable the construction of the planned capacity of offshore wind farms. Port enhancement is needed to support the necessary activity (mainly staging, marshalling and assembly) and can act as an enabler for capturing more of the economic value of offshore wind in Ireland. Central to the port infrastructure deficit is the challenge of raising the funds required for development which is typically more than €/£100m per port. Funding for port redevelopment for offshore wind build out is challenging due to a number of factors including the misalignment of the investment timelines for offshore wind projects and port upgrades, the uncertainty surrounding the realisable port revenue stemming from uncertainty about the location and timing of offshore wind development. The only port on the Island currently suitable for offshore wind build out is the Belfast D1 facility.

Progress made to-date and experience tackling the port challenge in other countries indicates the necessity of action in three distinct but interconnected policy functions:

1. **Identification of strategic investment priorities –** work to determine the port upgrade requirements and strategic decisions about investment priorities
2. **Collaboration and information sharing -** collective problem solving through coordinated and structured discussion
3. **Public finance to address funding gap –** provision of funds through grants and/or investment to support delivery of strategically significant projects

Ireland has a coordinated approach to strategic policy development for ports. Ports in Ireland tend to be state-sponsored (that is, owned by private or public limited companies in which the State is a significant shareholder).

Decision making around ports in Northern Ireland is focused on individual Trust Ports, overseen by politically appointed Harbour Commissioners with a public interest as well as a commercial remit.



PORT INFRASTRUCTURE

Ireland

Port infrastructure: Ireland

Institutional context: key actors and roles

The Department of Transport (DoT) leads national ports policy and the Ports Coordination Group, led by DoT, facilitates policy alignment. Expanding its membership to include industry stakeholders has been recommended to strengthen collaboration across government and industry sectors.

The Ireland Strategic Investment Fund (ISIF) and the European Investment Bank (EIB) offer financial backing for commercially viable port projects, while An Bord Pleanála oversees the critical planning and approval processes for large infrastructure projects.

Actor	Functional responsibility
Department of Transport (DoT)	• Oversees national port policy and coordination of Ireland's commercial port developments, especially those that serve the offshore renewable energy sector. The DoT convenes the Ports Coordination Group and is involved in funding discussions, policy alignment, and regulatory oversight of port projects that support climate and energy goals
Ireland Strategic Investment Fund (ISIF)	• An investment fund managed by the National Treasury Management Agency, ISIF can provide commercial funding for infrastructure projects with strategic significance, including ORE port infrastructure.
European Investment Bank (EIB)	• As a key European funding partner, the EIB provides loans and other financial instruments for large-scale infrastructure projects in EU countries.
Irish Maritime Development Office (IMDO)	• A state agency that promotes the development of Ireland's maritime sector, including ports. The IMDO is involved in market analysis, strategy development, and regulatory advice for expanding port facilities and aligning them with Ireland's ORE goals
Connecting Europe Facility (CEF)	• An EU funding instrument, CEF provides grants for trans-European transport, energy, and digital networks.
An Bord Pleanála (ABP)	• Ireland's planning appeals board, responsible for approving significant infrastructure projects, including port developments.
Regional Assemblies (e.g., Eastern and Midland Regional Assembly, Northern and Western Regional Assembly)	• Regional assemblies are responsible for supporting balanced economic development across Ireland. They are involved in the allocation of European Regional Development Fund (ERDF) resources, which may be a potential funding source for regional ports supporting ORE

Port infrastructure: Ireland

Institutional context: key instruments and mechanisms

Identification of strategic priorities

- Nationally important ports in Ireland tend to be owned by semi-state-controlled port companies with local and authority and private ownership more common among smaller regional ports.
- The National Development Plan (NDP) 2021-2030 outlines Ireland's priorities for large-scale infrastructure investments over the decade
- The NDP recognises the importance of Tier 1 ports like Dublin Port, Port of Cork, and Shannon Foynes in enhancing connectivity, supporting trade, and facilitating climate-related sectors like offshore wind.

Collaboration and information sharing

- Current collaboration occurs through the Ports Co-ordination Group established by the Department of Transport, which includes representatives from key departments, port operators, and regulatory bodies such as IMDO.

- This group's mandate is to maintain alignment in policy and planning efforts for port development, though it currently does not include industry members.

Recommendations for future collaboration made by Wind Energy Ireland (WEI) highlight the need for:

- Inclusion of industry stakeholders in the Ports Co-ordination Group for more integrated dialogue.
- A strategic investment model for ORE projects similar to Scotland's SIM, where the government, ports, and developers collaborate, creating a framework that could evolve over time based on the scope of offshore developments and funding challenges.
- Irish Port Platform for smaller ports, to foster regional cooperation, facilitate knowledge transfer, and jointly pursue opportunities to serve Ireland's ORE sector

Public finance to address funding gap

- A 2005 prohibition on Exchequer funding prevents the Irish government from directly financing infrastructure developments at commercially operated ports to encourage ports to be financially self-sustaining
- Nevertheless, as in many markets, the business case for timely investment in ports consistently demonstrates a 'funding gap' stemming from a range of uncertainties

Feasible public funding options for Irish port infrastructure encompass a mix of national and European sources:

- **Connecting Europe Facility (CEF) funding**: The primary European funding mechanism for infrastructure, but Irish applications have faced challenges, suggesting complementary support is necessary.
- **Ireland Strategic Investment Fund (ISIF)**: A potential source of commercial investment in ORE ports, particularly for projects with clear revenue potential, alongside other governmental grants.
- **European Regional Development Fund (ERDF)**: Often used for ports in Europe, though it cannot be used alongside CEF funding, making it suitable for ports ineligible for or unsuccessful in CEF applications.
- **Green loans and national tax incentives** (like the Industrial Buildings Allowance), which may help offset upfront capital costs but are useful only when projects reach the construction stage.
- **State Aid-compliant government grants**: Recommended as a catalyst to attract private investment and boost investor confidence in ORE infrastructure

- Port of Cork recently secured funding from both CEF and ISIF sources for enhancements that could support a role in offshore wind

https://windenergyireland.com/images/SYSTEM/reports/Irish_Ports_Funding_Study.pdf
https://windenergyireland.com/images/files/final-national-ports-study.pdf

PORT INFRASTRUCTURE

Northern Ireland

Port infrastructure: Northern Ireland

Institutional context: key actors and roles

Of Northern Ireland's five ports, four are 'Trust Ports', a form of legal structure separate from private, public or municipal ownership. The ports' commercial and strategic activity is overseen by a board of Harbour Commissioners which, in the case of Northern Ireland, are appointed by the relevant NI minister, currently the Infrastructure Minister.

The statutory basis for each Trust varies but generally include provision for wider public benefit alongside commercial goals. The legal structure (with no share capital) can also create challenges for raising large sums of finance for major upgrade works.

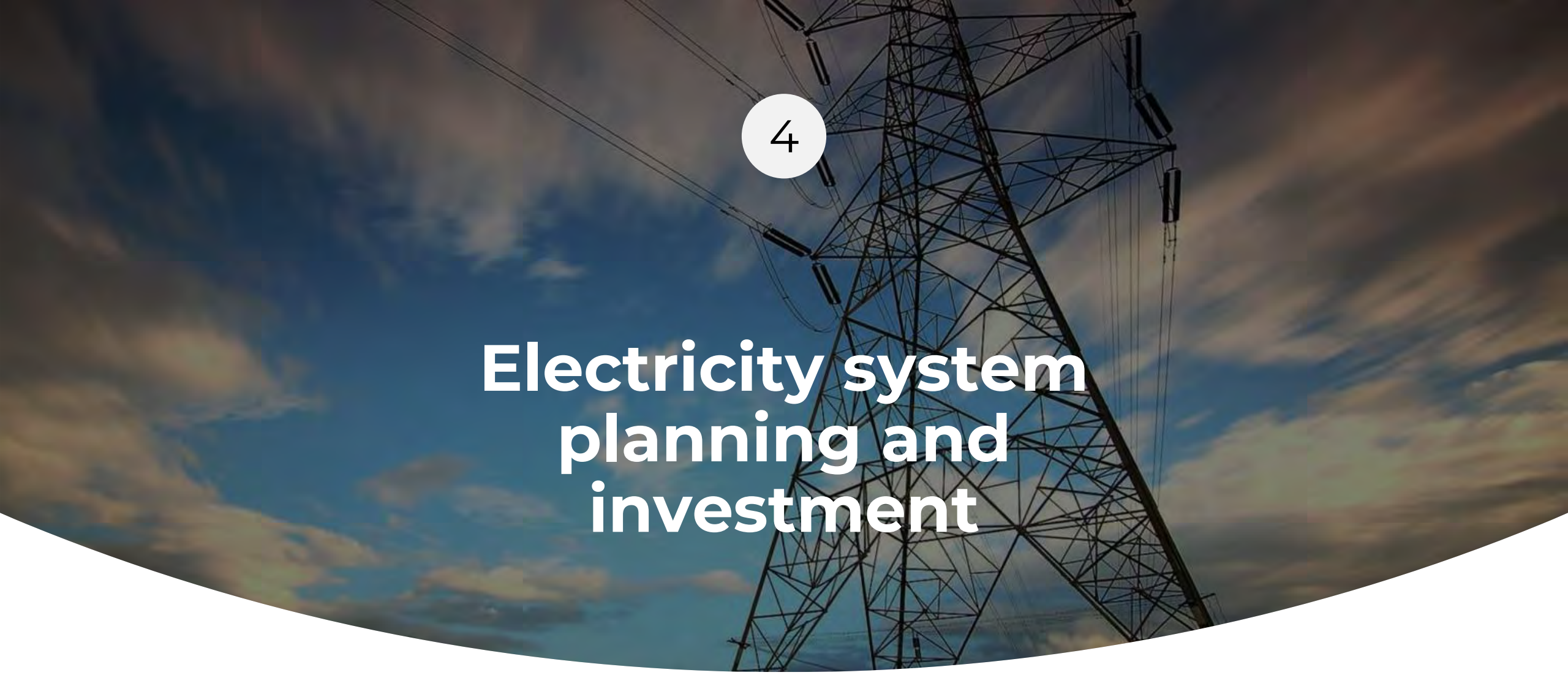
Actor	Functional responsibility
Department for Infrastructure (DfI) Gateways Team	• Stewardship and oversight of Trust Ports • DfI minister appoints board members
Boards of Harbour Commissioners (one for each port)	• Responsible for ensuring ports operate within commercial, fiduciary and public-service remit • Fixed term appointments through public competition

Key instruments and mechanisms

The ability of Trust Ports to finance large capital projects is limited by their legal structure which places liabilities on the public balance sheet. DfI has plans to consult on changes that may allow greater investment without impacting on the budgetary liabilities of the Northern Ireland Executive.

The major source of public finance available to ports in Ireland (The Connecting Europe Facility (CEF) and the Ireland Strategic Investment Fund (ISIF)) are not available.

Northern Ireland ports are eligible for UK funding initiatives such as the Floating Offshore Wind Manufacturing Investment Scheme (FLOWMIS) for which Belfast Port is thought to have made an unsuccessful application.



4

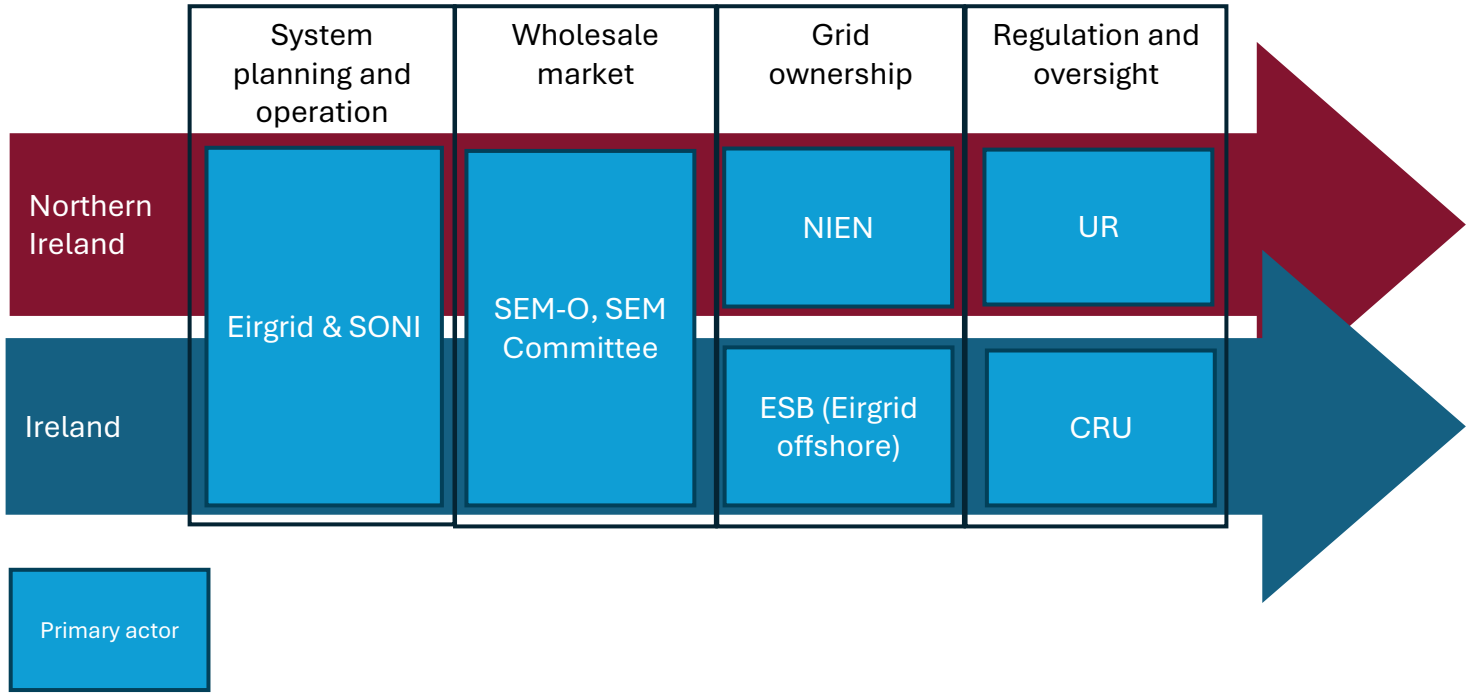
Electricity system planning and investment

Electricity system planning, investment and operation

Introduction and summary

The electricity transmission and distribution system, 'the grid', is an essential component in the energy transition. The island of Ireland operates is a single physically integrated, synchronous electricity system. Although the two jurisdictions have a number of legally independent institutions with distinct responsibilities, the technical requirements of managing the cross-border system involves close cooperation and, in some cases, operational integration. Electricity system planning, investment and operation involves four distinct but interconnected functions:

1. **System planning and operation:** day-to-day operations of the networks and planning for future changes
2. **Wholesale market design and operation:** creation and evolution of markets used for bulk electricity trading
3. **Grid ownership, construction and maintenance:** responsibility for the integrity of the physical electricity infrastructure
4. **Regulation and oversight:** administration of market codes, licensing of market participants, economic regulation of network access and pricing



ELECTRICITY SYSTEM
PLANNING, INVESTMENT AND
OPERATION

Ireland and Northern Ireland

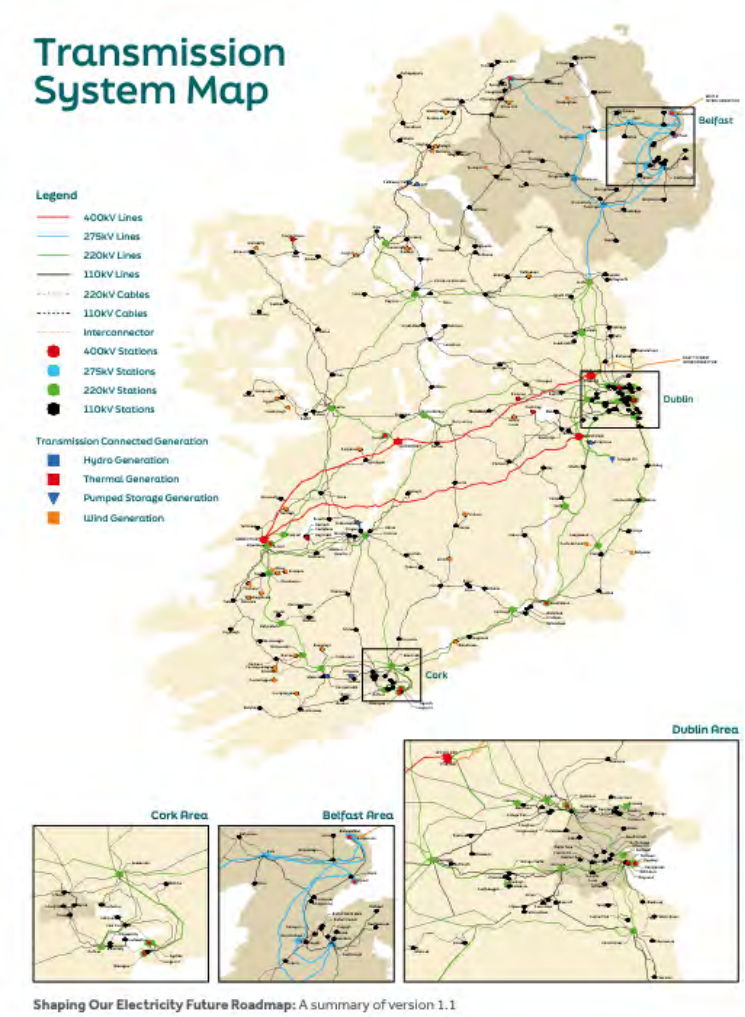
Electricity system planning, investment and operation: Ireland and Northern Ireland

Policy objectives and targets

The electricity system on the island of Ireland faces significant challenges. The Government of Ireland's Climate Action Plan and the Northern Ireland Climate Change Act see 80% of electricity from wind and solar by 2030. Combined with expected changes in demand patterns, Eirgrid and SONI, the respective system operators for Ireland and Northern Ireland, foresee a tripling of renewables production compared to 2022.

Mobilising the investment required to upgrade the electricity networks in line with the targets requires reform in the way the grid is planned and operated with the System Operators responsible for network planning calling for a shift towards a plan-led approach to renewable energy grid development. Ireland's Climate Action Plan also includes three new transmission grid connections or interconnectors to Northern Ireland, Great Britain, and the EU.

	Ireland	Northern Ireland
Demand	45.1 TWh (~Median GCS Scenario)	10.8 TWh (~Median GCS Scenario)
Offshore Wind	+5,000 MW +2,000 MW for hydrogen production	+500 MW
Onshore Wind	+4,500 MW	+1,000 MW
Solar PV	+8,000 MW (including 2,500 MW small scale)	+400 MW (including 100 MW small scale)
Short Duration Storage	+100 MW	+50 MW
Long Duration Storage	+2,400 MW	+350 MW
De-rated Gas Capacity	+2,000 MW	+900 MW



Shaping Our Electricity Future Roadmap: A summary of version 1.1

Electricity system planning, investment and operation: Ireland and Northern Ireland

Institutional context: key actors and roles

At the heart of any electricity system are the monopoly companies that own and operate the networks, and the regulators that guide and oversee their activity. On the island of Ireland, there is close integration in operations and ownership structures.

The cross-border nature of the infrastructure and the single electricity market creates some unique institutional arrangements not seen in other comparable markets. For example, a single market for power across two transmission grids with different operators.

Actor	Functional responsibility	Key documents
Eirgrid	• State owned TSO for Ireland, developing, planning and operating the electricity system	• Shaping our Electricity Future (v1.1)
System Operator for Northern Ireland (SONI)	• Eirgrid owned TSO for Northern Ireland, developing planning and operating the electricity system	• Shaping our Electricity Future (v1.1)
ESB Networks	• Majority state owned (through ESB Group) transmission and distribution company in Ireland • Owning and maintaining the physical network assets	• Networks for net zero
Northern Ireland Electricity Networks (NIEN)	• ESB group owned transmission and distribution company in Northern Ireland • Owning and maintaining the physical network assets	• Electrification: economic opportunity for Northern Ireland
Utilities Regulator (UR)	• Regulation of the network monopoly companies in Northern Ireland • Shared responsibility for regulation of the SEM	• N/A
Commission for Regulation of Utilities (CRU)	• Regulation of the network monopoly companies in Ireland • Shared responsibility for regulation of the SEM	• N/A
Single Electricity Market Operator (SEMO)	• Responsible for the operation of electricity wholesale markets on the island of Ireland • Joint venture of Eirgrid and SONI	• Future power markets stakeholder engagement workshop
Single Electricity Market Committee (SEMC)	• Decision making authority for the Single Electricity Market (SEM) • Committee representation of regulators from Ireland (CRU) and Northern Ireland (UR)	• N/A

Electricity system planning, investment and operation: Ireland and Northern Ireland

Institutional context: key instruments and mechanisms

System planning and operation

- Electricity system operations is conducted by Eirgrid Plc, the transmission system operator (TSO) for Ireland and System Operator for Northern Ireland Ltd (SONI, a subsidiary of Eirgrid)
- As in many comparable countries, climate change, energy security and the resulting changes to the way electricity is produced and consumed is driving change in the electricity system
- Volumes of energy produced and consumed are both expected to increase very significantly
- Grid infrastructure is already a constraint on the expansion of offshore wind and integration of major demand loads, such as data centres
- The future of the electricity system is subject to very large uncertainties, making investment and expansion planning extremely complex
- Eirgrid and SONI have initiated *Shaping our Electricity Future' (SOEF),* an 'ongoing transformative journey approach' to understand and prepare for the challenges
- SOEF has engagement with stakeholders at its centre and includes multi-year plans for network expansion:
  - Network Delivery Portfolio (NDP) in Ireland
  - Transmission Development Plan Northern Ireland (TDPNI)
- SOEF also prescribes closer collaboration with the TAO companies that own the assets and enhanced system operations that can manage high-volumes of variable renewable energy

Wholesale market design and operation

- A single electricity market (SEM) has existed since 2007
- It has evolved over time, most recently in 2018 with reforms to the market functioned designed to increase the ability to enable coupling between the SEM with EU electricity markets
- The Integrated SEM (I-SEM) is operated by the Single Electricity Market Operator (SEMO), a full-function joint venture of SONI, Ltd the Northern Ireland System Operator and Eirgrid Plc in Ireland
- SEM decision making authority is held by the SEM Committee (SEMC) made up of representatives of both national regulatory agencies (CRU and UR)
- The TSOs make a range of recommendations for SEM reform in the SOEF roadmap, focusing on alignment between market and grid operation and integration with GB and EU markets

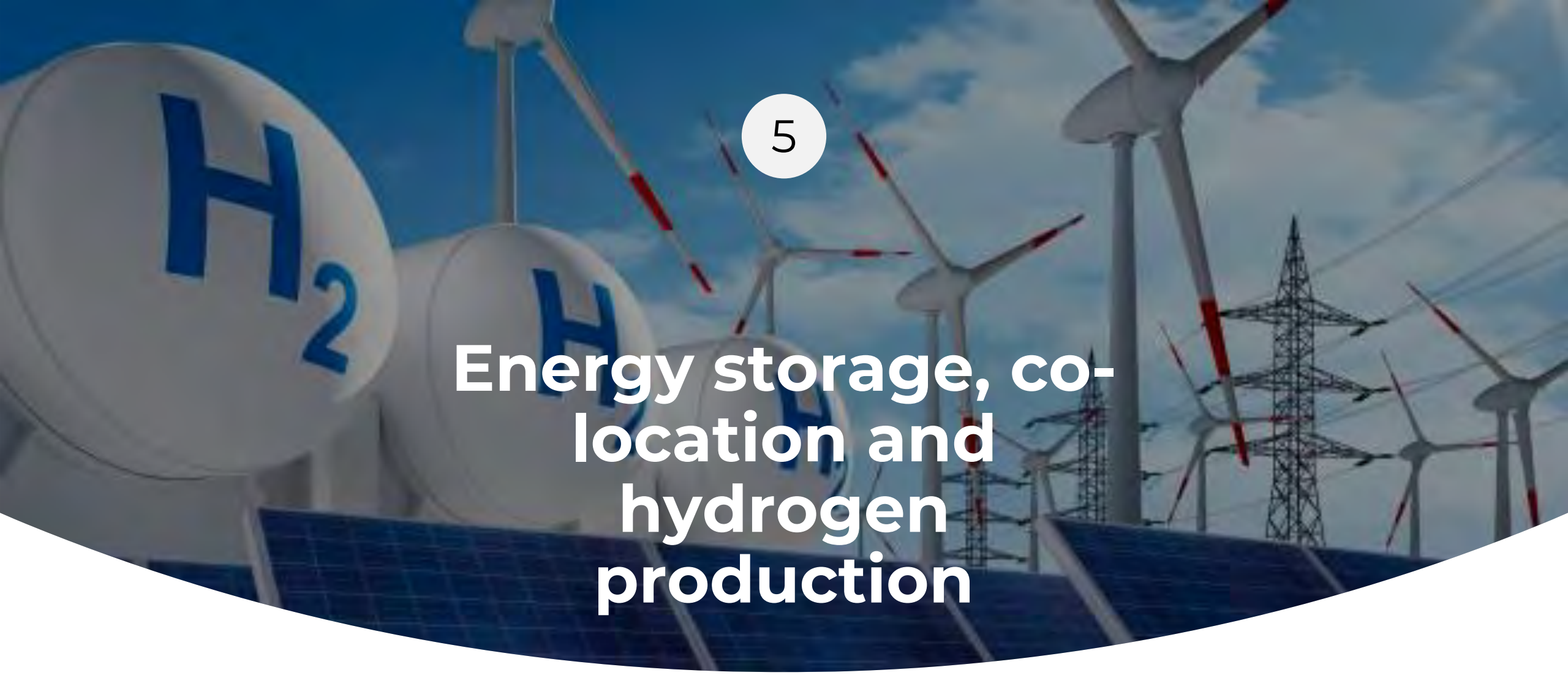
Grid ownership

- The physical assets of the high voltage electricity system are owned and maintained by Transmission Asset Owners (TAOs) and the lower voltage distribution networks by Distribution Asset Owners (DAOs)
- The TAO and DAO roles are played by ESB Networks (ESBN), part of ESB group, a statutory corporation in Ireland and Northern Ireland Electricity Networks Ltd (NIEN) in Northern Ireland, also part of the ESB group
- The TAO/DAO functions are funded through regulated use of system charges that are levied on network consumers and generators

Regulation and oversight

- Regulation of the electricity system covers topics including:
  - Price control – the income the regulated bodies (the TSOs, TAOs and DAOs are permitted to receive through customer levies and charges)
  - Approval of investment plans
  - Ensuring non-discriminatory access to the networks by defining the connection process and technical criteria ('codes')– and in line with EU and GB policy where necessary
  - Design, evolution and oversight of the electricity market
  - A range of reporting and monitoring functions such as verification and certification of the fuel mix used to produce electricity
- CRU is the regulator in Ireland
- UR is the regulatory in Northern Ireland
- The two regulators hold joint regulatory responsibility for the SEM through the SEM Committee
- Different methodologies are used to calculate the charges that can be passed on to generators for using the grid in Ireland and Northern Ireland

https://www.eirgrid.ie/shaping-our-electricity-future
https://www.semcommittee.com/



5

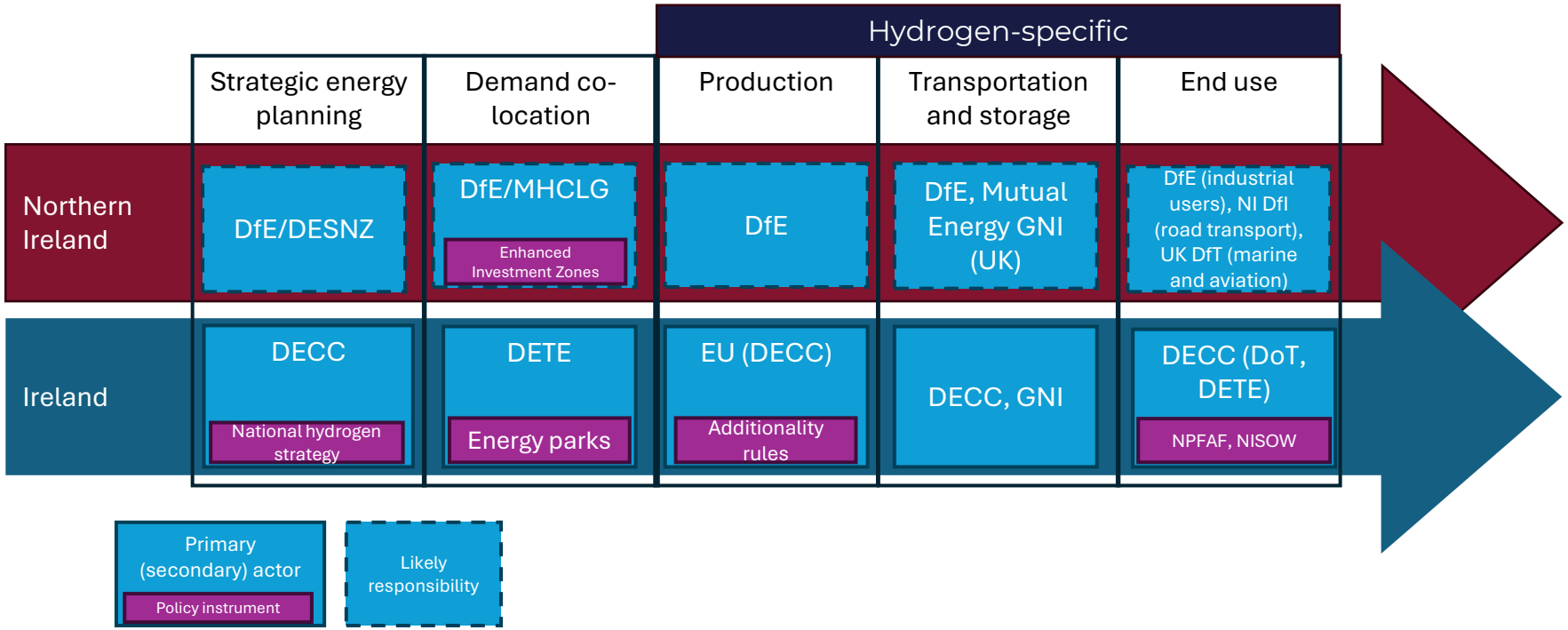
Energy storage, co-location and hydrogen production

Energy storage, co-location and hydrogen production

Introduction and summary

The abundance of renewable energy resource, especially offshore wind, combined with the electrically isolated system and already constrained grid system has created a strategic drive in Ireland to develop non-electrical use cases (especially hydrogen produced through electrolysis from offshore wind energy) and closer geographical integration of energy production and use, particularly large energy users. Unlike in some other countries where decarbonisation of existing industry is a hydrogen policy priority, in Ireland hydrogen and co-location activity is explicitly targeted at industrial development and expansion.
Creating an alternative value realisation model for offshore wind production that is less dependent on conventional grid offtake involves five distinct but interconnected policy functions:

1. **Integrated strategic energy planning:** ensuring co-evolution in renewable energy spatial planning, electricity, gas and water networks and transportation policy
2. **Co-location:** the specification of geographically clustered zones with production and large consumers of renewable power or hydrogen
3. **Production:** incentives and regulations for the designation of 'green' hydrogen
4. **Transportation and storage:** policies and regulations for the establishment of methods to move hydrogen from point of production to point of use
5. **End use:** the identification and prioritisation of green hydrogen applications



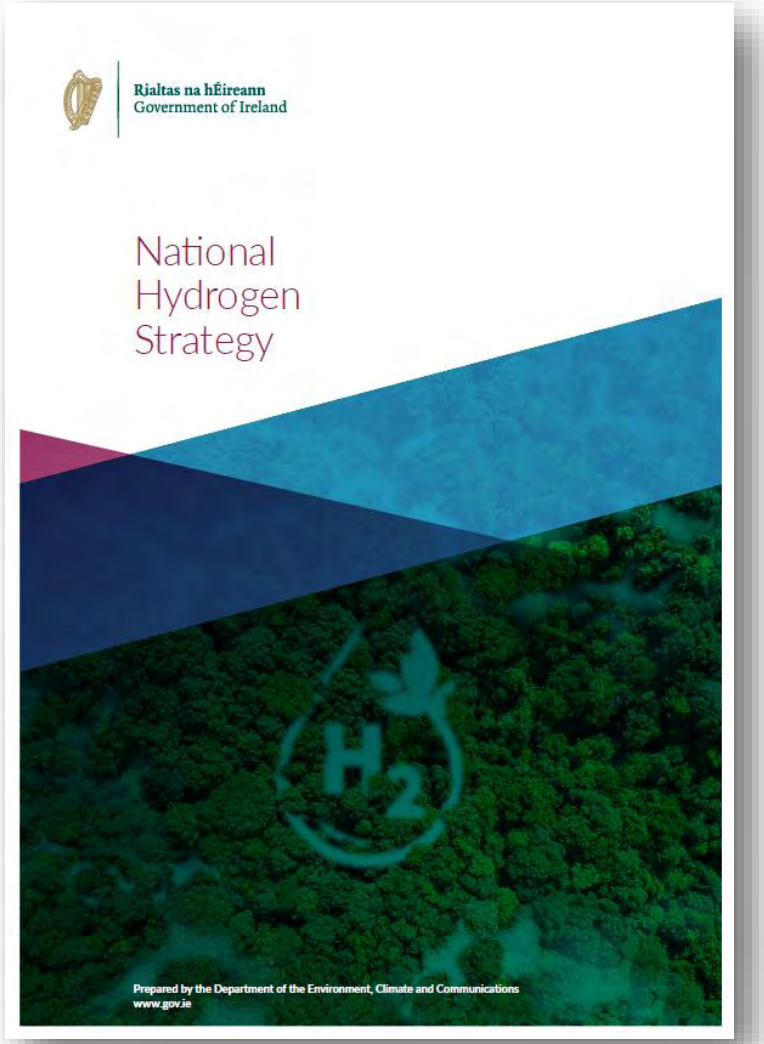
ENERGY STORAGE, CO-LOCATION AND HYDROGEN PRODUCTION

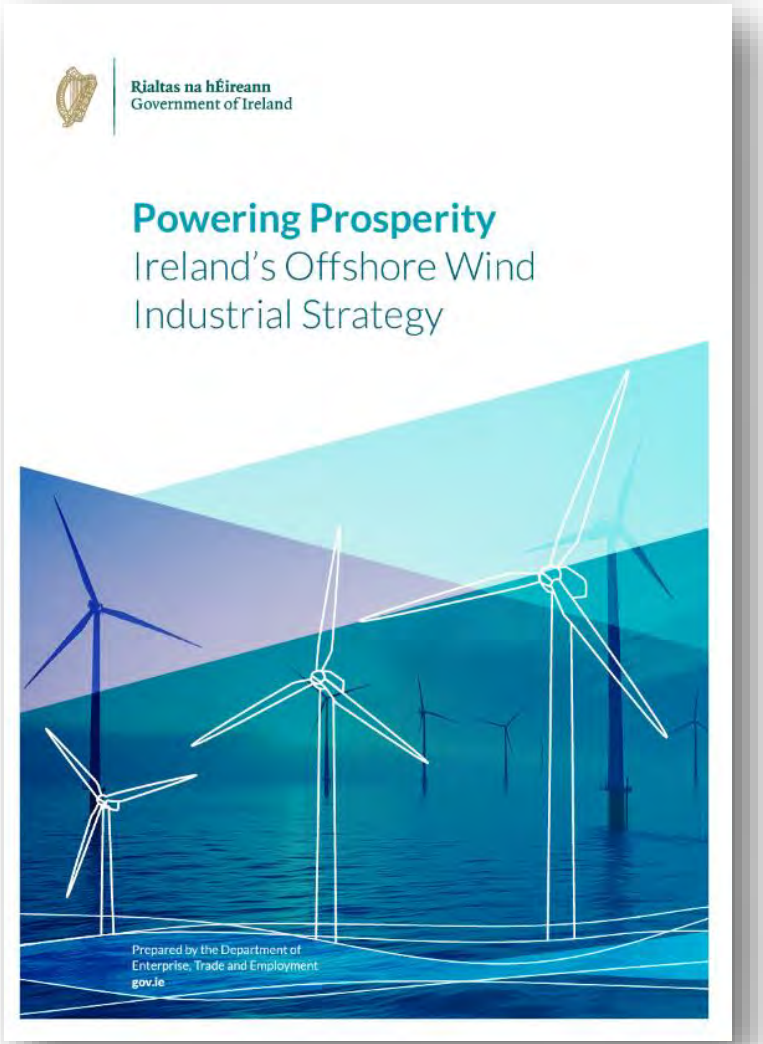
Ireland

Energy storage, co-location and hydrogen: Ireland

Policy objectives and targets

- Ireland aims to develop 2 GW of offshore wind capacity for non-grid uses, including renewable hydrogen production, by 2030.
- The National Hydrogen Strategy sets out three key strategic drivers for developing an indigenous hydrogen sector in Ireland: decarbonising the economy, strengthening energy security, and enabling industrial growth, including export potential.
- Focus on using hydrogen for long-duration energy storage, especially for seasonal storage to support the integration of variable renewable generation.
- Powering Prosperity – Ireland's Offshore Wind Industrial Strategy envisions co-located green energy industrial parks where industries can consume offshore wind electricity directly as well as for hydrogen production and storage.
- These 'Green Energy Parks' are intended to serve as hubs for energy-intensive industries (especially data centres), supporting both domestic and export demands.





Energy storage, co-location and hydrogen: Ireland

Institutional context: key actors and roles

Although alternative value attribution models for offshore wind energy such as hydrogen production and co-location are central to Ireland's ambition for energy, climate and industrial growth, it remains a nascent area of policy development. In this current early stage, the prime mover of policy is DECC, which is leading on the formation and implementation of the National Hydrogen Strategy with wide ranging implications across the Irish energy system. Given the significance of both the industrial opportunity identified in the development of offshore wind projects in Ireland and overseas as well as the continued focus on maintaining Ireland's status as an international destination for investment in data infrastructure, the role of DETE is also very prominent.

The strategic direction being pursued will, over time, place increasing demands on numerous elements the policy system. There is already significant activity around the regulation and planning of electricity and gas networks involving the regulated entities and regulators.

Ireland's plans are largely consistent with the direction of travel in European policy, with rules from the European Commission on the definition of green hydrogen, for example, enabling rather than constraining Ireland's position.

Actor	Functional responsibility	Key documents
Department of the Environment, Climate and Communications (DECC)	• Setting the strategic direction for policy • Energy system planning and sectoral integration	• Hydrogen Strategy for Ireland
Department of Enterprise, Trade and Employment (DETE)	• Exploring the concept of Green Energy Parks	• Powering Prosperity
IDA Ireland	• Engaged in a continuous programme of delivering Business Parks, Strategic Sites and Next Generation sites to support winning foreign direct investments of differing scale	• Powering Prosperity
GNI	• Ownership and operation of gas networks that may transport green hydrogen in future	• Pathway to a net zero carbon network
Eirgrid	• Electricity system planning	• Shaping our electricity future
Commission for Regulation of Utilities (CRU)	• Energy market regulation	• National energy demand strategy
European Commission	• rules on the EU definition of renewable hydrogen	•Delegated Act (EU) 2023/1184 on a methodology for renewable fuels of non-biological origin •Delegated Act (EU) 2023/1185 a minimum threshold for GHG emissions savings of recycled carbon fuels

Energy storage, co-location and hydrogen: Ireland

Institutional context: key instruments and mechanisms

Strategic energy planning

- Although this policy area is inherently cross-sectoral and cross-departmental, DECC is the lead department and is responsible for the recently published National Hydrogen Strategy for Ireland (NHSI)
- Coordination between departments and other stakeholders such as the electricity and gas networks takes place through an Interdepartmental Hydrogen Working Group established in 2020
- The NHSI is a wide-ranging document touching on many areas of policy across the value chain including the prioritisation of end-use applications
- The vision put forward in the NHSI implies a very significant shift in Ireland's approach to energy system planning
- Most notable is the explicit prioritisation of industrial and export market opportunities as an underpinning motivation for hydrogen production

Demand co-location

- At the centre of Ireland's energy and industrial policy is the issue of data centres as part of the 'twin transition' of digital and decarbonisation
- A 2022 Government Statement on the Role of Data Centres in Ireland's Enterprise Strategy acknowledges the challenges of accommodating the energy needs of 'digital infrastructure' within the constraints of climate policy and the physical grid system
- In 2022, CRU published updated guidelines for data centre grid connections that place significant requirements on data centre operators to consider their location and energy provision, contributing to concerns about the attractiveness of Ireland as an international data centre hub
- The NHSI and Powering Prosperity - Ireland's Offshore Wind Industrial Strategy, acknowledge this challenge and propose increased co-location of large consumers of energy (such as data centres) with renewable energy producers (such as offshore wind farms)
- The concept of the 'Green Energy Park' is being explored in a piece of work commissioned by DETE to assess the opportunity for co-location. They are also considered a means of creating dynamic industrial clusters involving SMEs

Hydrogen production

- Policy on hydrogen production covers technological innovation, investment incentives and certification
- Ireland does not as-yet have any dedicated hydrogen investment incentives and there is little dedicated innovation support, although hydrogen energy is flagged in the Research and Innovation Strategy published in 2022
- Certification rules to ensure that renewable fuels of non-biological origin (RFNBO) such as 'green' hydrogen is produced from verifiably renewable sources are defined by the European Commision through two recent delegated regulations:
  - Additionality, temporal and geographiccorrelation methodology
  - Methodology for calcluting emissions savings
- Ireland has stated plans for a national scheme to ensure compliance with the EU regulations.

government-statement-on-the-role-of-data-centres-in-irelands-enterprise-strategy.pdf
CRU21124-CRU-Direction-to-the-System-Operators-related-to-Data-Centre-grid-connection-.pdf (divio-media.com)
https://www.gov.ie/pdf/?file=https://assets.gov.ie/263248/f982c10f-eca6-4092-a305-90000e5213ed.pdf
https://energy.ec.europa.eu/document/download/21fb4725-7b32-4264-9f36-96cd54cff148_en?filename=2024%2003%2014%20Document%20on%20Certification.pdf
https://www.gov.ie/pdf/?file=https://assets.gov.ie/224616/5f34f71e-e13e-404b-8685-4113428b3390.pdf

Energy storage, co-location and hydrogen: Ireland

Institutional context: key instruments and mechanisms

Hydrogen transportation and storage

- In the short-term, small scale hydrogen applications can use tanker road haulage and rail solutions for which existing regulations are in place
- By mid-century, the transportation of hydrogen gas in Ireland is expected to require significant pipeline infrastructure for which the safety and regulatory provisions do not currently exist
- GNI, the owner and operator of Ireland's existing natural gas transmission network has proactively laid out a plan to progressively repurpose the existing system
- GNI is also investing in research partnerships with UCD and UU to clarify the potential for a hydrogen-gas energy network in Ireland
- DECC will examine the system requirements for long duration energy storage to 2050 in order to prioritise further work

Hydrogen end use

- The NHSI outlines a range of priority applications for the use of green hydrogen:
  - Long term storage and hydrogen power generation to provide system flexibility and to manage the variable output of a very large offshore wind fleet
  - Integration with the energy parks concept as part of a zero-carbon energy supply solution, primarily for data-centres
  - Industrial heat and processing
  - Road and rail transportation
  - Hydrogen export via pipeline or sea, particularly into countries with heavy industrial demand such as Germany through the so-called 'European Hydrogen Backbone' - an initiative supported by GNI and other network companies designed to accelerate the creation of pan-European hydrogen infrastructure
- Each of these areas will require substantial policy reform led by relevant departments including compliance with emerging EU regulations.
- For example, the Department for Transport consulted earlier this year on updated framework for alternative fuels infrastructure to ensure compliance with new EU legislation

https://www.gasnetworks.ie/docs/pathway-to-a-net-zero-carbon-network.pdf
https://www.gov.ie/en/consultation/441f2-update-of-the-national-policy-framework-for-alternative-fuels-infrastructure-for-transport/

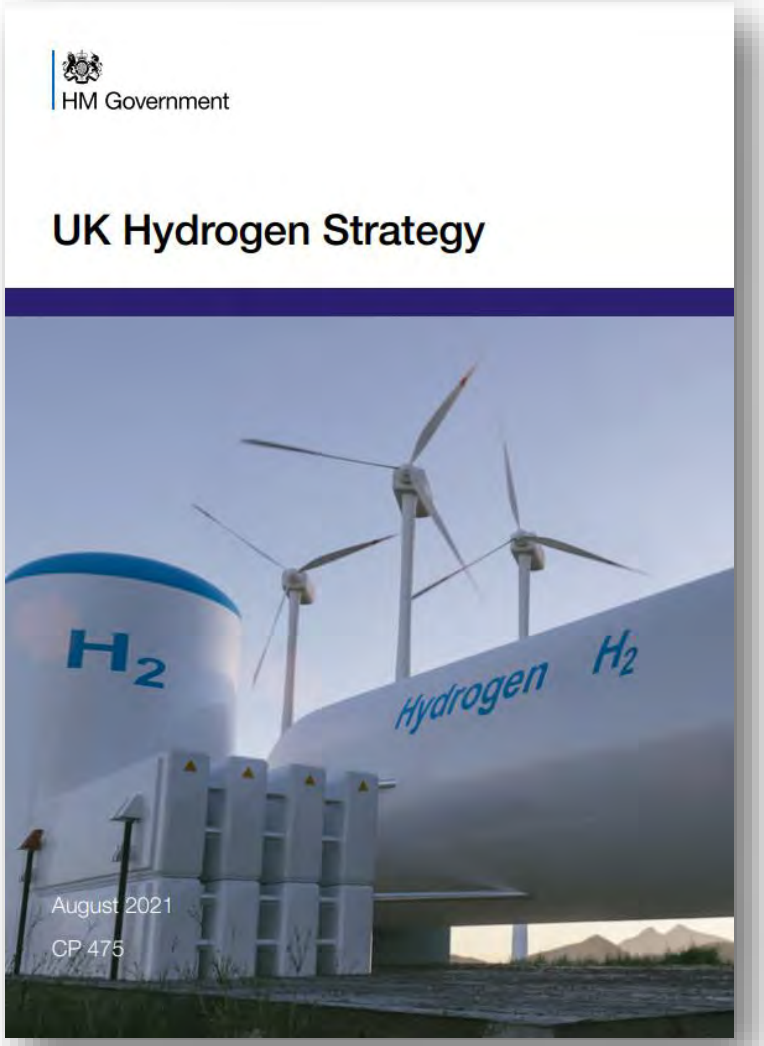
ENERGY STORAGE, CO-LOCATION
AND HYDROGEN PRODUCTION

Northern Ireland

Energy storage, co-location and hydrogen: Northern Ireland

Policy objectives and targets

- Northern Ireland does not currently have a separate hydrogen strategy and currently relies on the UK Hydrogen Strategy from August 2021. Work is ongoing developing a Northern Irish hydrogen policy.
- From our consultation, the “green gas” focus in Northern Ireland is from a push by DAERA to reduce run off from farms by increasing production of biogas and biomethane through anaerobic digestion.
- Given the local wind resource, and lack of local oil and gas production, it was suggested in consultation that Northern Ireland may focus on green hydrogen from renewables rather than blue hydrogen from natural gas, however this is not explicitly agreed in policy.
- The Hydrogen Business Model from DESNZ applies to Northern Ireland, however power prices are higher on the Northern Irish grid than in GB which creates a competitivity challenge.



Energy storage, co-location and hydrogen: Northern Ireland

Institutional context: key actors and roles

Given that energy storage, co-location and hydrogen are cross cutting topics, this creates additional complexity in Northern Ireland where certain related matters are reserved.

The current situation in Northern Ireland seems to be an overlapping patchwork of policies, and a lack of clarity on responsibilities between departments. There does not seem to be the same level of focus, priority and coordination as can be seen in Ireland when it comes to the development of policies relating to energy storage, co-location and hydrogen.

Actor	Functional responsibility	Key documents
DfE	• Policy direction for the production of green hydrogen and other green gases	• N/A
DfI	• Policy for the use of hydrogen in land vehicles in Northern Ireland	• N/A
UK DfT	• Policy for the use of hydrogen and derived fuels for maritime and aviation applications across the UK	• Clean Maritime Plan from 2019 is awaiting a refresh • Jet Zero strategy
DESNZ	• Policy for subsidising the production of low carbon hydrogen • Definition of low carbon hydrogen	• UK hydrogen strategy • Hydrogen production business model • Low carbon hydrogen standard
GNI	• Ownership and operation of gas networks that may transport green hydrogen in future	
System Operator for Northern Ireland (SONI)	• Eirgrid owned TSO for Northern Ireland, developing planning and operating the electricity system	• Shaping our Electricity Future (v1.1) • Hydrogen options for Northern Ireland

6

Organisations active in relevant policy and advocacy

ORGANISATIONS ACTIVE IN RELEVANT POLICY AND ADVOCACY

Wind Energy Business Associations

WINDEUROPE

EU-wide umbrella and membership organisation

- WindEurope is the main umbrella organisation for the wind energy industry in the EU
- It has individual corporate members as well as formal alignment with national associations including in Ireland
- It works across a wide range of legislative and policy topics including the NZIA, cross-border interconnection and electricity markets

WIND ENERGY IRELAND

Ireland-based membership organisation

- Wind Energy Ireland represents a range of wind energy business interests in Ireland
- WEI cooperates with WindEurope on issues with EU relevance

RENEWABLEUK

UK-based membership organisation

- RenewableUK represents the wind energy industry in Great Britain
- Does not directly participate in Northern Ireland

RENEWABLENI

Northern Ireland membership organisation

- RenewableNI represents the wind energy industry in Northern Ireland
- RenewableNI has a formal partnership with both RenewableUK and Wind Energy Ireland

Business and Entrepreneurship Agencies

ENTERPRISE IRELAND

Irish government's enterprise development agency

- Building capacity and capability in the domestic offshore wind supply chain in Ireland via expertise gained in developing other sectors and focus on start-ups and scaling.
- Responsible for the Gael Offshore Network which brings together Irish companies in the offshore wind supply chain.
- Directly supports companies seeking to enter the offshore wind market with a toolbox of company support schemes.

INVEST NI

Economic Development Agency for Northern Ireland

- Efforts to develop the Northern Irish offshore wind supply chain led by Sharon Cousins.
- Works closely with NIMO to develop an understanding of the Northern Irish offshore wind offering.
- Directly supports companies seeking to enter the offshore wind market.

IDA IRELAND

Agency responsible for attracting FDI to Ireland

- Provides direct support to foreign companies seeking to invest in Ireland.
- Generally focused on large scale investments from multi-national companies.
- -ocused on winning new international
- investment, and targeting strategic FDI in each Tier of the offshore value chain.
- Works with international companies that will complement the delivery of Ireland's offshore wind targets.

ENTERPRISE NI

Representative organisation NI's 27 Local Enterprise Agencies

- Supporting LEA network to provide aspirant entrepreneurs and existing micro and small businesses with access to workspace, development services, access to finance, and the informed support they need to start, sustain and grow their business.
- Lobbies on behalf of self-employed, micro, and small businesses

ORGANISATIONS ACTIVE IN RELEVANT POLICY AND ADVOCACY

Electricity Industry Associations

EURLECTRIC
EU umbrella organisation

- Represents European utilities active in electricity generation, distribution and supply

ELECTRICITY ASSOCIATION OF IRELAND
Membership organisation in Ireland and Northern Ireland

- Represents the electricity industry and gas retail sector operating within the Single Electricity Market (SEM) on the island of Ireland

ENERGY UK
UK membership organisation

- Represents the electricity industry in the UK covering suppliers, generators, aggregators, flexibility providers, electric vehicle charging operators and software companies

ELECTRICITY NETWORKS ASSOCIATION
UK and Ireland membership organisation

- Represents a membership of the energy networks in the UK and Ireland

ORGANISATIONS ACTIVE IN RELEVANT POLICY AND ADVOCACY

Hydrogen Business Associations

HYDROGEN EUROPE

Irish government's enterprise development agency

- Hydrogen Europe is an EU advocacy organisation
- Its policy priorities are enabling an EU market for hydrogen, hydrogen infrastructure and widening the applications of hydrogen as an energy vector

HYDROGEN IRELAND

Membership organisation in Ireland and Norther Ireland

- A cross-border business and advocacy organisation

HYDROGEN ENERGY ASSOCIATION

UK-based membership organisation

- The UK Hydrogen Energy Association is an advocacy organisation

Maritime & Marine Business Associations

BRITISH PORTS ASSOCIATION

UK membership organisation

- Represents ports, terminal operators and port facilities in all parts of the UK

MARINE IRELAND INDUSTRY NETWORK

Company network

- Company network chaired by a representative of Enterprise Ireland
- Existing links with NIMO.

NIMO

Company network

- Regional cluster for the maritime industry.
- Uniting the Maritime & Offshore Sectors In Northern Ireland for Sustainable Economic Growth through innovation and collaboration
- Led by Kerry Muldoon from Tetratech
- Linked up with Marine Ireland Industry Network and Invest NI.

MARINE RENEWABLES INDUSTRY ASSOCIATION

Irish membership organisation

- Smaller than the wind energy and renewables organisations, but directly involved in certain topics such as negotiations with fishermen

ORGANISATIONS ACTIVE IN RELEVANT POLICY AND ADVOCACY

Consulted organisations for this project

An Roinn Comhshaoil, Aeráide agus Cumarsáide
Department of the Environment, Climate and Communications

Dundalk Institute of Technology

North Channel Wind

Department for the Economy

Enterprise Ireland

NIMO Northern Ireland Maritime & Offshore

Invest Northern Ireland

An Roinn Fiontar, Trádála agus Fostaíochta
Department of Enterprise, Trade and Employment

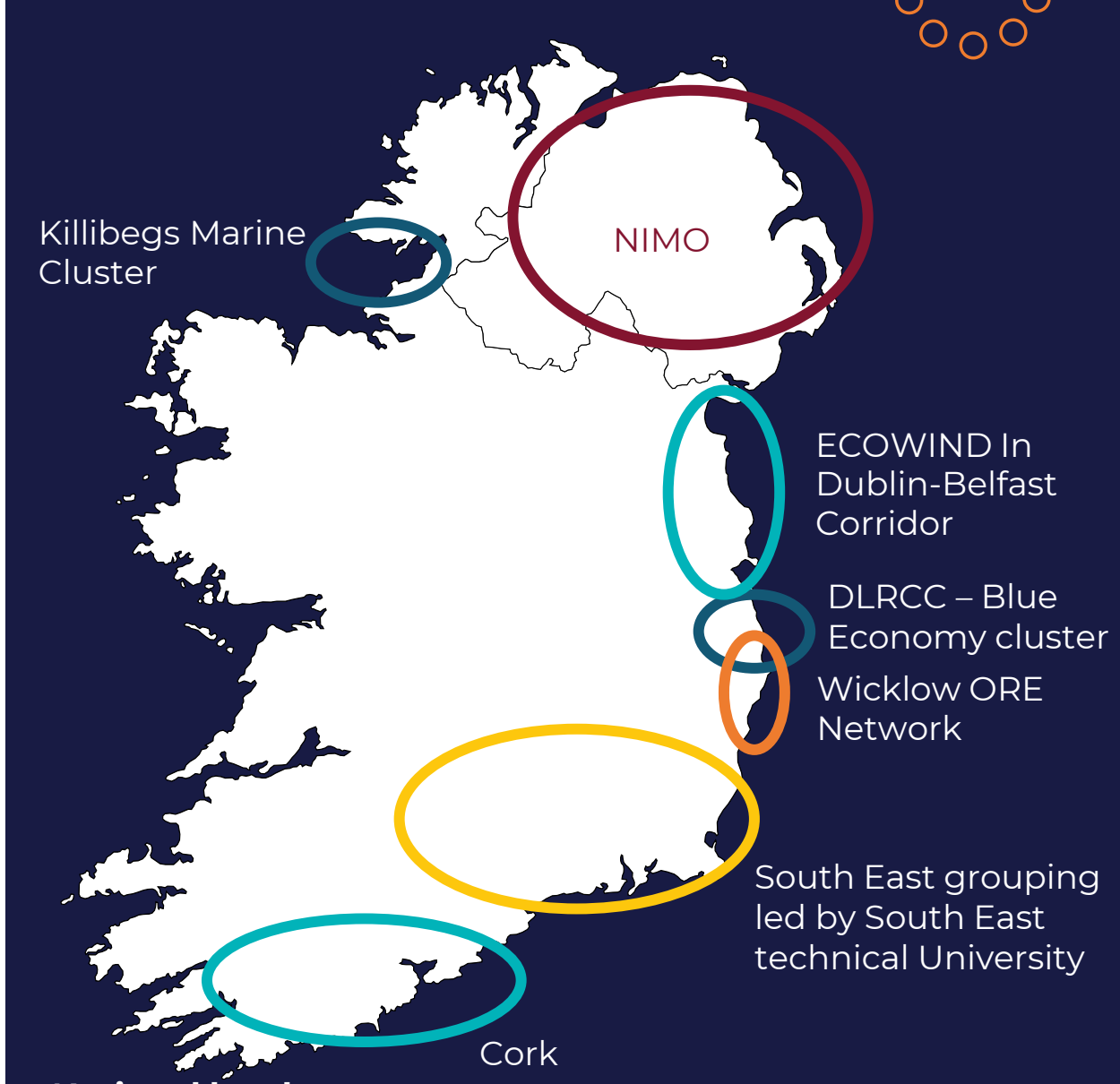
Danish Technological Institute

Department for Infrastructure
An Roinn Bonneagair

RenewableNI

Clusters and Regional Enterprise Plans

- The island of Ireland has many clusters in various regions being set up.
- In Northern Ireland NIMO is the main relevant cluster for offshore wind.
- Several DETE Regional Enterprise Plans (REPs) have set up Offshore Wind Working Groups, composed of cross-functional experts examining the regional economic opportunities from offshore wind: South-East REP, South-West REP, Mid-East REP, West and North-West REP (jointly).
- Other REPs may in future set up their own Offshore Wind Working groups. More detail on REPs available here.
- Industry is now taking a more active role on examining the potential of a national supply chain cluster, with a hub and spoke model being one potential future configuration.



National level:

- Enterprise Ireland Gael Offshore Network
- Wind Energy Ireland

Note: This is not an exhaustive list of clusters and regional groupings across the island of Ireland.

International comparisons

WP2

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Document control

REVISION	A
AUTHORS	David Thomason, Alan Duncan, Bruce Clements
STATUS	Draft
CHECKER	Paul Reynolds
APPROVER	Paul Reynolds

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A	Initial version	17/12/2024

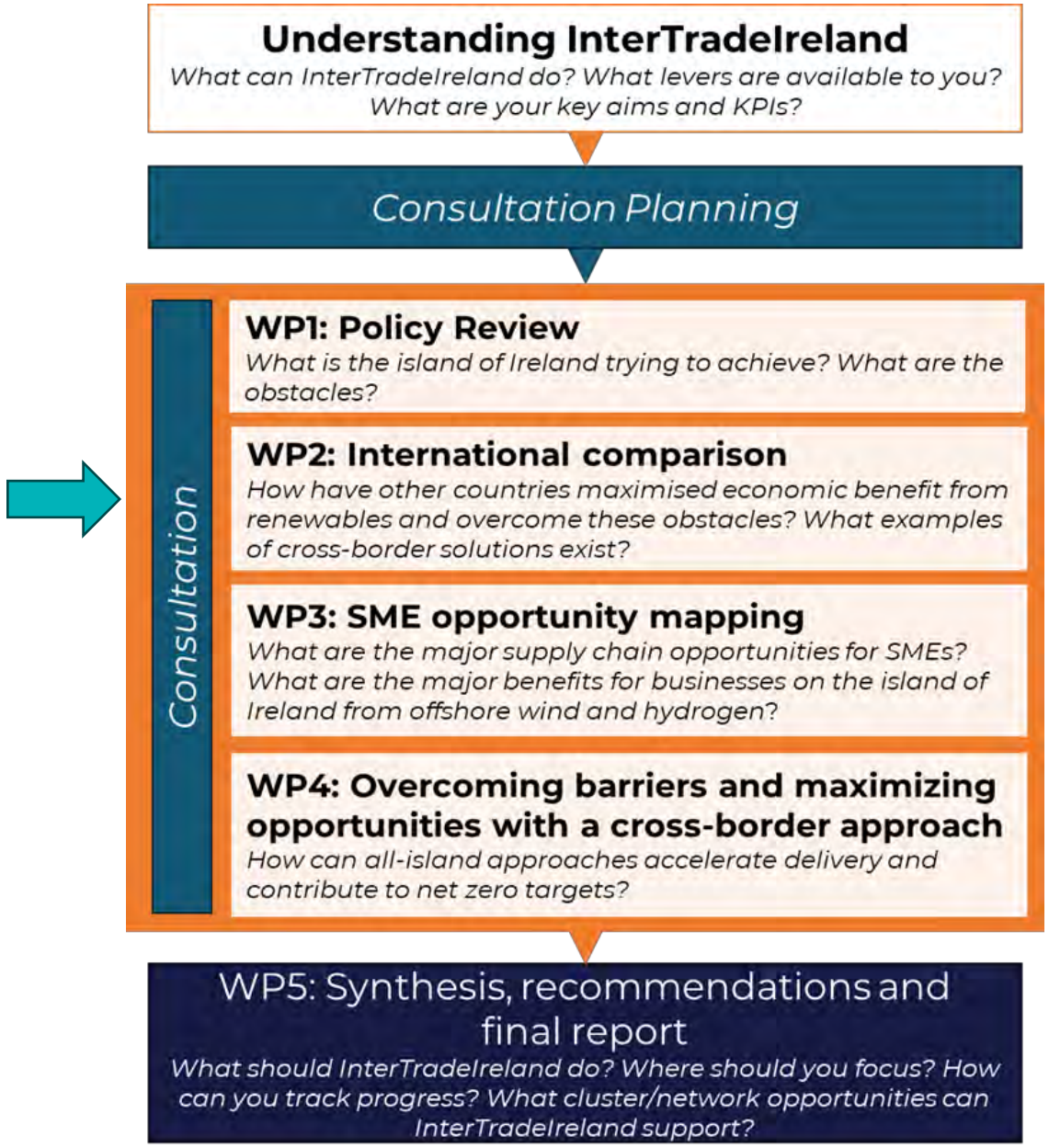
WP2: International Comparisons

Purpose & context:
This document is provided as the main deliverable under Work Package 2 as described in section 4.3 of proposal ITI001-P-01-A.

This report provides an overview of key reports in the existing literature for the offshore wind and hydrogen supply chain opportunities across the island of Ireland, followed by case studies focusing on key focus areas that are most relevant to InterTradeIreland. These focus areas are:

- Renewables for energy export and off grid energy solutions in Denmark;
- Supply chain support mechanisms for the offshore wind industry in Scotland;
- Ports and growth centres for the offshore wind supply chain in the UK and Denmark.
- Cross border collaboration mechanisms in the USA;

For each focus area, a case study has been developed followed by a clear set of conclusions and takeaways for InterTradeIreland.



Geography down selection

Given the unique role of InterTradeIreland and the focus on cross-border trade and all-island solutions, there are very few international examples that were considered relevant. The criteria that were chosen for potential international comparisons were:

1. Current presence of offshore wind – there are more lessons to learn from countries that have already attempted to develop the industry than those who are just starting.
2. Complex overlapping jurisdictions – given the complex situation of Ireland in the EU and Northern Ireland in the UK, the intention is to identify other complex situations to learn from.
3. Cross-border collaboration – Identifying examples of cross-border grid and energy strategies, or areas where a lack of cross-border coordination hindered deployment of offshore wind and green energy.
4. Off-grid offshore wind – Given the ambition to deploy 37 GW of offshore wind in Ireland, which far exceeds the current grid demand, alternative solutions for offshore wind are of interest.

This process led to a focus on Scotland and the wider UK; Denmark; and the USA, with a focus on the two East coast clusters of states (one around Maryland and the other in New England).

Country	Presence of OSW	Complex jurisdictions	Cross-border	Off-grid OSW	Selected for WP2
Scotland in the UK					✓
Denmark					✓
France					X
Germany					X
Maryland in USA					✓
New England in USA					
Taiwan					X
Netherlands					?
Uruguay					X
Japan					X

1

Literature Review

Relevant reports & publications

Offshore wind & green hydrogen supply chain opportunities across the Island of Ireland

REF*	REPORT	PUBLISHED	AUTHOR	SECTOR	APPLICABLE TO
01	Offshore Renewable Energy Technology Roadmap	June 2024	SEAI	Offshore Wind	Republic of Ireland
02	Building our Potential – Ireland's Offshore Wind Skills and Talent Needs	January 2024	BVG Associates	Offshore wind	Republic of Ireland
03	Exploring opportunities in the Northern Ireland Energy Transition	March 2021	NUI Galway	Hydrogen	Northern Ireland
04	Green Jobs Delivery Group – Hydrogen Task and Finish Group	July 2024	Cogent Skills	Hydrogen	UK
05	Investigating-potential-offshore-wind-supply-chain-Northern-Ireland.pdf (economy-ni.gov.uk)	June 2023	Fraser of Allander Institute	Offshore wind	Northern Ireland
06	Irish Offshore Wind Supply Chain Study	October 2019	Carbon Trust	Offshore wind	Republic of Ireland
07	Offshore Renewables Surplus Potential WS1 – Market Analysis	November 2023	AFRY	Wind & hydrogen	Republic of Ireland
08	Offshore Renewables Surplus Potential WS3 – Renewable Hydrogen	December 2023	AFRY	Hydrogen	Island of Ireland
09	Powering Prosperity – Ireland's Offshore Wind Industrial Strategy	March 2024	Government of Ireland	Offshore wind	Republic of Ireland
10	Hydrogen and Wind Energy – The role of hydrogen in Ireland's energy transition: Green Tech Skillnet	January 2022	GDG Geosolutions	Wind & hydrogen	Republic of Ireland
11	The Clean Revolution – Building Northern Ireland's Offshore Wind Industry	August 2022	BVG Associates	Offshore Wind	Northern Ireland
12	Harnessing our potential	March 2020	Carbon Trust	Offshore Wind	Republic of Ireland

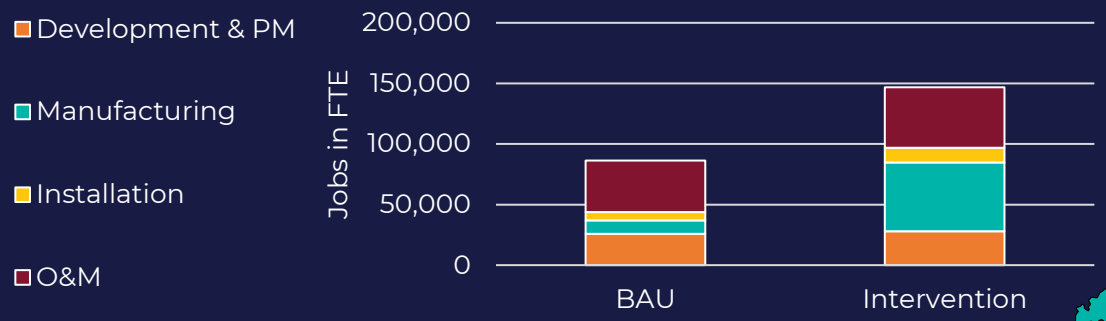
*Reports will be referenced using these numbers in the following slides

Offshore Wind - Key facts & numbers

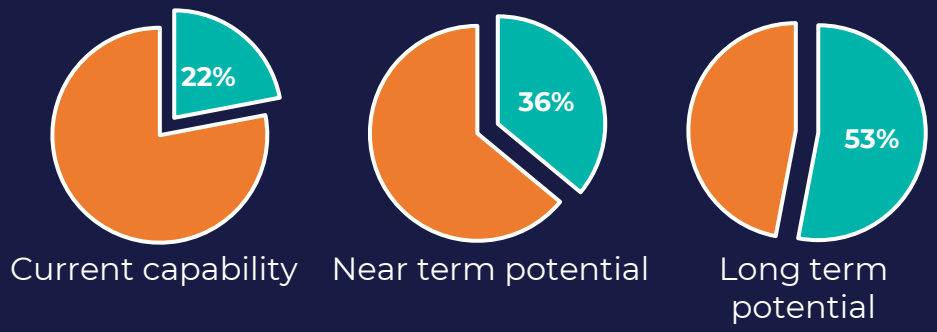
IRELAND

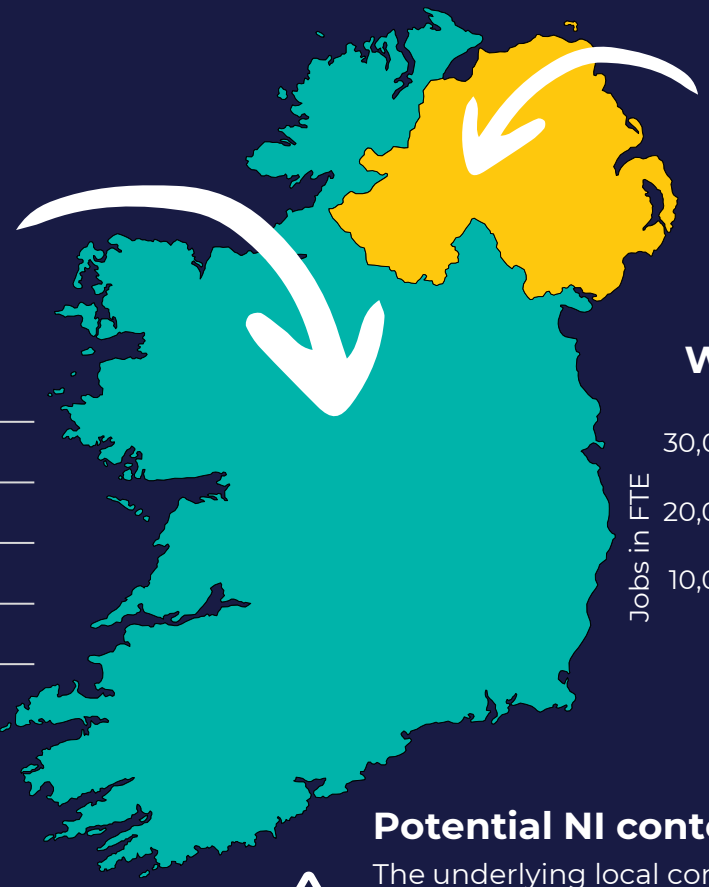
Size of the opportunity in GVA by 2050 (1)

Where are the opportunities for jobs by 2040? (2)



Potential Irish content in offshore wind farms (12)

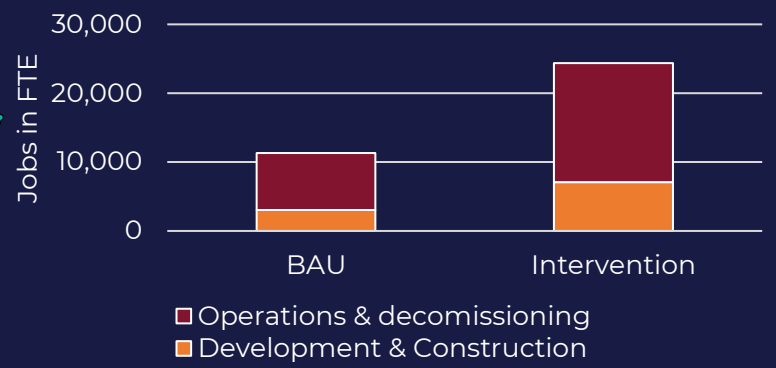




NORTHERN IRELAND

Size of the opportunity by 2032 in GVA (11)

Where are the job opportunities? (11)



Potential NI content in offshore wind farms

The underlying local content proportions assumed to assess the GVA are opaque in report 11 by BVG.
In report 5, a minimum of 80% local content for foundation supply is assumed, which seems challenging given Harland & Wolff's recent high profile contract terminations and lack of monopile production capability.

Recommendations

The following table extracts recommendations made in the reviewed reports that are most relevant to InterTradeIreland. The ORE Technology roadmap serves as the main source as it was published in June 2024 and pulls together 50 recommendations, covering those made in previous reports. There are no recommendations in the NI reports, but similar recommendations likely apply.

Topic	Recommendation
Frameworks for ORE Delivery	Accelerate ORE delivery by ensuring frameworks promote Ireland as an attractive market for offshore wind projects.
Seabed Occupancy and Offtake	Establish a predictable pattern for ORESS auctions or successor schemes.
Export Systems and Grid Connection	Develop a strategic roadmap for Ireland's transmission network to 2050.
Supporting the Wider Energy System	Promote local supply chain opportunities in renewable hydrogen production.
Supporting the Wider Energy System	Encourage innovative technologies to support grid access and optimize ORE deployment.
Supply Chain and Skills Development	Focus on Irish strengths in project development and operations/maintenance.
Supply Chain and Skills Development	Establish a robust methodology for calculating and increasing Irish content in ORE projects.
Supply Chain and Skills Development	Incentivize large-scale manufacturing and port development to attract foreign direct investment.
Supply Chain and Skills Development	Support industrial clusters with targeted policies to promote regional collaboration and economic growth.
Research and Innovation	Develop and implement a focused ORE research and innovation strategy for Ireland.
Research and Innovation	Prioritize research in fixed and floating offshore wind and wave energy.
Research and Innovation	Facilitate partnerships between research institutions, industry players, and funding bodies.
Research and Innovation	Ensure long-term support for promising innovations with robust stage-gate processes.
Research and Innovation	Promote collaboration with international research efforts to share knowledge.
Research and Innovation	Develop repositories for data sharing and standardization.
Infrastructure Investments	Strategically invest in port infrastructure to facilitate offshore wind turbine assembly and maintenance.

Hydrogen - Key facts & numbers

IRELAND

- **Small domestic demand (8)** for hydrogen in Ireland, with only one refinery in Cork and a lack of ammonia, steel or chemical industries.
- **Lack of competitive advantage (8)** against domestic production in other EU countries brings into question the plan for an export driven strategy. Although Ireland has a significant wind resource, the lack of solar potential and transport costs make it challenging to compete with local generation in other EU countries.
- **Pipeline export competes with shipping (8)** – If Ireland can connect via pipeline, then it will likely be cheaper than imports relying on shipping.
- **New industries need scale (8)** – Irish industry for green ammonia, methanol or sustainable aviation fuel (SAF) would need to be internationally competitive to achieve the required scale as there is not sufficient local demand.
- **Export to the EU via pipe route to market (8)** is described as credible, however the hydrogen costs in both AFRY's report (8) and the GDG report (10) do not align with the actual market conditions observed in similar markets since publishing. In the UK, the hydrogen subsidy strike price was £ 9.50 per kg compared to under € 3.50 per kg (2) or € 3.60 to € 5.40 per kg (10). The economics of hydrogen for export likely need to be revisited.

NORTHERN IRELAND (3)

- **No major industrial demand** for hydrogen in Northern Ireland due to lack of ammonia, refinery, steel or chemicals industries.
- **Salt caverns provide an opportunity** for large-scale low-cost storage, particularly at Larne Lough.
- **Hydrogen buses** are of interest due to the local presence of Wrightbus, a bus manufacturer which is investing in hydrogen buses. Translink's report on hydrogen in Transport explains that hydrogen buses have higher capital costs and operational costs compared to Battery Electric vehicles, require additional garage modifications and have struggled to procure green hydrogen in NI. However, the refueling time was only 6 to 10 mins compared to 3 to 6 hours charging.
- **Gas grid blending** where hydrogen is injected into the gas grid up to 20% by volume (only 7% by energy) is suggested as an option. Other countries have assessed blending in detail; for example, Spain has a modern gas grid which is highly compatible with hydrogen, and found the cost of adaptations to achieve 20% blending would increase the total operational expenditure of the gas grid by 2% over a 20-year amortisation period.
- **Hydrogen for export** is suggested as an option for NI, although there is no economic analysis to support this.

Gap analysis

Where are the gaps in the literature that InterTradeIreland should be aware of?

IRELAND

- **Export competitivity:** Although there is a focus on exports for the offshore wind supply chain, and existing supply chain companies have managed to export internationally, any major supply chain facility investment in Ireland would need to assess the international competitivity to ensure sufficient pipeline.
- **Route to market for 37 GW:** Ireland's ambitious targets for offshore wind lack a clear route to market, and the proposed solutions such as a hydrogen pipeline to Germany carry significant risk. For those 37 GW, there needs to be a clear route to market for the capacity to get built.

NORTHERN IRELAND

- **Realism about Harland & Wolff:** The report by the Fraser Allander institute assumes that 80% of foundations are produced out of Northern Ireland in their low scenario and 100% in the high scenario. Belfast has not produced offshore wind foundations in over a decade, and they have never produced monopiles. In 2023, H&W terminated their contract to supply jacket foundations for the Neart na Gaoithe offshore windfarm from their site in Methil. H&W may produce offshore wind foundations in future; however, this should not be assumed as a basecase scenario.
- **Lack of recent assessment of hydrogen opportunity:** The hydrogen market has cooled significantly since 2021 when the report for NI was written. There has been significantly more evidence on the economic challenges for green H_2 production and its use in transport applications, particularly given the continued reduction in battery prices.

ALL ISLAND

- **Joined up approach to supply chain:** The supply chain on both sides of the border has been considered in isolation. There has not been a significant effort to articulate the value of an all-island supply chain.
- **Competitive vs Additive approach:** Understanding the supply chain priorities and capabilities across the island of Ireland, but also across the UK and even the North Sea Basin can allow a focus on additive supply chain investments rather than duplicating investments being made in the same geographic region.
- **Robust economic analysis on hydrogen:** The hydrogen prices in the various reports do not seem to represent the current market conditions for green hydrogen and there is not a clear explanation of the route to cost reduction.

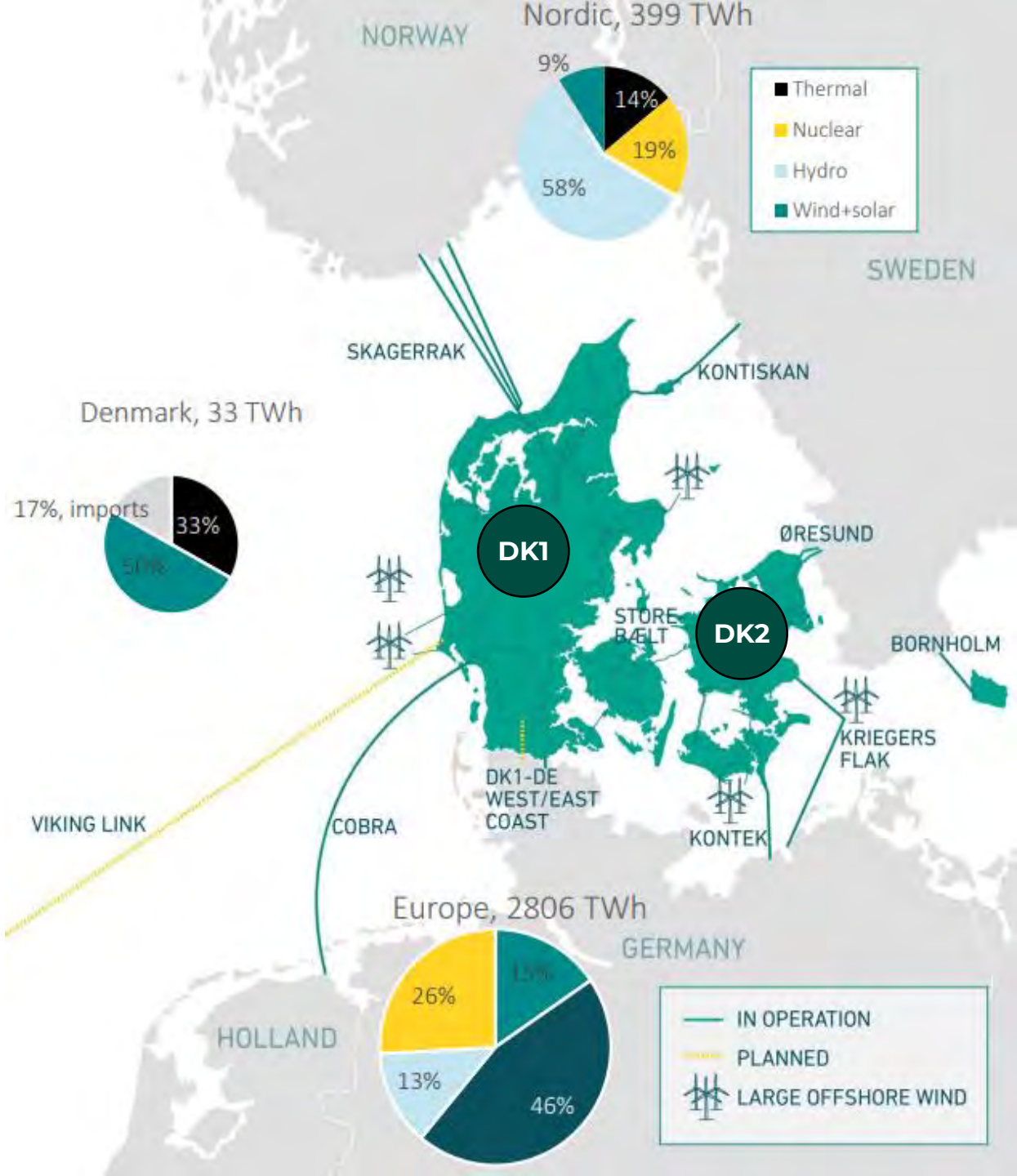
2

Renewables for Energy Export in Denmark

Denmark - Managing a high renewables grid

Reaching high levels of renewable penetration onto the electricity grid creates challenges for grid stability and resilience. Denmark serves as an interesting case study as in 2024 they generated the majority (56%) of their electricity mix from wind. There are 4 main routes to ensuring grid stability at high levels of renewable penetration:

1. **Dispatchable generation:**
   - often relies on fossil fuels. This includes technologies such as coal plants, gas peaker plants, biomass plants and diesel generators.
   - Denmark has 2.1 GW of biomass, 3 GW of coal, 1.6 GW of gas and close to 1 GW of oil power plants according to ENTSOE (European Network of Transmission System Operators for Electricity).
2. **Interconnectors:**
   - Interconnection to other countries with renewable generation that is less correlated with local generation, or other forms of power generation can enable higher amounts of renewables to be integrated onto the grid.
   - Denmark benefits from interconnection to Norway, Sweden, Germany, the Netherlands and the UK.
   - Interconnector capacity of over 8 GW exceeds total peak demand of 7.2 GW in Denmark. For comparison, the island of Ireland has approximately 2.2 GW of interconnectors for a peak demand of over 7GW.
3. **Storage:**
   - Given Denmark's unique geography, it has been able to rely on interconnectors to reduce the need for storage. In 2023, less than 10 MW of battery storage participated in the ancillary service market; for comparison the GB grid has a 5x higher peak demand but 350 times more battery capacity.
4. **Novel technologies and flexibility services**
   - The Danish grid secures over 300 MW of grid services from electric boilers. It also enables heat pumps and solar farms to provide grid services.
   - Other novel technologies such as smart charging and vehicle to grid (V2G) capabilities for electric vehicles can help manage a high renewables grid.



Denmark - From high renewable grid to energy exporter

The challenges of becoming a green energy exporter

Green Energy Parks

- The Danish Green Energy Parks policy aimed to enable the deployment of large volumes of onshore renewables to produce e-fuels and other energy products for export.
- This policy led to a surge in ambition amongst Danish developers, with some discussing 20 GW projects in a country with a peak demand of about 7 GW.
- The bubble around green energy parks is deflating due to difficulty reaching FID.
- Smaller projects have been built, including the 3 MW Stiesdal biogas upgrading facility.
- Recent subsidy auction awarded power-to-X subsidy for close to 300 MW of projects but Plug Power's offer for a 100MW project was withdrawn due to the company's financial health.
- Other projects were cancelled or delayed: Orsted is exiting the green fuels market, including scrapping 70MW FlagshipONE green methanol project two years after FID and withdrawing from a sustainable aviation fuel (SAF) project.

Offshore wind power-to-X

- The latest Danish offshore wind auction provided the option to bid for a large offshore wind farm with only part of the site able to connect to the grid.
- The auction was expected to be a subsidy free auction, and developers would need to find innovative uses for the extra renewable capacity to increase the competitivity of their cash bid.
- However, no one bid into the auction.
- A successful offshore wind power-to-X strategy needs to ensure that developers can build a business case that works; this has yet to be achieved. In particular:
  - Developing a robust financial model for an offshore wind project which will not be built for 5 to 10 years, and relying on novel technologies such as green hydrogen or e-fuels proved to be challenging for developers.
  - Making an assumption on the willingness-to-pay of German hydrogen consumers is difficult. Projects also need to consider international competition from locations with low cost solar and onshore wind.
  - Relying on a third-party hydrogen pipeline that does not exist yet is a significant risk. The pipeline to Germany has now been delayed by 3 years.

Energy islands

- The Danish government approved the development of 2 energy islands in 2020: Bornholm Energy Island and North Sea Energy Island (Energiø Nordsø).
- The role of these energy islands is to serve "as a hub for connecting and distributing power from the surrounding offshore wind farms (OWF)."
- The actual use of the power is not clearly defined; the expectation is to serve as a hub for international interconnection and potentially power-to-X applications.
- The auction to build these islands is planned to be launched by the end of 2024 according to the teaser for investors from November 2022. The completion date was initially meant to be 2033 but this has been delayed to 2036.
- The business model for the bidders relies on sale of 50.1% of the island to the Danish state, long term rent from the Transmission System Operator (TSO) in Denmark, payments from the TSO for additional services, rent from any other 3rd party leases and payments from 3rd parties for use of the port on the island.

Conclusions & takeaways for ITI

Denmark provides a potential snapshot of the future for Ireland

1. **Interconnectors cannot solve all of Ireland's grid challenges** Reaching high levels of renewable energy penetration requires dispatchable generation, interconnectors, storage, and novel flexibility solutions. The island of Ireland is geographically more isolated and has less access to hydropower which makes a high renewable content more reliant on the other 3 options due to difficulties achieving the levels of interconnection seen in Denmark.

2. **Subsidising exports?** Developing a green energy export economic strategy is challenging, the economics do not currently work for subsidy free power-to-X projects and subsidising projects for export of energy is politically difficult to justify.

3. **Challenging route to market –** For projects to get built, there needs to be a clear route to market to allow projects to reach FID. Third party pipelines, long development timelines requiring demand forecasts a decade ahead of time, and policy complexities of export projects create a significant amount of risk for projects.

4. **Operation at scale likely beyond 2035 –** Denmark is somewhat of a trailblazer and their projects are unlikely to be operational before 2035. This supports the view that Power-to-X, particularly from offshore wind does not present a large near-term supply chain opportunity across the island of Ireland.

5. **Opportunity to learn from the Danish experience –** Ireland has achieved 36% wind in their electricity mix, the second highest in Europe; and 43% renewables. However, at 56% wind in their electricity mix and 81% renewables, Denmark provides a snapshot of the future for the island of Ireland. They have achieved high levels of wind penetration and are exploring opportunities to make use of additional capacity, including a recent failed offshore wind auction targeting green hydrogen and e-fuel production. Policy makers, particularly in the Republic of Ireland, could benefit from building stronger links to their Danish counterparts to make the most of the ongoing learnings.

3

Supply chain support in Scotland

Overview* of OSW supply chain development mechanisms in Scotland

Expert support

Providing direct access to industry expertise can support market entry for SMEs into offshore wind.

OWES – Scottish Enterprise

Short support of a few days for companies in Scotland, launched in 2016 and ending in 2022. Full impact analysis here.

WEST - OWGP

Similar to OWES but UK-wide and provides longer support, usually up to 10 days.

F4OR - OWGP

Aims to support UK companies to get ready to bid for work in the offshore renewable sector.

Sharing in Growth – OWGP

Fully funded business transformation programme lasting 7 to 9 months.

Grant programmes

There are a variety of grant funding programmes for offshore wind supply chain companies from the OWGP and the government.

Manufacturing Facility Support Programme – OWGP

Up to £ 500k, focused on funding early-stage development activities to build the investment case.

Innovation Grants – OWGP

£ 25k to 200k grants for specific innovation calls.

Development Grants – OWGP

£ 50k to 500k to increase capacity and competitiveness in the OSW supply chain.

FLOWMIS - DESNZ

A competitive investment scheme awarding port funding up to £ 160 million in grants.

Clusters

There are 8 UK offshore wind regional clusters representing supply chain businesses. There are two in Scotland:

- **Forth & Tay cluster**
- **DeepWind cluster**

There is an ongoing effort to combine these into a single Scottish cluster.

Clusters in the UK are not centrally managed and tend to lack coordination which seems to have led to duplication of efforts on multiple occasions.

Accelerators

Accelerators help companies that are innovating to address key industry issues.

TechX Accelerator – Net Zero Technology Centre

A 18-week programme for 10 innovative clean energy start-ups with potential to accelerate the transition to net zero.

OREC – National Launch Academy

A 7-to-9-month programme for 10 companies providing support including legal advice, IP support and input to investor pitch decks.

Developer commitments

There have been multiple attempts to secure commitments from developers to develop the Scottish and UK OSW supply chain.

Supply Chain Development Statement

As part of their ScotWind lease bid, developers made a binding commitment to the Scottish supply chain. However, the enforcement mechanism is too weak to actually ensure developers deliver.

Sector deal

In 2019, the deal between industry and government committed to 60% UK content by 2030.

SIM – Strategic Investment Model

Aims to enable developer collaboration to invest in the supply chain.

Investment programmes

There are many different investment pots in Scotland, some of which do not have a clear route to allocation, and the landscape is rapidly evolving.

SNIB: Scottish National Investment Bank is expecting to invest £ 500m in the Scottish OSW supply chain.

NWF: National Wealth Fund (used to be the UK Investment Bank) aims to mobilise billions of pounds of investment in the UK's world-leading clean energy and growth industries.

IGF: Industrial Growth Fund which is expected to be established as part of the Industrial Growth Plan.

Supply chain accelerator: A £50m fund to develop the local supply chain for offshore wind.

These are the most relevant to InterTradeIreland

* This list is non-exhaustive as there are other support mechanisms which are not offshore wind specific, and novel mechanisms that are still in development such as the Clean Industry Bonus and GB Energy

Expert support & business transformation programmes

OWES - Scottish Enterprise

2016 to 2022
Companies supported: 350
Cost: Under £ 5k per company
Impact: £ 2.9 million in GVA

Scottish Enterprise's Offshore Wind Expert Support Service ran in various guises for around a decade, following its launch in May 2010. The service was initially developed in response to Scottish Territorial Wind and UK Round 3 offshore wind leasing rounds, with the aim of helping the Scottish supply chain respond to the contract opportunities resultant from the projects leased via the rounds.
The service is target at companies with the potential to diversify into the offshore wind sector, offering them access to free (SE fully funded) one-to-one advice and guidance delivered by specialist consultants. The consultants work with each company to help them address specific needs, including advice on supply chain positioning; company capability assessment; product/service suitability assessment; and signposting/contacts.
As a low-cost, short-term intervention, Expert Support was designed to help companies to understand whether offshore wind represented an opportunity for their business and how their existing products/services may be adapted for the sector, before committing to any significant business transformation activity and/or a more in-depth transformation programme such as Fit 4 Offshore Renewables.

Recommendation:
Providing a low-cost route to explore the offshore wind market can open up opportunities that SMEs may not have been able to afford to explore themselves. However, OWES only allowed a few days per companies which was not sufficient when there was a significant opportunity to explore.

Wind Expert Support Toolkit (WEST) - OWGP

2021 to present
Companies supported: 200+
Cost: Less than £10k per company

WEST is a low intensity intervention within the OWGP's business transformation programme and aims to support growth of supply chain companies entering or already embedded in the offshore wind sector.

WEST is a short-term foundation support activity that will include:
- an assessment of a company's needs
- development of a plan to address company needs
- bespoke and targeted advice and support
- recommendations for next steps and action plans

Recommendation:
The WEST programme built on the learnings from OWES and provided more days of support (usually up to 10 days) from consultants. Ensuring the support available is tailored and flexible enough to explore any significant opportunities is important to ensure that impact is achieved. The feedback and impact of the programme can be seen in the case studies.

Fit for Offshore Renewables (F4OR) - OWGP

2022 to present
Companies supported: 10 to 20 per year
Cost:

The F4OR Programme is a medium intensity programme that supports ambitious companies who want to get ready to bid for work in the offshore wind sector. The national programme supports companies from across the UK through a rigorous 12-18 month programme focusing on improving business operations and sector competence.

Recommendation:
SMEs often struggle with understanding the tendering requirements and contracting mechanisms in offshore wind, and this can be a significant barrier to entry which the F4OR programme aims to address.

Sharing in Growth (SiG) Offshore Wind Programme

2020 to present - has existed in other sectors since 2012
Companies supported: Less than 5 per year
Cost: £ 150k per company

Established in 2012, Sharing in Growth is an award winning organisation that has secured over £5bn of contracts to companies in Aerospace, Civil Nuclear and associated sectors, accelerating the companies' growth beyond their peers. The approach is to work closely with the leadership team, combining Sharing in Growth's benchmark analysis with the companies' strategy to define key business challenges. This results in a wholly bespoke set of intervention 'blocks' with their specific targets.

Recommendation:
Collaborating with and learning best practice from other sectors has allowed the offshore wind industry to scale up its interventions across the sector and build on the lessons learnt.

Grant programmes

Manufacturing Facility Support Programme – OWGP

2024 to present
Companies supported: 4 or more
Cost: Up to £ 500k per company with £ 2 million budget total

The Manufacturing Facility Support Programme (MFSP) aims to provide grants to UK businesses seeking to either build new manufacturing facilities or significantly expand existing manufacturing facilities to increase UK offshore wind manufacturing capacity and capability. MFSP Grants (up to £500k) will fund pre-investment activities that are critical to unlocking capital investment in UK manufacturing facilities. These facilities should make key components, equipment and systems required for the offshore wind sector.

The MFSP aims to increase UK offshore wind manufacturing capability and capacity by:

1. Funding early-stage (pre-investment) development activities for Projects
2. Delivering bankable Projects that are ready for capital investment
3. Aligning with the industry's "make", "nurture to make" and "protect" strategies and priority focus areas.

The MFSP intends to fund and de-risk the early-stage development activities required to build the investment case and secure capital investment. After completing the MFSP, Projects are expected to unlock a minimum of:

- £5 million in capital investment within 2 years, and
- 20 new UK jobs within 5 years, and
- £5 million in annual revenue within 5 years

Successful companies should be able to demonstrate growth and impact by 2030.

Innovation grants – OWGP

2023 to present
Companies supported: 15 in first round
Cost: £ 25 to 200k per company

The purpose of the Innovation Grant is to fund projects focused on targeting Future Cables and Electrical Systems and Next Generation Installation and O&M Technologies within the UK offshore wind sector and ultimately develop new products and services. The call is open to a wide range of proposals across the existing supply chain and beyond, to fund projects that will overcome challenges associated with the innovation priority areas identified by industry. The call is targeted to address key challenges in the UK offshore wind supply chain, with projects that will:

1. Address offshore wind innovation priorities as identified by industry
2. Lead to an increase in UK jobs, turnover, intellectual property, and exports in the offshore wind sector

Companies are required to contribute at least 50% of the total project budget.

Development grants – OWGP

2023 to present
Companies supported:
Cost: £50 to 500k per company

The purpose of the Development Grants is to help UK companies to improve their competitiveness or increase capability to enable a step-change in their growth. The call is open to a wide range of proposals across the existing supply chain and beyond, to fund projects that will:

1. Unlock growth in high value UK offshore wind supply chain areas identified by industry
2. Lead to an increase in UK jobs, turnover, intellectual property, and exports in the offshore wind sector.

This covers investment in new equipment and facilities as well as the development and implementation of new processes.

FLOWMIS – DESNZ

2023
Companies supported: 2 ports
Cost: £ 160 million

The Floating Offshore Wind Manufacturing Investment Scheme (FLOWMIS) aims to distribute funding to support critical port infrastructure that will enable the delivery of floating offshore wind. The aims of the scheme are:

1. enabling the delivery of our 5GW 2030 deployment ambition by securing the additional capacity necessary to scale up and accelerate floating offshore wind deployment in the UK;
2. increasing capability in the UK floating offshore wind supply chain, driving cost reduction and the commercialisation of floating offshore wind technology;
3. delivering industrial growth and associated regional economic and social benefits (e.g., quality jobs and increased GVA); and
4. accelerating towards our target to achieve net zero by 2050.

Recommendation:
InterTradeIreland may not be well positioned to offer these grants but providing signposting and potentially funding application support could be valuable both sides of the border.

OWGP impact

Offshore Wind Growth Partnership

The Offshore Wind Growth Partnership (OWGP) is one of the key organisations in delivering support to the offshore wind supply chain in the UK. The OWGP is an independent, not-for profit organisation whose core funding is provided by private developers, represented through OWIC (Offshore Wind Industry Council).

The OWGP was established as part of the sector deal in 2019 and aims to:

- Support growth of the UK offshore wind supply chain
- Deliver increased supply chain productivity, compeititveness and export capability
- Facilitate innovation and IP development
- Encourage UK based businesses with transferable capabilities to enter the offshore wind sector
- Promote greater collaboration in the sector within the UK and worldwide

Providing a coordinated set of support schemes and grant funding mechanisms targeting specific barriers to UK supply has been fundamental to the success of the OWGP. This has success led to the OWGP being chosen as the delivery body for the UK's Industrial Growth Plan.

Recommendation:
Providing a clear point of contact and access to a variety of support schemes and grants that can be tailored to a specific company's needs can enable the successful market entry and growth of many companies.

Over
£20m
funding awarded to UK companies

292
projects supported

1108
newly created jobs in offshore wind

Over
£65m
contracts won and retained in offshore wind by supported businesses

"The Sharing in Growth (SiG) programme has helped us analyse and optimise our supply chain and manufacturing processes. Through the programme we have developed a technology roadmap aimed at bringing key manufacturing steps in-house. As a result, our turnover has increased by 10%, profitability has improved, and we have been able to offer a wider range of capabilities specific to the needs of the sector. We are hugely positive about the impact the programme has had on our business. We can see tangible improvements and would definitely recommend it to other businesses wanting to solidify their place in the sector."

STEVE ADAMS, Managing Director, Hutchinson Engineering

"Since working with OWGP on the WEST programme Exo has achieved significant traction in the offshore wind industry. Having gained a solid understanding off the industry through the WEST programme, Exo has gone on to lead projects in the sector with the Living Windfarms Project with further OWGP support. Thanks to this, Exo has been able to bring a suite of Nature Inclusive scour protection systems from concept stage to commercialisation."

WILLIAM COULET MSC, Managing Director, Exo Engineering

"This appointment [as the IGP delivery body] reflects the success OWGP and OWIC have achieved by working together to support firms across the UK to grow, innovate and win work in offshore wind. We look forward to this next phase of work to implement the Growth Plan and secure new investment in the UK supply chain."

CLARK MACFARLANE, OWIC Supply Chain Vice-Chair

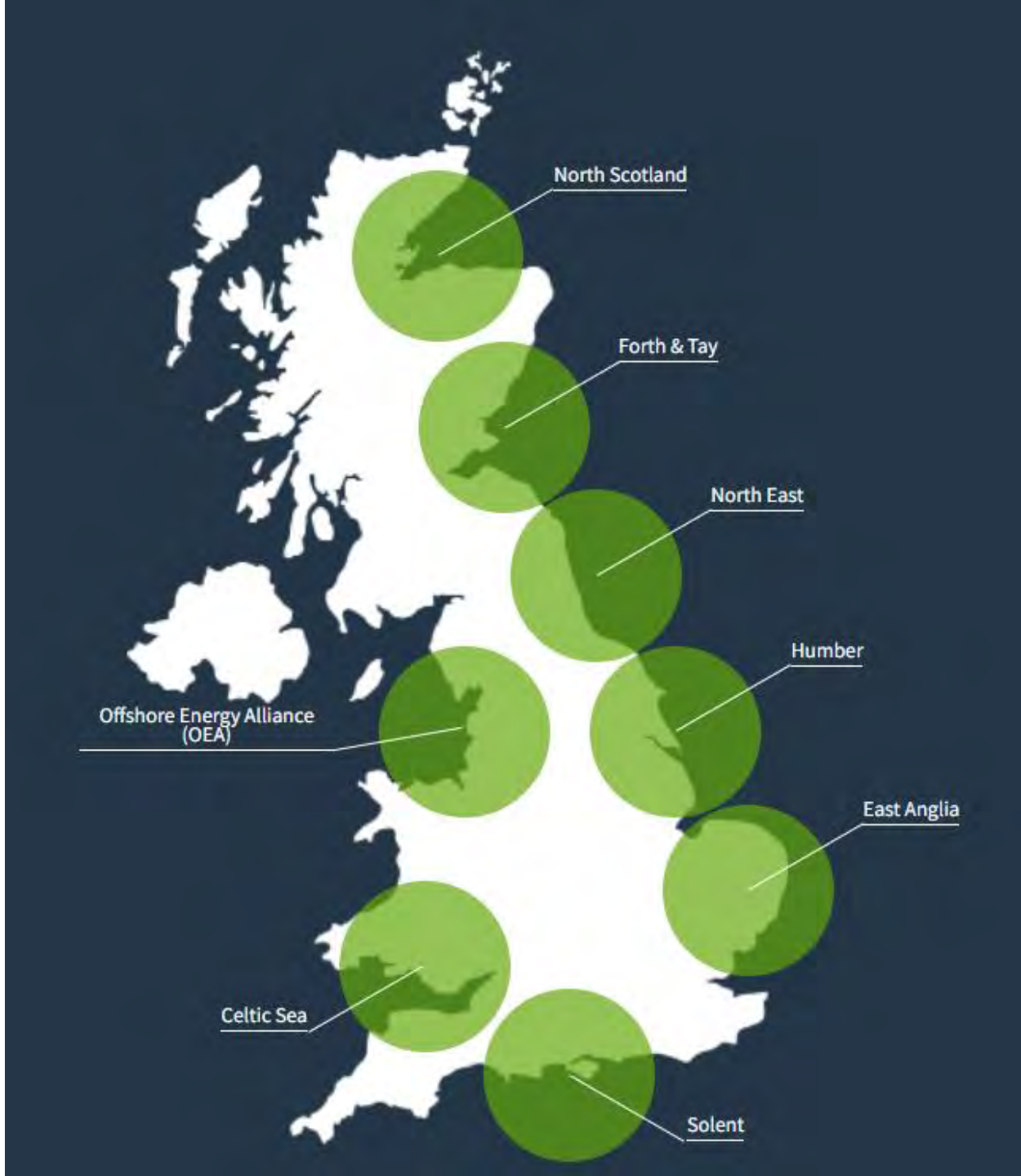
Clusters

The UK has 8 geographical clusters that aim to pull together and support the local offshore wind supply chain. They have generally lacked any significant coordination which has led to duplication of effort, some confusion for supply chain companies and varying support from each cluster. For example, most clusters have a register of supply chain companies that any company can be added to on request instead of a national approach.

The two Scottish clusters are meant to be uniting into a single Scottish cluster; however, this has faced some resistance and has yet to be finalised. It is also notable that there is no offshore wind cluster in Northern Ireland, although NIMO acts as the cluster for the maritime industry.

Recommendation:
Ensuring good coordination between clusters can avoid the duplication of efforts and help make the system easier to navigate for supply chain companies. In Ireland, the "hub and spoke" model for clusters is intended to be implemented to improve coordination and avoid the issues faced in the UK. There could be a role for InterTradeIreland in working towards an all-island model from cluster collaboration.

Celtic Sea	CSC – Celtic Sea Supply Chain Cluster (celticseacluster.com)
Solent	The Solent Cluster | Working towards a lower carbon future
East Anglia	EastWind – Offshore Cluster (ewoc.co.uk)
Humber	The Humber Offshore Wind Cluster
North East	www.energicoast.co.uk
Forth & Tay	Forth and Tay Offshore | Powering Scotland's East Coast
North Scotland	DeepWind offshore wind cluster | Offshore Wind Scotland
OEA	Home | Offshore Energy Cluster | - The Offshore Energy Alliance



Conclusions & takeaways for ITI

There are plenty of lessons to learn from the various supply chain development initiatives in the UK and Scotland

1. **Expert support works** – The OWES programme by Scottish Enterprise in the past, and now the OWGP support programmes have robust evidence of impact in bringing more UK companies into the offshore wind supply chain. Providing companies with a cascade of tailored support programmes from an initial light touch expert support through to business transformation and grant programmes can enable market entry across the supply chain.

2. **No need to reinvent the wheel** – Many of the schemes listed are UK-wide and apply to Northern Ireland, but there have been many learnings in Scotland about how best to support the development of the local supply chain, including some high-profile failures like BiFab. Northern Ireland can coordinate with existing UK schemes; and Ireland should ensure it learns the lessons and best practice from Scottish and UK schemes to avoid repeating past mistakes.

3. **Clusters benefit from coordination** – The move to unify the Scottish clusters, and the variation in quality of support in UK clusters is in part due to a lack of coordination. Enabling cross-border collaboration between NIMO and the Irish offshore wind clusters could be a role for InterTradeIreland.

4. **The largest government funding has been for ports –** In the UK, £160 million was allocated through FLOWMIS to two ports, compared to most other government funds and investments being under £1 million per company, although the Scottish government's failed BiFab bailout cost close to £52 million.

5. **Leverage is required to get developers to invest in the supply chain –** Supply chain investments need to occur before offshore wind projects have reached FID, therefore developers are unlikely to invest in supply chain projects unless there is a strong incentive, penalty or other reason to push them to do so.

6. **SMEs often lack the time and capability to navigate the funding landscape and write compelling applications –** There are many routes to funding in the UK and SMEs rarely have the resource or the capability to work it all out. InterTradeIreland could provide support navigating these complexities and applying for funding both sides of the border.

4

Port investment & growth centres

Thinking about clusters

Clusters, hubs, centres – beyond the name, what makes them effective

- Clusters can help businesses grow and are a tool used to bring together businesses in renewables / net zero sectors. Geographical clusters (e.g Aberdeen for oil and gas) can help for mutual support such as sales, training, technology development, marketing, contracting.
- However, the key growth drivers for scaling enterprises, for attracting investment and for growing SMEs needs something more than geography, e.g. a hub business, an expertise focus, sufficient scale to be commercially relevant.
- Offshore wind for example at the service end has some things in common, but there are many sub areas e.g. composites, marine technology, software development that don't necessarily gain from a geographical cluster but would be better suited to an expertise cluster – or growth hub.
- Growing SMEs requires a sizeable, sustainable market, buyers to gain sales pipeline, availability of personnel with the right skills, access to other companies to deliver solutions.

We will explore 3 case studies around the North Sea basin & look at the lessons learned

1. Montrose
2. Blyth
3. Esbjerg

Growth centre examples

- Hub company (aerospace expertise around Rolls Royce)
- Hub piece of infrastructure (deep water port e.g. Rotterdam)
- Innovation / research hub (spin offs from Stanford/ CalTech helping supply Silicon Valley with start ups)

Shared elements of growth centres

- ✓ Vision of where you could go
- ✓ Clear understanding of what you have right now
- ✓ Understanding of the commercial needs, now and in the future of more than one sector
- ✓ Commercial capability and remit to look beyond narrow year on year P and L
- ✓ Space to allow growth
- ✓ Core company
- ✓ Benign policy around it

Port of Montrose & Port of Blyth

Port of Montrose, Scotland

Trust port with energy, transport & logistics working in cargo, oil & gas, decom. As well as renewables.

Features –

- Port has multiple revenue streams
- Port has established itself as the offshore mooring port for the UK, berthing of anchor handlers (AHTS) as well as storing chain, anchors, fibre ropes, wire ropes and mooring "jewellery".
- Mooring expertise based here is working globally
- It stores 90% of the UK's offshore mooring chain
- Plus has a wider O&M service offer: home to O&M for Seagreen & Inch Cape OSW farms

Lessons learned –

- **Understood** commercial relevance to market.
- **Core client:** Attracted a core client (Intermoor), that in turn made the port attractive for other mooring expertise (FMS)
- **More than one large market:** Mooring expertise relevant to more than one sector e.g. oil and gas, as well as FLOW
- **Attracted other aligned business:** Having established expertise, extended with long term clients e.g O&M bases
- **Provided space:** Commercial park available for them

Port of Blyth, England

Trust port that began as coal exporting hub, transitioning through OSW assembly through O&M to now become a specialised support port focused on power cable expertise

Features –

- First OSW farm off Blyth in the UK
- Attracted hub companies e.g. Osbit, and made itself relevant to OSW sector as a focal point for the North East cable expertise cluster e.g. SMD, JDR, Cathie etc. including cable storage
- Now supported by a new JDR power cable factory
- Port is home for ORE Catapult innovation and testing centre, which adds to its relevance.

Lessons learned –

- **Core client:** Important to have a hub company / set of companies
- **Core expertise:** Focused on support for OSW in power cables – an important hub for a wider power cable expertise cluster in the North East
- **Reinvention:** Constant reinvention as the commercial needs change and acting early / proactively / flexibly
- **Space:** Providing space to adapt to different needs
- **Attractive to other companies:** Growing the cluster of companies

Recommendations

1. Have a focused area based on a needed and sustainable area of expertise relevant to a wider market
2. Constant flexibility is important, providing space and revinenting the commercial proposition
3. Move early, proactively and responding to market needs
4. Attract a hub company that can access a wider market / markets from the location
5. Build expertise systematically around that hub

Port of Esbjerg, Denmark

Background –

- A public self-governing port owned by the Municipality of Esbjerg.
- It was Denmark's main fishing port, now supporting multiple sectors e.g. offshore wind, freight, cargo and roro, oil and gas, & marine.
- It features 4.5 million m2 and 10 km of quayside
- It is Europe's leading port for shipping offshore wind turbines and has supported 23.8 GW of projects (over 55 OSW projects)
- It is a base for over 200 energy service providers

Features –

- It has regular income for dredging, able to freely use the dredged material for building out port space & quayside. This has provided a cheap way to extend the port
- It is a major hub for leading turbine companies e.g. Siemens & Vestas
- Economic success is measured in terms of regional growth & therefore it can afford to develop businesses, rather than focus on a return on quayside revenue over the sort term.

Lessons learned –

- Regular income from dredging & free material helped prime the port
- Took advantage as early mover to build out as the developers, turbine companies & industry required, offering cheap and deep quayside as well as a large flexible space, in advance of other North Sea ports
- Port space build-out made offering cheap land possible thereby able to attract businesses – growing a cluster that in turn made it more useful as a port / industrial location for the major clients (a self-reinforcing virtuous circle).
- Not needing to optimise income on each transaction, it can look at what it adds to the region.

Recommendations

1. Provide reliable, fixed income if possible & add space cheaply, simply and flexibly
2. Take early move advantage, and make sure that there is a sizeable market for the scale of the operation, that will provide a sales pipeline & pay off the investment
3. Continually adapt e.g. add space, quayside, facilities, services to make the offer relevant for the clients
4. Grow around hub clients that are successful and also able to access multiple clients / markets
5. Pre-invest in facilities ahead of contracts - as developers only have a 3 year window where infrastructure risk needs to be already mitigated
6. Measure the overall effect, rather than maximising immediate quayside income, as the wider cluster will become self-reinforcing, and an income multiplier. It will take time to build, so metrics must be adjusted

Conclusions & takeaways for ITI

Building a growth centre around a hub company and port

1. **Attract a hub company:** Nurture hub companies and grow around them
2. **Know the wider commercial situation:** Ideally there needs to be a larger market with more than one sector for the hub company / companies to find the growth centre relevant.
3. **Regular income for the hub company** is required that allows it the financial security to develop, so that provides certainty of revenue, employment, investment repayment and the development of skilled staff
4. **Reinvent the commercial offer:** Remorseless reinvention is necessary to constantly ensure that the centre maintains commercial relevance to its hub companies and core markets rather than hanging on to a legacy market / revenue / identity etc.
5. **Pre-invest to make the centre as relevant as possible.** Opportunities come in waves e.g. oil and gas, OSW; there has to be a balance between pre-investment and flexibility beyond a 3-year horizon.
6. **Be flexible and provide lots of space**, as space is flexible: provide it more cheaply and easily, as this allows adaptation
7. **Change is inevitable.** Seek to have commercial revenue from more than one sector as policies change, finance changes, technology changes, markets change and businesses change. Look for sectors that will be sustainable.
8. **Measure and reward the desired effect.** Measure and reward on the regional growth metric, rather than on a narrow location / period metric, as growth centres / clusters are systems once primed.
9. **Align all commercial interests to the focus of the centre** rather than have different agencies with different objectives e.g. Esbjerg has a commercial right to the material it dredges, so the port management & regional growth is all aligned.
10. **Provide flexible space for different sorts of businesses**, that allow them to grow without having to take onerous lease / other commercial commitments with access to skills / personnel.

5

USA state collaboration models*

*This section has been written at the end of the Biden/Harris administration; the policy environment at the federal level will change with the incoming Trump administration however at a State level there is expected to be continued support for offshore wind.

US market context

Rapid deployment ramp, federal versus state control & emerging regional collaborations

With only 174MW of operational offshore wind capacity, the U.S is planning one of the steepest deployment ramps globally, targeting **30GW by 2030** and **110GW by 2050**. With a roadmap of 117GW already identified across 13 states, 47GW of capacity has already been identified in state legislative planning.

With fixed wind most likely deployed on the Eastern Sea Board and floating wind on Western Sea Board, the N.E. states are leading the U.S. charge, with confirmed offtake agreements in place with developers totaling 15.3GW across 8 states.

With financial support and regulatory control managed at a federal level, responsibility for deploying OSW resides at a state level.

Federal – The Inflation Reduction Act ('22) will invest $396bn, providing tax incentives to developers for stimulating the domestic supply chain and enabling the manufacture of components. The Investment Tax Credit and Production Tax Credit elements of IRA drive wage and apprenticeship commitments and deliver domestic content bonuses if 100% of steel and iron components & 20% of manufactured products are from US. The Advanced Manufacturing Credit rebates 10% for US-built vessel costs (a solution for the Jones Act cabotage restrictions in U.S.).

State - the N.E. states have realised that collaborating together, whilst respecting 'soft' competition realities, is proving to be the best way to realise economies of scale regionally.

State	Planning Target	Mandated Target	
	MW	MW	Year
California	25,000	-	-
Connecticut	2,304	2,304	2030
Delaware	1,200	1,200	2050
Louisiana	5,000	-	-
Maine	3,000	3,000	2040
Maryland	8,500	8,500	2031
Massachusetts	23,000	5,600	2027
New Jersey	11,000	11,000	2040
New York	20,000	9,000	2035
North Carolina	8,000	-	-
Oregon	3,000	-	-
Rhode Island	1,630	1,630	2030
Virginia	5,200	5,200	2034
Total	116,834	47,434	

Agreed Offtakes ~ 15.3GW	
New Jersey	5.3 GW
Massachusetts	3.8 GW
Virginia	2.6 GW
New York	1.9 GW
Maryland	1.1 GW
Rhode Island	0.6 GW
Conneticut	0.3 GW
Maine	0.16 GW

Collaboration priorities

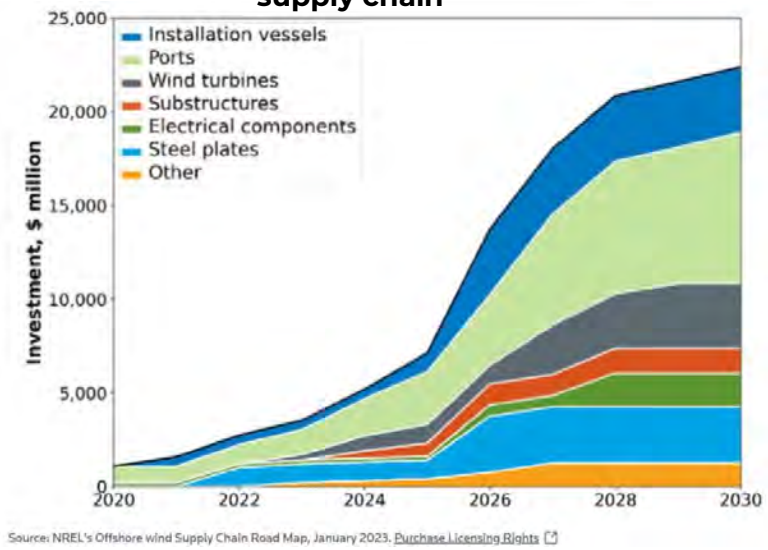
3 priority areas for collaboration

In order to deliver the ambitious offshore wind targets, set at both the federal and state level, there are 3 priority areas for collaboration:

- Supply chain and skills,
- Joint procurement of power,
- Transmission infrastructure investment.

Each of these areas will be discussed in depth in the following slides.

Investment required in the US offshore wind supply chain



Source: NREL's Offshore wind Supply Chain Road Map, January 2023. Purchase Licensing Rights

Supply Chain & Skills Focus

The National Renewable Energy Laboratory (NREL) - a federal DoE entity – published a national supply chain roadmap in 2023 (1) under the premise that improved regional collaboration that engages multiple states could lead to a more resilient supply chain with broadly distributed benefits.

With an estimated 34 manufacturing facilities required, NREL estimate that $22.4bn of investment is likely required across these facilities, ports and U.S. flagged vessels (see graph bottom left).

NREL identified the opportunity for regional collaboration to better coordinate resources and strategies between states to develop a more effective supply chain which avoided state capability duplication, delivered economies of scale and developed unified workforce standards nationally.

The three most progressive collaborative initiatives are explored in more depth on the next slides:

- Federal-State Offshore Wind Implementation Partnership (9 states expanded to 11)
- SMART POWER (Maryland, Virginia & N Carolina)
- Shared Vision (New Jersey & New York)

Joint Procurement Focus

Three N.E. U.S. states – Massachusetts, Rhode Island and Connecticut - announced the first multi-state collaboration to jointly procure offshore wind power in October 2023.

The rationale is that this approach gives the states increased bargaining power through scale and allows greater flexibility for participants to select a single or multi-state proposal and split the offtake from a single project as best suits.

Transmission Focus

The federal DoE Grid Deployment Office is proactively identifying immediate actions needed to connect the first generation of Atlantic offshore wind projects to the grid, as well as exploring longer-term efforts to increase transmission over the next several decades as offshore wind expands.

N.E. U.S. states are already taking a collaborative approach, realising the long-term economic and environmental benefits of offshore infrastructure.

(1) A Supply Chain Road Map for Offshore Wind Energy in the United States (nrel.gov)

Deep dive: Supply Chain Collaboration

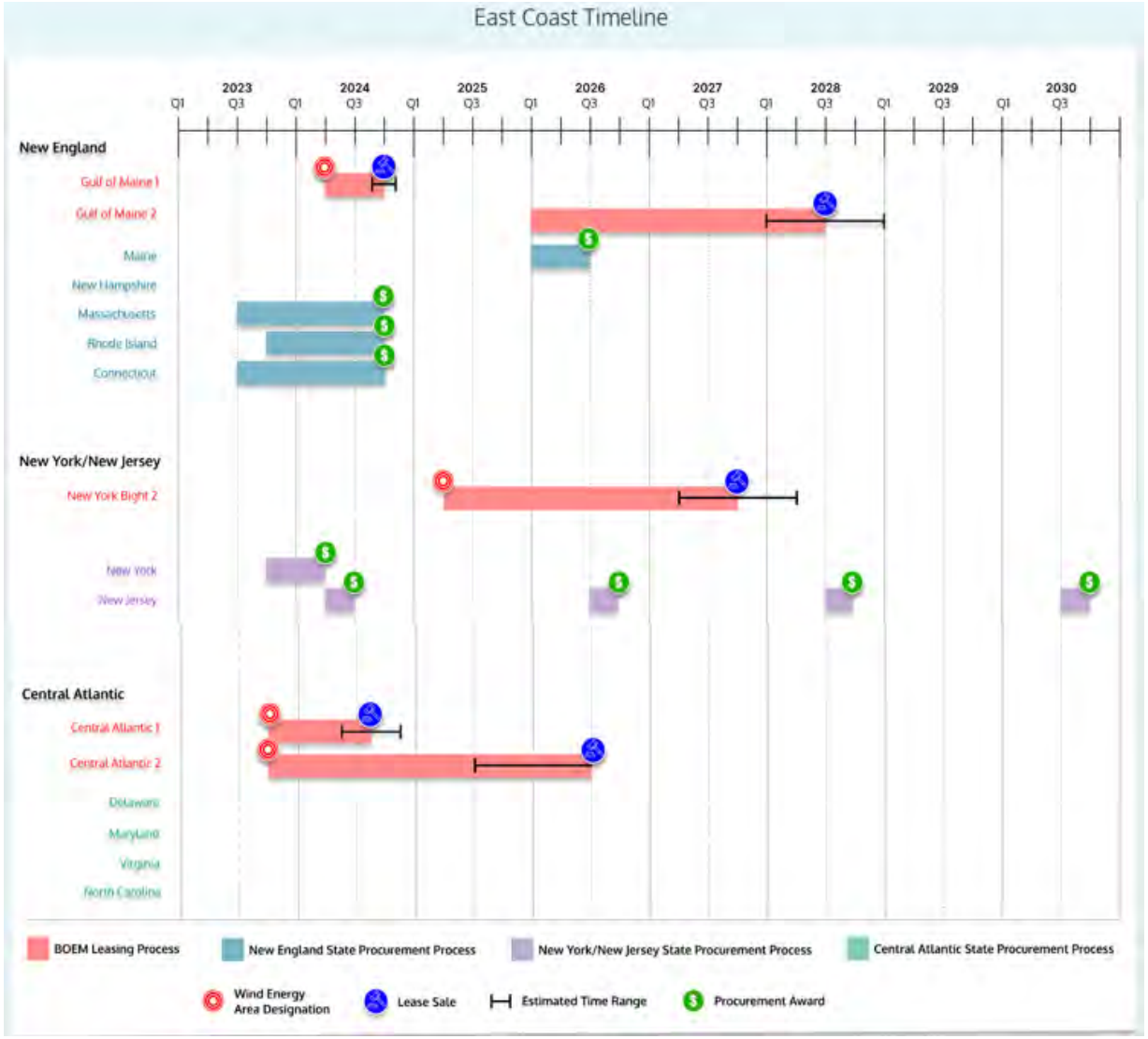
Federal-State Offshore Implementation Partnership (2022) ~ 1

Launched at a federal level (1), this initiative brings together four federal bodies, and nine eastern state (Connecticut, Maine, Maryland, New Hampshire, New Jersey, New York and Rhode Island) and aims to strengthen collaboration on offshore wind supply chain development. The initiative seeks to expand manufacturing facilities, port infrastructure and workforce capability in a coordinated and sustainable manner, allowing sub-regional development whilst harnessing inter-state strengths, and filling high priority national supply gaps. Federal alignment is intended to focus technical support and enable a shared procurement and leasing timetable.

A memorandum of understanding was designed to facilitate inter-state development of U.S. vessel and steel capability whilst creating a sustainable workforce. By aligning demand via a consolidated procurement roadmap (East Coast Timeline), the Supply Chain Working Group can coordinate investment around supply chain and workforce whilst centralising resource visibility via a publicly available regional supply chain capability and opportunity repository including certification and qualification requirements.

The collaboration arrangement has delivered a number of tangible benefits:

- Regional supply chain clusters allows states to pool resources and align goals
- The federal government / state-sponsored working group – if funded appropriately – can fulfil the coordination role extremely effectively
- Coordinated, flexible and transparent local content requirements across multiple geographies catalyse domestic supply chains, with two specific examples:
  1. hierarchical domestic content in offtake agreements can rank state investment, followed by regional adherence up to national delivery, ensuring coordinated adherence
  2. local content trading – similar to carbon trading – can deliver economy of scale local benefit delivery.



(1) FACT SHEET: Biden-Harris Administration Advances Offshore Wind Transmission, Strengthens Regional Supply Chain Buildout, and Drives Innovation | The White House

Deep dive: Supply Chain Collaboration

Federal-State Offshore Implementation Partnership (2022) ~ 2

The Federal-State initiative also provides a framework under which sub-regional efforts such as Smart Power and Shared Vision can be enabled. Coordinating up into a larger state initiative is particularly effective in streamlining federal and state regulatory processes, improving long-term planning, delivering pipeline certainty, ensuring inter-dependent logic in domestic supply chain capability and improving best practice sharing.

It is anticipated that participating states will benefit from: (i) consistency in wages, training and safety standards (ii) standardising baseline regulatory and permitting environments for supply chain activities, where location-specific regulations can be modified from these baselines instead of being developed completely independently to minimize transaction costs when conducting activities in different states (iii) creation of regional supply chain investment based on inherent state strengths. The key learning is that a multi-region collaboration must have an empowered independent working group working for all members.

The collaborative effort has already delivered a number of benefits including optimized N.E. port functionality mapping, significant commitment to N.E. manufacturing establishment across a range of offshore wind components and stimulated investment across ports, vessels, transmission and the sub-tier supply chain.

Deep dive: Supply Chain Collaboration

SMART POWER – Maryland, Virginia & N Carolina (2020)

The Southeast and Mid-Atlantic Regional Transformative Partnership for Offshore Wind Energy Resource (1) collaboration aims to cooperatively promote, develop, and expand offshore wind energy generation and the accompanying industry supply chain and workforce across the three states. The group meet quarterly to discuss issues related to supply chain, regulations, regional assets, regional promotion, and best practices in offshore wind development. In concert with dedicated federal initiatives, it provides a platform for states to build supply chains collaboratively instead of competitively. The stated goals are:

The collaboration works across a number of areas, which are complementary to supply chain development:

• **Regional Promotion** – consolidated representation facilitating larger bargaining power with stakeholders and prospective developers.

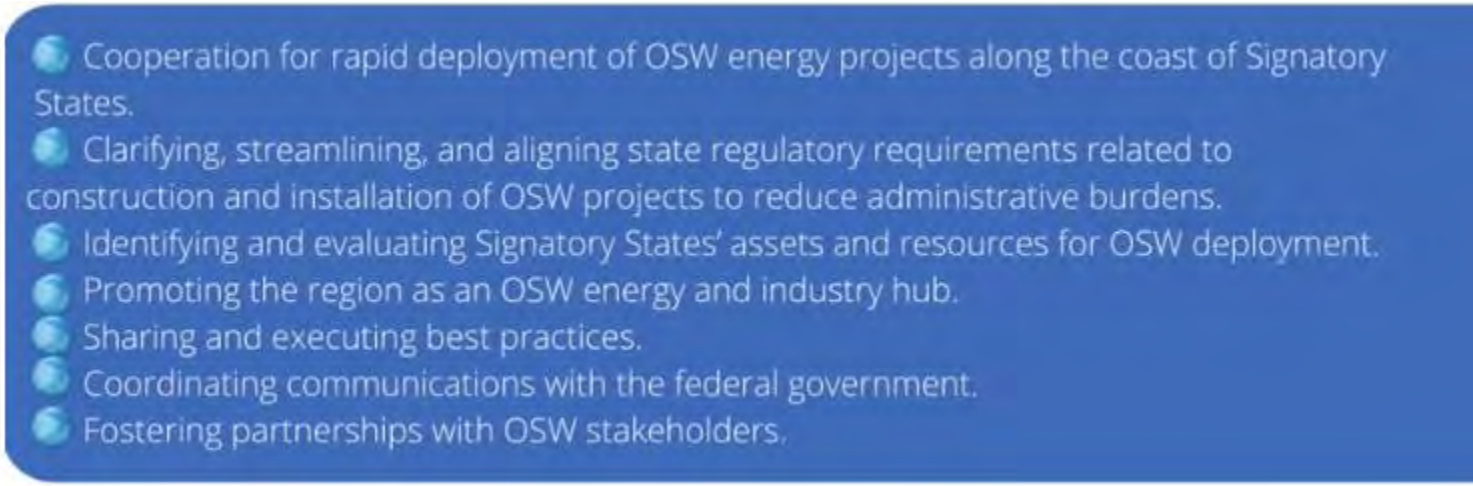
• **Workforce Development** – increased stakeholder involvement in workforce growth and workforce fluidity for specialised skills sharing. Improved training needs visibility resulting in better vocational training program development across labour unions, colleges and schools.

• **Supply Chain Development** - a regional supply chain among OEMs, Tier 1 and Tier 2 suppliers leads to lower costs and better sub-tier growth and diversification.

• **Research Efforts -** Coordinates regional research efforts and fills regional gaps in the OSW supply chain and workforce.

• **Federal Coordination -** Facilitates federal relations and coordination efforts especially as it pertains to the Central Atlantic Renewable Energy Task Force and OSW leasing areas off the coasts of North Carolina, Virginia, Maryland.

An added benefit of a larger collaboration is that it has the scale to commission pieces of work that deliver meaningful future roadmap strategies. The National Offshore Wind Research & Development Consortium undertook a region-specific offshore wind workforce assessment and supply chain project (2). With a number of specific areas of study (shown in the next slide), this project will identify regional solutions to nationally identified supply chain gaps by highlighting the region's current capabilities and future supply chain investment potential (report due to be published in early 2025).



(1) SmartPower Factsheet (2) 136_SMART-POWER-Press-Release_clean.pdf

Deep dive: Supply Chain Collaboration

SMART POWER – Maryland, Virginia & N Carolina (2020)

The SMART POWER initiative between Maryland, Virginia and North Carolina provides a blueprint for cross-state collaboration focused on regional offshore wind growth, by assessing and developing infrastructure, supply chain and skills at a regional level.

Operationalize the MOU – Key Needs

- Centralized Collaboration Taskforce
  - Implement and coordinate the taskforce and regional activities
- Establish metrics and timelines for taskforce success
- Form taskforce of key stakeholders
- Central taskforce organizer should be on the staff level (authority)
- Identify and leverage existing stakeholder infrastructures (such as in academics and at ports) for both the creation of the overall MOU taskforce but also for specific topic areas and rollout of actions.
- Share best state practices

Recommended Initial Strategic Initiatives

Cross-State Workforce Development Focus

- Cross-state workforce training
  - Identify workforce stakeholders and coordinate discussion with tri-state labor offices industry needs, and training institutions analysis
  - Envision cross state training
  - Establish inter state credit system for OSW studies
  - Incorporate requirements in the RFP
- Leverage community stakeholders and institutions committed to diversity
  - Outreach campaign to underserved regional communities
  - Identify pathways for employment
  - Innovation value proposition would leverage the existing university centres. This can be encouraged through direct funding from the states or with support from industry.

Regional Asset Analysis — Interconnection of Resources

- Assess all aspects of the supply chain and product lifecycle including:
  - Physical infrastructure
  - Existing supply chain (including adjacent industries) in OSW taxonomy
  - Workforce
- Training capability (identify the training gaps, skills that can be transferred from other programs, and pathways)
- Regulation variance by state
- Create clear GIS overview of layered regional resource map

THE MOU Strategic Initiatives MUST Have .....

Local Content Shared Mechanism - The Program

- An assessment of each states' local content requirements compared with MOU polices
- Marry gap analysis with local content sharing which would support the region
- Ensure commitment on the political level and foster regional collaboration through respective state departments
- Analyse the economic implications
- Create a simple point system for regional content sharing, with the input from economic advisors and experts
- Simplicity is the goal

Deep dive: Supply Chain Collaboration

Shared Vision – New Jersey & New York (2019)

New York and New Jersey signed an MOU with the federal Bureau of Ocean Energy Management (BOEM), to collaborate and enhance the regional domestic supply chain. The member states meet quarterly to discuss project progress, potential obstacles and further opportunities to collaborate towards the creation of a vibrant regional supply chain. Jointly, both states have set the most progressive deployment target in the U.S., targeting >16GW of capacity by 2035.

After achieving some of the highest 'strike prices' in the U.S. in early solicitation rounds, the region has been suffered a number of setbacks, with Equinor and BP terminating their contract in New York for the 2.5GW Empire Wind – citing non-viable project economics – and Orsted doing similar with the 2.2GW Ocean Wind project in New Jersey citing high inflation, rising interest rates and supply chain bottlenecks; rather than being a terminal problem, it is likely to mean a reset of the prevailing price points in the region.

The Shared Vision working group has developed a joint best practice set of principles that have:

- Ensured that no communities in either state are negatively impacted or underserved by offshore wind development
- Defined what constitutes genuine local content in order to ensure that real benefit trickles down to the regional supply chain
- Developed metrics for defining and delivering regional supply chain benefit
- Developed a joint roadmap for regional coordination and outreach
- Developed a mechanism for sharing best practice on how developers are meeting supply chain commitments and providing for underserved communities

The Shared Vision collaboration has delivered a number of positive improvements regionally:

- Bi-annual New York & New Jersey Offshore Wind Supplier Forum which connects local businesses with developers and other contracted suppliers to explore opportunities in offshore wind, helping NJ and NY businesses to build the knowledge and relationships needed for success in the growing industry (1).
- Significant port infrastructure investment – enabling private funding – in NY (I) a staging, assembly, and O&M centre at the South Brooklyn Marine Terminal (ii) regional operations and maintenance hubs at Port Jefferson and Montauk Harbor and NJ (the New Jersey Wind Port (NJWP), the first purpose-built offshore wind marshalling and manufacturing port in the U.S.
- Investment in focussed offshore wind OEM facilities to serve both states – NY prioritising towers (the nation's first offshore wind tower manufacturing facility at the Port of Albany) and NJ specialising in foundations (a monopile fabrication facility being built in Paulsboro, NJ)
- Investment in workforce development (NJ - $4m for workforce development programs at New Jersey community colleges for GWO and wind turbine technician training / NY - establishing the Wind Institute, which coordinates and advances workforce training, education, research and innovation competence).

(1) NY and NJ Collaborate to Co-Host Offshore Wind Supplier Forum - NYSERDA

Deep dive: Joint procurement

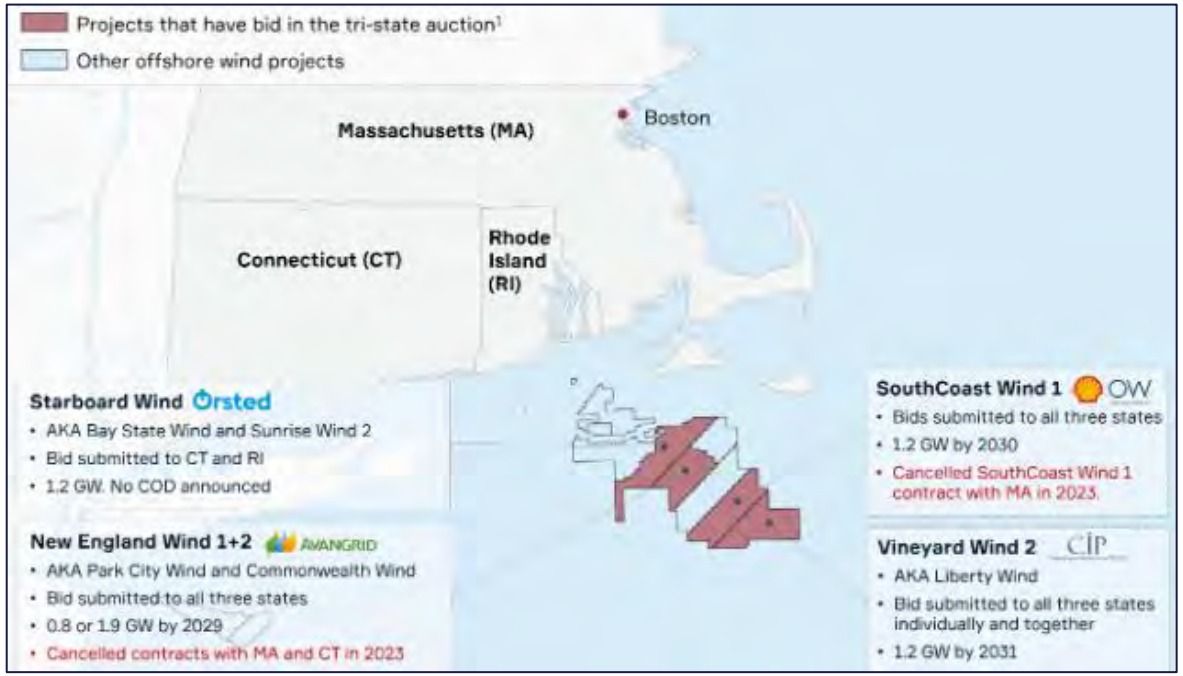
First tri-State power purchase collaboration – Greater bargaining power and offtake flexibility

Massachusetts, Rhode Island and Connecticut have shown leadership with their multi-state, 6.6GW solicitation. The three New England states signed an MOU to coordinate offshore wind procurement in March 2024. The multi-state procurement allows developers to submit multiple project bids to one or more states, through a single process and the states may offer separate offtake contracts or join forces to select proposals that would benefit more than one state.

It was announced in September 2024 that Massachusettes and Rhode Island had agreed deals totalling 2.9GW; Conntecticut has delayed a decision. Interestingly, Massachusettes agreed a 1.1GW offtake (with an additional 0.2GW going to Rhode Island) with the Ocean Wind's SouthCoast Wind project – a project which was previously cancelled by the developer in 2021 incurring a large termination fee. This joint procurement approach appears to be attractive for developers, with the risk profile reduced where multiple states are involved and it seems to indicate that development costs are more economical within the currently challenging economic environment.

This joint procurement approach can allow smaller states to achieve economically viable project capacities for developers and improve project pipeline security for the supply chain.

Overall, this collaborative approach helps to streamline the process for offshore wind investors and should lead to cost reductions from proposed projects due to economies of scale. The approach also hopes to counter project cost pressures which have seen project cancellations in other U.S. states; this solicitation has enabled investment in Massachusettes for a $300m offshore wind terminal soon to begin construction in Salem and port infrastructure expansion in New Bedford.



Deep dive: Joint transmission investment

Transmission collaboration to reduce cost and improve delivery – *Power Up New England*

The federal Atlantic Offshore Wind Transmission Plan (1) is a strategy to seize near-term and long-term offshore wind opportunities across U.S. Required to facilitate the rapid deployment of 30GW of offshore wind by 2030. A study within this initiative suggests that networked transmission benefits outweigh costs by >2:1.

Transmission collaboration is advocated under the premise that states working together is far superior to an every-state-for-itself approach. Control of the U.S. grid is extremely fractured and complicated, whilst it does require significant upfront investment and coordination effort in the short-term, inter-state collaboration will deliver considerably outcomes for the state, developers and rate payers in the long-term. Consolidated transmission planning includes many aspects, from consolidating onshore connection points or pre-building dedicated offshore wind interconnection infrastructure to connecting multiple projects together to form an offshore grid. For success, multiple states can collaborate to achieve three critical outcomes:

i. decreasing the number of costly on-land transmission upgrades

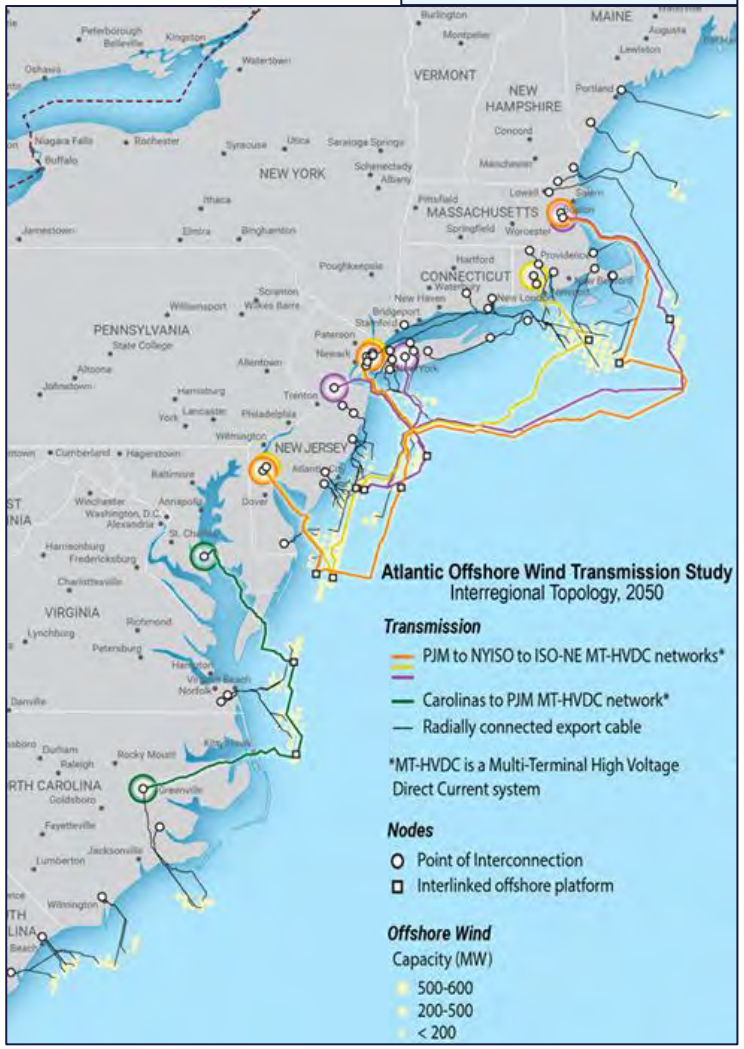
ii. building offshore infrastructure unlikely to be damaged by weather or other ocean users

iii. reduce disruption of onshore ecosystems when building new substations. Beyond the physical grid infrastructure, collaboration can improve general equipment standards, streamline permitting and improve wholesale power market governance.

Under the 'Power Up New England' plan, six N.E states (Massachusetts, Rhode Island, Connecticut, Maine, New Hampshire & Vermont) are collaborating to apply for federal funding – DoE Energy Grid Improvement Program - for new transmission that would unlock up to 4.8 GW of new offshore wind capacity, under the premise that this approach will reduce the risk and the cost of the transmission element. The states want to build new and upgraded transmission points of interconnection in Southeast Massachusetts and Southeast Connecticut, install battery storage systems to optimize delivery and build a 345kV transmission line to increase transfer capacity between New England and New York by up to 1 GW.

New York has also taken steps to ensure that future offshore wind projects could connect to a regional offshore grid - 'Meshed-ready' projects have the technical capability to connect to future offshore substations that would form the basis for a future 'meshed network', linking multiple projects together via alternating current lines in order to minimize the number of land-based interconnection points.

Potential offshore wind transmission development by 2050



(1) Atlantic Offshore wind action plan fact sheet

Conclusions & takeaways for ITI

A collaborative approach to developing offshore wind can deliver a number of benefits

1. **Collaboration avoids duplication and allows economies of scale:** The N.E. U.S. states provide strong evidence that taking a wider macro approach to supply chain development avoids capability duplication across geographically close areas, allowing offshore wind specialisms to be naturally developed by fostering a collaborative rather than competitive ethos. An All-Island approach delivers economies of scale, ensuring that bargaining power for attracting inward investment is increased.

2. **Port investment & regulatory alignment:** The Federal-State Offshore Wind Implementation Partnership collaboration suggests that an All-Island approach will deliver benefits, particularly for coordinating port infrastructure investment and task alignment. Similarly, a joint approach could help shape appropriate state involvement and help streamline regulatory processes.

3. **Learnings from the SMART POWER collaboration** suggest that an All-Island approach to offshore wind can help promote the attractiveness of the opportunity within an already congested European marketplace, contribute to a well-trained and fluid workforce and promote a progressive research and innovation effort.

4. **The Shared Vision program** provides a template that an All-Island approach could follow to ensure that benefit is delivered to underrepresented communities nation-wide and drive meaningful local content goal-setting and tracking.

5. **A joint procurement approach can deliver economy of scale improvements**; from considering the U.S., smaller jurisdictions can derive benefit from working together. Full joint procurement may be challenging for the island of Ireland, but collaborating to ensure a consistent project pipeline would be feasible.

6. **Offshore grid coordination:** Developing a consolidated offshore grid has the potential to reduce lifetime project cost and improve onshore environmental impacts. However, the legal and practical hurdles of delivering this may be insurmountable across the island of Ireland.

SME opportunity mapping

WP3

Table of contents

Document control

REVISION	A
AUTHORS	Peter Westbrooke, Alan Duncan, Paul Reynolds, Jane Harris
STATUS	Draft
CHECKER	Bruce Clements, Paul Reynolds
APPROVER	David Thomason

Version History

A	Initial version	10/01/2025

WP3: SME opportunity mapping

Purpose and context

This document is provided as the main deliverable under Work Package 3 as described in section 4.3 of proposal ITI001-P-01-A.

The aim of this report is to identify the opportunities for SMEs across the island of Ireland from the energy transition with a focus on the offshore wind sector.

The report first explains the methodology for assessing SME opportunities in offshore wind, then discusses the results of the mapping exercise. This is followed by a brief commentary on the hydrogen industry and the broader qualitative benefits from offshore wind to SMEs on the island of Ireland.

Methodology (1/2)

Four steps to assess the current strengths across the island of Ireland and identify opportunities arising in offshore wind, with a particular focus on SMEs.

1. Collate → 2. Analyse → 3. Identify → 4. Map

1. Collated a list of companies in the island of Ireland which are or have the potential to be active in the offshore wind industry

Data has been retrieved from the following sources:

- **Gael Offshore Network**
  - Marine Ireland's Gael Offshore Network provides a filtered list of companies working in offshore wind in the ROI.
- **Northern Island Maritime & Offshore**
  - NIMO (funded by InvestNI) has provided a list of companies working in offshore wind in Northern Ireland.
- **Relevant industry reports**
  - A handful of additional companies were identified from relevant industry reports, including Powering Prosperity and The Clean Revolution
- **Everoze industry experience**
  - The resulting list was reviewed, and any additional companies added based on the team's experience in the island of Ireland

In total 160 companies were identified; the complete list is given in ITI001-X-01-A. This list is not exhaustive however it is unlikely that any omissions materially affect the findings of this report.

Outputs: Database of Irish companies

2. Analysed each company to assess capability, Company Success Level and Irish footprint

The companies were mapped against Everoze's Work Breakdown Structure, a comprehensive breakdown of all contract packages required to deliver a range of different offshore wind farms. Each company was also allocated a Company Success Level (CSL), based on the criteria given below:

CSL	Criteria
1	Basic research
2	Needs formulation
3	Needs validation
4	Small scale stakeholder testing / tank testing
5	Large scale early adopter / full prototype / full scale demo project
6	Actively bidding for work packages in offshore wind
7	Proof of traction: won commercial contract in offshore wind
8	Proof of satisfaction: won 3 commercial contracts or someone buys it twice
9	Proof of scalability: Commercially successful with strong pipeline
10	Global market leader (top 3 globally)

The Irish 'footprint' of each company was assessed and assigned a value of 25%/50%/75%. This enabled targeting of companies with significant presence across the island of Ireland, that are likely to deliver packages locally rather than from overseas.

Outputs: Leading companies in the Irish offshore wind supply chain

Methodology (2/2)

Four steps to assess the current strengths across the island of Ireland and identify opportunities arising in offshore wind, with a particular focus on SMEs.

3. Identified areas of strength and opportunity in the Irish supply chain

Companies were sorted based on CSL and Irish footprint, resulting in 12 sub-sectors where there exists significant strength in the Irish supply chain. The criteria for including a company were in general:

1. CSL greater than or equal to 7 in ROI, or 6 in NI, and
2. Irish footprint of 50% or 75%

A lower CSL was included in NI due to the low number of companies at higher CSLs. Exceptions to these criteria were made as follows:

- In ROI, companies involved in onshore substation and grid connection works or anchors and moorings supply were included at lower CSL based on Everoze judgement. The lack of offshore wind projects connecting to the Irish grid means that Irish companies capable of delivering onshore packages with experience in other sectors are unlikely to have worked on offshore wind projects specifically, hence have lower CSL. Likewise, companies involved in anchor or mooring supply will not have supplied the industry due to the lack of floating offshore wind projects, however they would be capable of delivering those packages.
- NI companies with a CSL of 6 that are unique in their capability on the island of Ireland are not included, as this is deemed insufficient to be an area of strength or opportunity.
- Some companies with an Irish footprint of 25% (e.g. large engineering consultancies) are referenced, as there is uncertainty as to where a given package will be delivered from.

This analysis enables a comparison of strengths in ROI and NI, particularly where cross-border opportunities exist.

Outputs: Opportunity areas, Geographic split, Interventions

4. Mapped the value of these areas of strength and opportunity, for both bottom-fixed and floating reference projects

Two reference projects were defined, to show the potential value that could be captured for a typical fixed-bottom and large-scale floating offshore wind project. The reference projects are as follows:

Reference Project	Fixed	Floating
Installed Capacity	900 MW	1500 MW
Wind Turbine Capacity	15 MW	20 MW
Foundation Concept	Monopile	Concrete Semi-Sub
Export System	HVAC	HVDC
Operational Lifetime	30 years	25 years

Sankey diagrams of the cost breakdowns of each project were created, highlighting the packages where strengths and opportunities have been identified.

Outputs: Sankey diagrams showing potential value share (Fixed/Floating)

RESULTS

Highest CSL companies identified

Companies assessed as having a CSL (Company Success Level) score of 7 or more denoting commercial success in offshore wind to date

CSL	7	8	9	10
	Proof of traction: won commercial contract in offshore wind	Proof of satisfaction: 3 or more contract wins	Proof of scalability: commercially successful with strong pipeline	Global market leader
Republic of Ireland	• Altemar Environmental Consultants • EMR Integrated Solutions • Enerview • Europlan Engineering • Exceedence • Fehily Timoney • Hibernian Marine Systems • Irish Commercial Charter Boats • Irish Lights • Irish Sea Contractors • Kirby Engineering • Marine Specialists • Techworks Marine • VRAI	• Alpha Marine • ASL Safety • Bluewise Marine • Cathx Ocean • Eastgate Engineering • Farra Marine • Fastnet Shipping • Green Rebel • Innovision Media • Mainport • MMG Welding • Subsea Micropiles (FEED studies) • West Coast Diving	• Brightwind • Combilift • Doyle Shipping Group • Dublin Offshore Consultants • Errigal Training Centre • Galetech • Gavin and Doherty Geosolutions	• Xocean
Northern Ireland	• Fjordstrong • Copius Group • Decom Engineering • Harland and Wolff • Langan Engineering • McSherry Civil Marine • Plaswire	• A&L Goodbody • Cimpina • Farrans • McLaughlin & Harvey	• CASC • GWA Supplies • Ridgeway Rockbags	• EDS • Ventus

12 opportunity areas

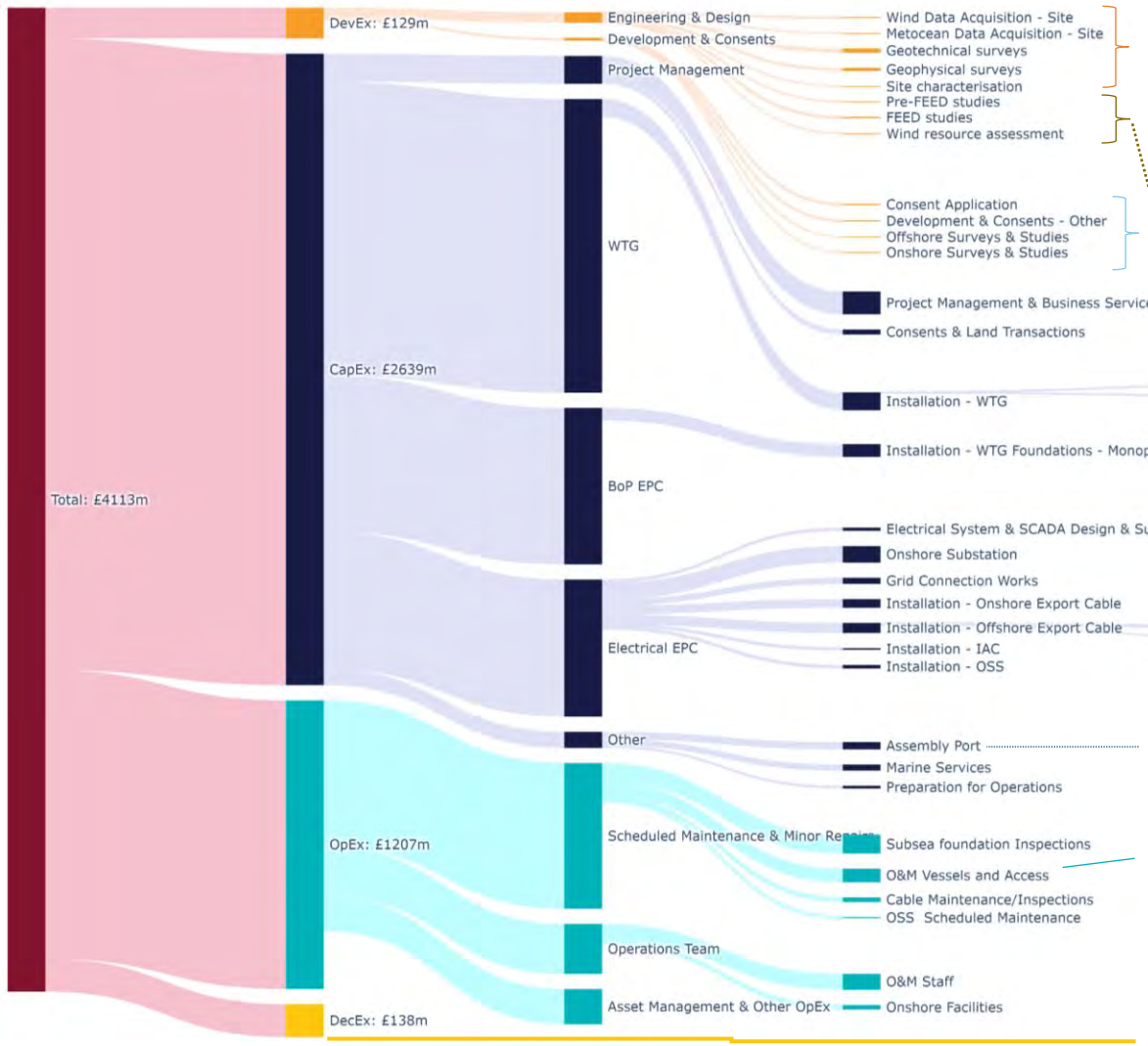
These leading companies can be clustered into 12 main sub-sectors

Sub-sector	Ireland	Northern Ireland
1. Surveying: Through-life marine surveys and data acquisition	Xocean, Green Rebel Marine, CathX, TechWorks Marine	Mainport
2. Technical consultancies: Engineering studies, detailed design	GDG, Dublin Offshore Consultants, Exceedance, Brightwind, Enerview, Ayesa, Galetech (Arup, Mott Macdonald, LDD, Ionic, Wood)	Langan Engineering (Mott Macdonald, Arup)
3. Environmental / sustainability tech:	Altemar, Fehily Timoney, Innovision Media, Bluewise Marine, Hibernian Marine Systems	Fjordstrong,
4. WTG/FOU* assembly - engineering support services (onshore):	Combilift, Eastgate Engineering, Cimpina, Europlan Group	CASC, Barton Industrial Services, H&W
5. Cable support services: Testing and terminations, installation and O&M support	West Coast Diving, Irish Sea Contractors, Marine Specialists	Ventus, EDS, Ridgeway, McSheery Civil Marine, De Romeine Nearshore, Elecsys,
6. Electrical, onshore substation & grid connection works: Onshore electrical and civils design and installation	H&MV Engineering, Kirby, TLI Group, Suir Engineering, FLI Precast, Graham. Jones Engineering, Gaeltec	Farrans, Graham, Mclaughlin & Harvey, M&M Contractors, Omexom
7. Ports, navigation and logistics: Construction support and O&M vessels	Doyle Shipping, Rosslare, Cork, Killybegs, Dun Laoghaire, Irish Lights, JFC Marine	Doyle Shipping, Clarkson Port Services, Port of Belfast
8. Small vessels:	Farra Marine, Alpha Marine, Fastnet Shipping, Irish Commercial Charter Boats, MMG Welding	DR Maritime, SeaSource, Artemis,
9. Spares		GWA Supplies
10. Training providers: Offshore wind-specific safety training	Errigal Training Centre, ASL Safety, VRAI	
11. Moorings and anchors: Detailed design, supply and maintenance	Subsea Micropiles, Dublin Offshore Consultants, Jamestown Manufacturing, Wood, TFI Marine	
12. End of life reprocessing:Decommissioning and reprocessing of key materials		Plaswire, Ionic Technologies, Decom Engineering

*WTG= Wind Turbine Generator; FOU = foundation

Mapping the value – fixed monopile project

Mapping the subsectors highlights that companies on the island of Ireland are generally at lower tiers and represent a fairly small % of the overall breakdown. This diagram focuses on current capability.



1. Surveying (also through life element)

2. Technical consultancies

3. Environmental / sustainability tech

4. WTG/FOU assembly support services (onshore)

5. Onshore substation & grid connection works

6. Cable installation support services

7. Ports and logistics (also through life element)

8. Small vessels (also through life element)

9. Spares

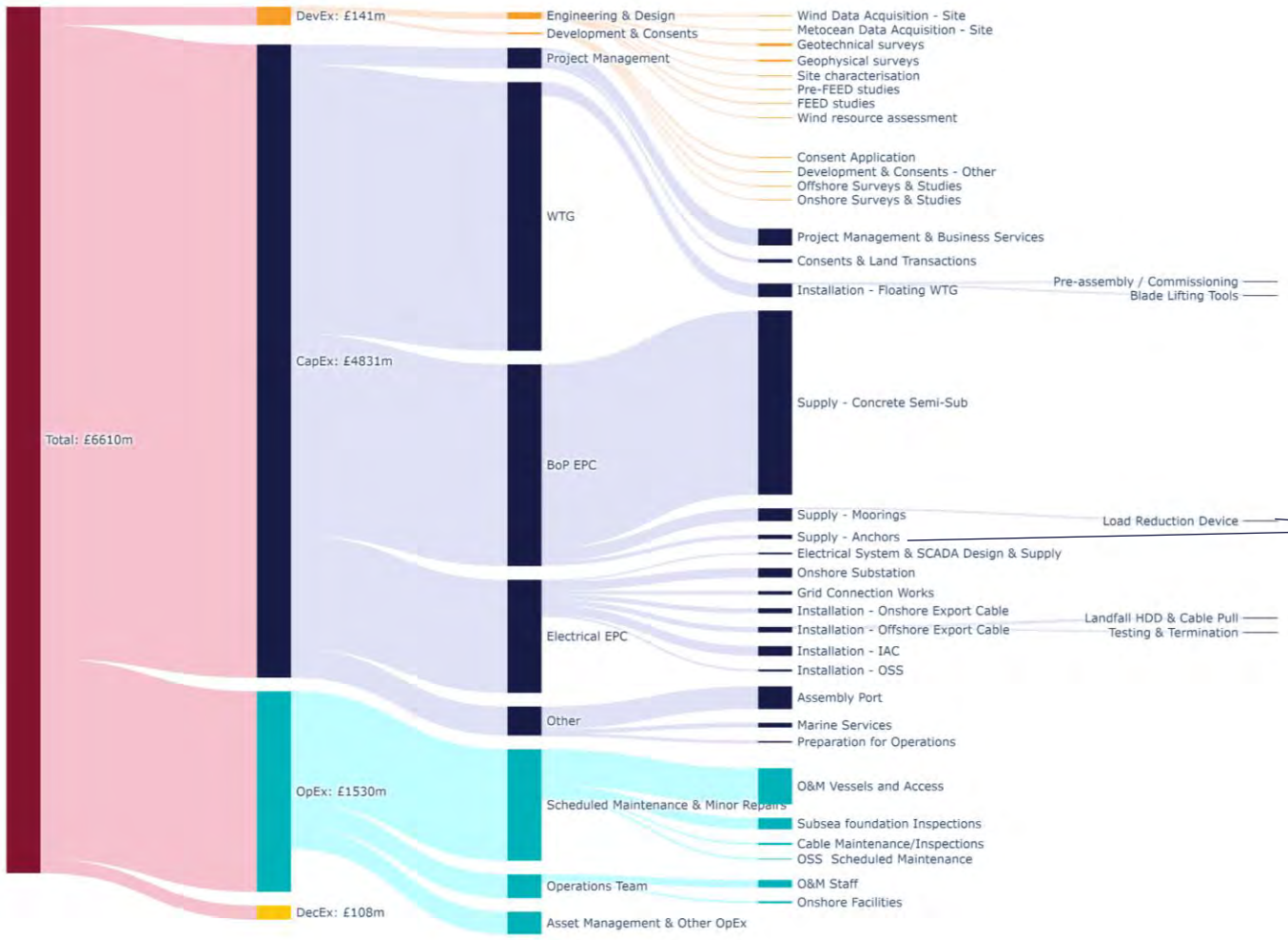
10. Training providers

11. Moorings and anchors (shown on next slide)

12. End of life reprocessing

Mapping the value – floating concrete project

Companies on the island of Ireland are generally at lower tiers and represent a relatively small % of the overall breakdown.

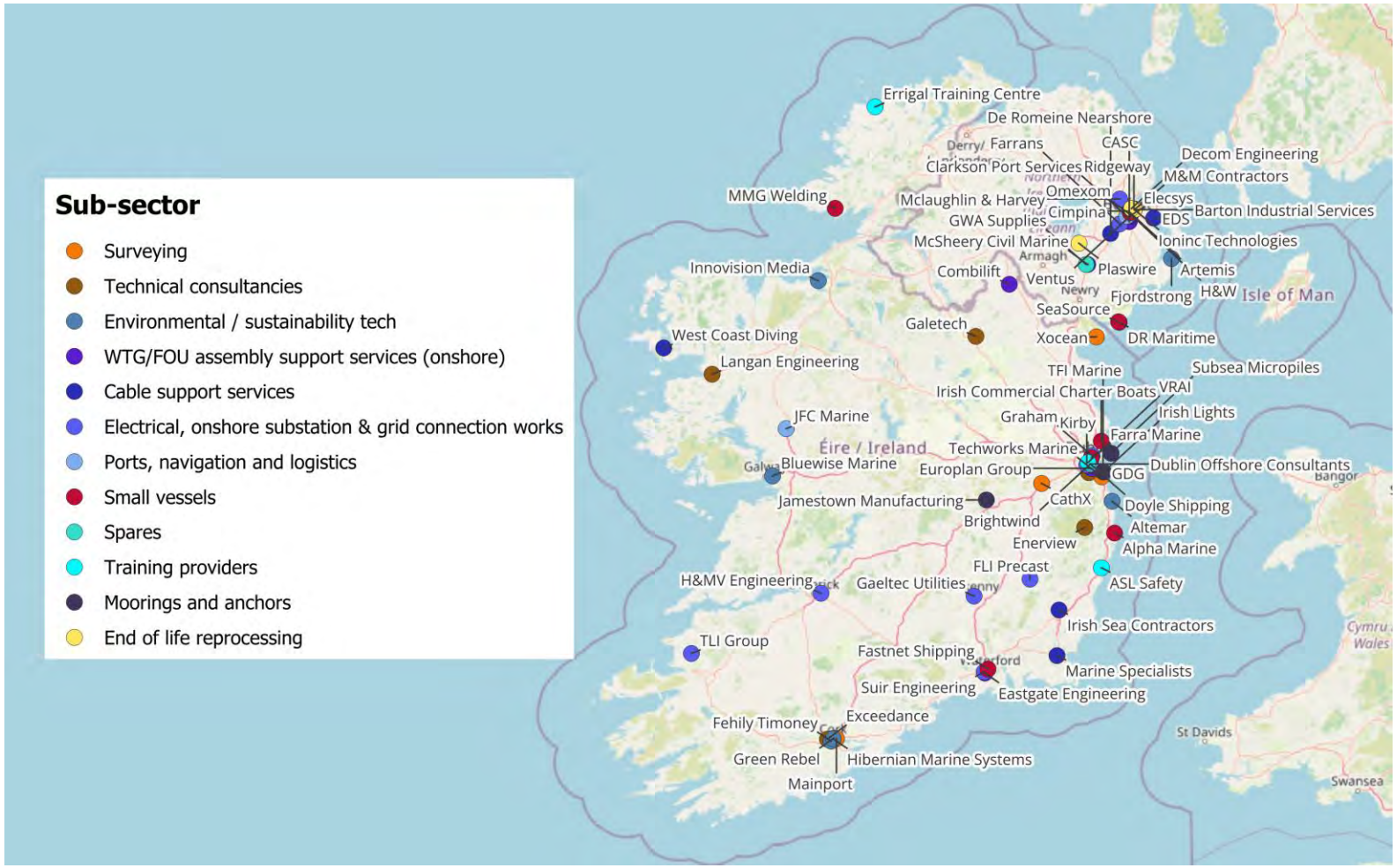


11. Moorings and anchors

May also be potential for aggregate supply if concrete batching plant in Ireland.

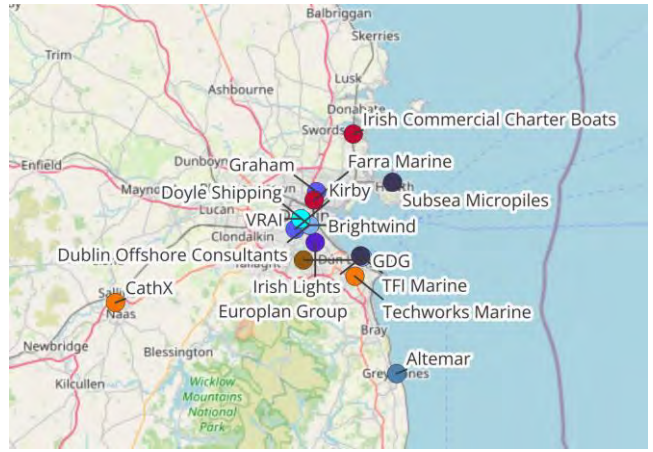
Locations

Mapping the companies geographically highlights major clusters around Dublin, and Belfast and a minor cluster around Cork.



Belfast:

Dublin:



Geographic split

Northern Ireland and Ireland have their own respective strengths.

There is good competence across Ireland and Northern Ireland in 'WTG/FOU assembly - engineering support services (onshore)', 'Ports, navigation and logistics' and 'Electrical, onshore substation & grid connection works'.

The analysis shows Northern Ireland has stronger capability in:
- Cable support services
- Spares
- End of life reprocessing

The analysis shows Ireland has stronger capability in:
- Surveying
- Technical consultancies
- Small vessels
- Moorings and anchors

Most of the larger companies appear to work across Ireland, Northern Ireland (and the rest of the UK) e.g. Arup, Clarkson, Dublin Offshore Consultants, Doyle's Shipping Group, GDG, Ridgeway, TLI, Subsea Micropiles, Xceedence, Xocean,

Sub-sector	Ireland	Northern Ireland
1. Surveying:		
2. Technical consultancies:		
3. Environmental / sustainability tech:		
4. WTG/FOU assembly - engineering support services (onshore):		
5. Cable support services:		
6. Electrical, onshore substation & grid connection works:		
7. Ports, navigation and logistics:		
8. Small vessels:		
9. Spares		
10. Training providers:		
11. Moorings and anchors:		
12. End of life reprocessing:		

- Strong commercial footprint now
- Emerging capability
- Some capability
- Limited capability

Green hydrogen supply chain

The hydrogen sector is facing headwinds and the timelines are likely beyond InterTradeIreland's time horizon

Different motivations across the island

The motivations and interest in green hydrogen are different in Northern Ireland and the Republic of Ireland:

- In the Republic of Ireland, hydrogen is seen as an option to export excess renewables, particularly offshore wind but this is not expected until further into the future, most likely the late 2030s and 2040s. Based on our consultation, there has not been a significant focus on supply chain development for hydrogen in Ireland, in part due to the long time-horizon and lack of local subsidy mechanism for green hydrogen projects to date.
- In Northern Ireland, the focus is on the industrial supply chain for hydrogen equipment, not on the export of excess renewables. To date, there has been one small demo project, and significant R&D effort from Wright Bus. The high power prices across the Irish grid are likely to pose a challenge to the development of a green hydrogen industry as the HBM subsidy is competitive and projects in GB have access to cheaper, greener power.

Headwinds in the hydrogen sector

The hydrogen sector has received a lot of attention and political support in recent years. However, based on our team's project experience and market understanding, the sector is facing significant headwinds.

- **Cost:** The cost reduction pathways that were put forward for the green hydrogen sector have not been achieved, and despite significant subsidies there have been few projects reaching FID.
- **Support mechanism difficulties:** The UK hydrogen business model has proven to be hugely complex and pushes projects to secure 15-year PPAs which are difficult to find in the market, while the EU subsidy regime is simpler but can leave projects carrying significant exposure to power price fluctuations.
- **Efficiency challenges:** Electrolysis cannot match the efficiency of direct electrification, and subsequent compression, storage or transport processes can further decrease this efficiency. Given that electricity is a large portion of green hydrogen costs, this makes it difficult for hydrogen to compete with direct electrification in most applications.
- **Decreasing cost of alternatives:** Due to the decreasing cost of batteries for EVs and energy storage, and the development of improved solutions for direct electrification for heat such as high temperature heat pumps, the market for hydrogen has been progressively shrinking over time. The best examples of this are battery EVs for personal vehicles and heat pumps for home heating which have seen significantly more growth than hydrogen due to higher efficiencies and lower costs.

Hydrogen is often suggested to be the Swiss army knife of the energy transition, as it can be used in transport, high temperature industrial heating applications, power storage and other difficult to decarbonize areas of the energy system. This is an unfortunately apt comparison, as a Swiss army knife can be used in many applications however usually people will opt for the most efficient tool for the job.

Green hydrogen: a low priority sector for InterTradeIreland

The island of Ireland is unlikely to develop a significant green hydrogen industry in the coming decade, therefore this report has not focused on this sector. The timelines could be accelerated if there is a significant increase in appetite to subsidise green hydrogen, a rapid decrease in production costs and a rapid decrease of renewable power prices across the island of Ireland. Alternatively, if a route to market with a hydrogen consumer with a high willingness to pay is identified, then it could accelerate the industry. Given that it was agreed to focus on the offshore wind supply chain for this report, the following slide simply provides an overview of the companies active in the hydrogen sector in Northern Ireland and a breakdown of hydrogen costs.

Green hydrogen supply chain

Which companies are active in the sector in Northern Ireland?

Invest NI dataset
Through the consultation process, Invest NI have shared their database of companies in the hydrogen sector in Northern Ireland, which includes 35 companies, however a similar database was not identified in Ireland.

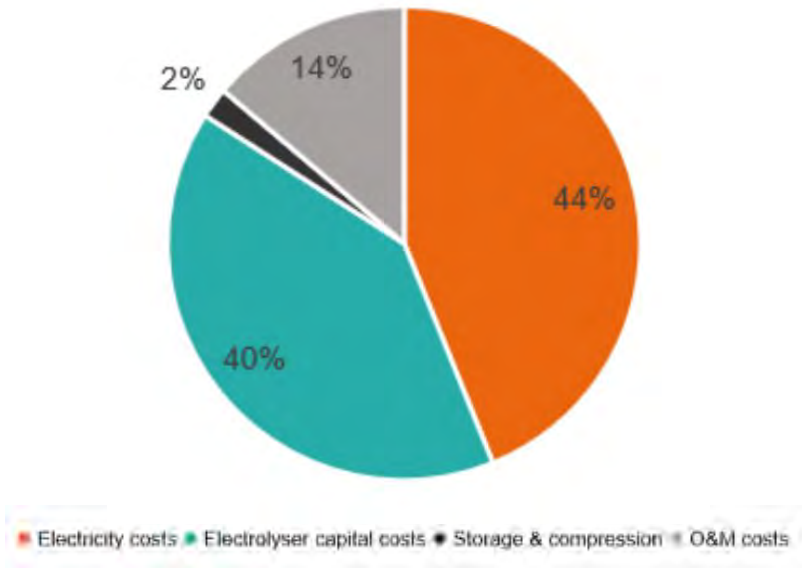
One of the key challenges of developing a green hydrogen supply chain is that due to the wide array of potential applications for green hydrhowever,ctor is very broad. Based on the 35 companies from Invest NI, the following parts of the hydrogen supply chain are represented:

- Project development
- Design services
- Electrolyser manufacture
- Hydrogen storage
- R&D
- Hydrogen distribution
- Fuel cell vehicle production

It would currently be difficult to identify which companies will be most relevant in a decarbonized future as it highly depends on the importance of different applications of hydrogen on the island of Ireland and globally. Although there are 35 companies, there are many companies in the dataset whose core activities are in other sectors with relatively minor R&D activities in hydrogen, and some smaller start-ups focused on hydrogen. InterTradeIreland should be wary of encouraging SMEs to invest significant time and energy in green hydrogen given the significant uncertainty and timing risks of the industry.

Cost breakdowns in hydrogen production
Green hydrogen production facilities are industrial plants with complex and expensive electrolyser equipment. As seen in the diagram below, there is significant CapEx involved, making up 40% of the overall cost. However, the ongoing cost of electricity is even more significant, making up 44% of the overall hydrogen cost. Furthermore, in order for the hydrogen to be green, the electricity input must be sourced from renewables. Therefore, driving down the cost of electricity and decarbonising the local grid are a pre-requisite to developing a green hydrogen industry.

Cost breakdown for a 100 MW electrolyser connected to an offshore wind with 3 hours of storage at 30 bar and a pipeline offtake at 30 bar[1]



(1) https://www.climatexchange.org.uk/wp-content/uploads/2024/01/CXC-Cost-reduction-pathways-of-green-hydrogen-production-in-Scotland-%E2%80%93-total-costs-and-international-comparisons-Jan-2024.pdf

Benefits to Irish businesses

An overview of other potential benefits to SMEs

Carbon emissions saving

- Increasing the availability of clean sources of energy throughout the island of Ireland will help enable SMEs to lower their carbon impact and meet carbon reduction targets. This is particularly relevant when companies are striving for certifications such as B corp or SBTi compliance.
- Having a supply of green hydrogen fuel could help reduce carbon emissions of SMEs currently using carbon intensive fuels, in industries such as manufacturing, transport and agriculture.

ESG considerations

- As stated for carbon emissions, more renewable energy sources will enable businesses to meet ESG goals. Meeting ESG requirements will help SMEs align with the growing investor and consumer demand for sustainability credentials.
- Focus on ESG credentials can encourage investment in local manufacturing and supply chain companies in countries such as Ireland and the UK with strong governance, social and environmental track records.

Innovation

- Both offshore wind and hydrogen development will encourage R&D within the energy sector. There will be an increasing need for innovation in a range of areas (e.g. O&M, hydrogen storage, grid technologies). If businesses on the island can use the growing sector to capitalise on this, and take a proactive approach to R&D, then there is potential to compete and have impact on a global scale in the offshore wind and hydrogen industry.
- Localities with windfarms and/or hydrogen production facilities could become clusters for industry. This may stimulate collaboration for SMEs with other companies, academic institutions and government.

Resilience and cost reduction

- Locally producing renewable energy will decrease the islands overall reliance on the international energy market and imported fuel. Over time this could result in more stable energy costs, protecting SMEs from fluctuating energy prices in a volatile international market.

Overcoming barriers and maximising opportunities with a cross-border approach

WP4

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Document control

REVISION	A
AUTHORS	David Thomason, Alan Duncan, Bruce Clements
STATUS	Draft
CHECKER	Paul Reynolds
APPROVER	Paul Reynolds

Version History

A	Initial version	10/01/2025

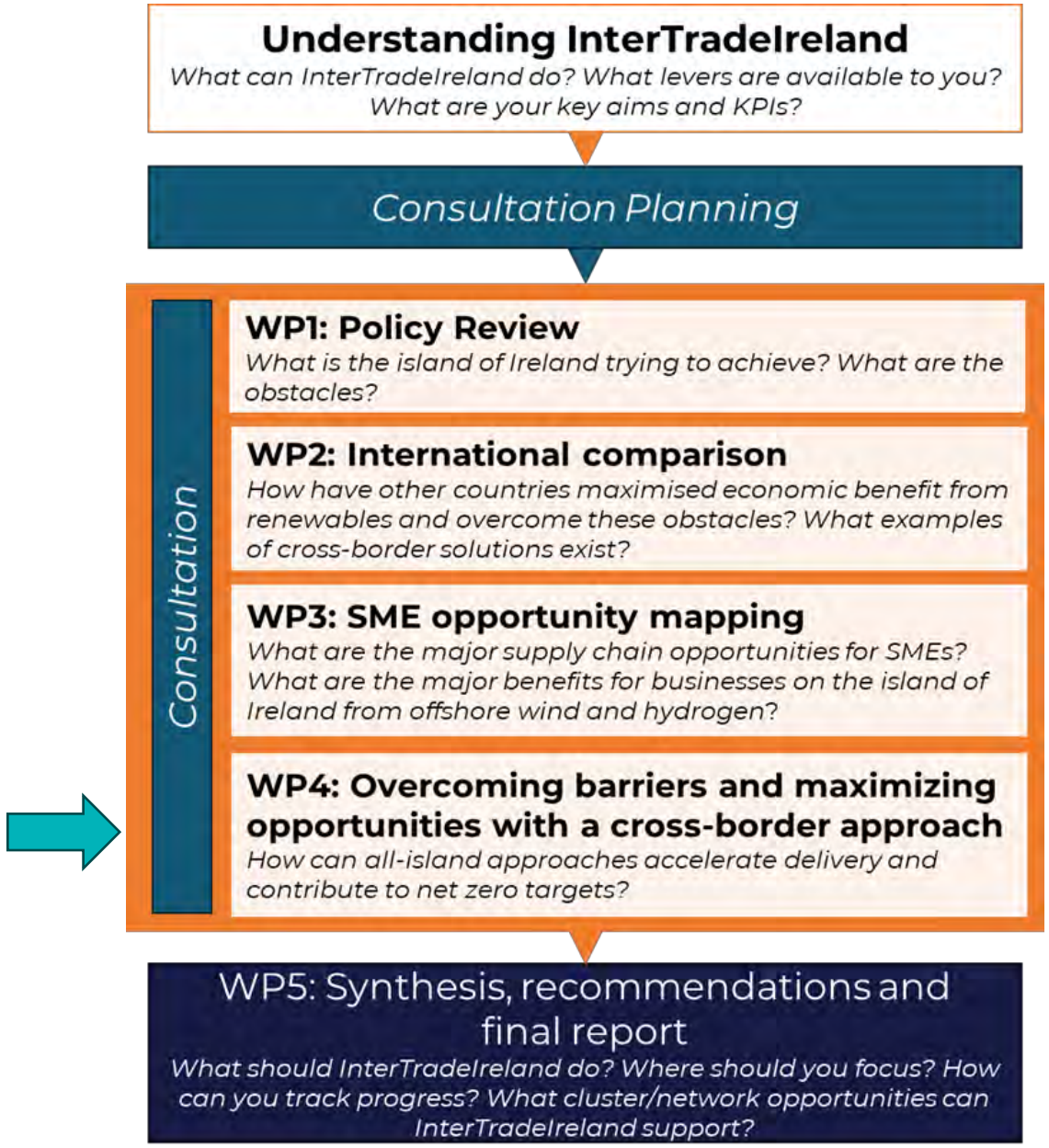
WP4: Constraints Mapping

Purpose & context:
This document is provided as the main deliverable under Work Package 4 as described in section 4.5 of proposal ITI001-P-01-A.

This report provides an overview of the constraints mapping exercise which identified the barriers to developing an offshore wind industry across the island of Ireland where an all-island approach could be beneficial.

First, a long list of constraints was developed through the consultation process, supported by our in-house experts. Then, a workshop with InterTradeIreland was then held to identify where there is the best opportunity for the organization to get involved.

This document pulls together the key conclusions for each of the constraints, identifying where an all-island approach can accelerate delivery and contribute to net zero targets.



3

Constraints mapping

Initial long list

What are the constraints across the island of Ireland?

In order to develop the offshore wind supply chain, there are key constraints relating to both technology development and policy, where an all-island approach and cross border topics are a concern. Throughout the consultation process, and in discussion with our team of experts, a set of 12 constraints have been identified in 5 broad categories; an overview of these constraints can be seen on the diagram on the following slide. This slide provides a brief introduction, but the constraints are covered in more detail later in this section.

ENABLING TECHNOLOGIES

Floating technology: In order to reach its ambitious 37 GW target, Ireland will need to build out wind turbines with floating foundations due to the deep seabed in the country's territorial waters. Floating wind is still a relatively new technology with key technical questions still unanswered and significant potential for cost reductions.

Storage & flexibility: In order to reach high levels of renewable penetration, novel long duration storage and energy demand flexibility technologies need to be developed and tested.

ENERGY STRATEGY

Energy demand: There is not sufficient energy demand across the island of Ireland for the scale of ambition for offshore wind. Increasing energy demand will be necessary.

Electricity prices: High electricity prices are a key challenge to developing the local supply chain for any high energy intensity sector.

POLICY ENVIRONMENT

Marine spatial plan: Developing a local offshore wind industry requires a plan for deployment across the seabed while balancing all the other marine users.

Consenting: Securing consents is a key part of the offshore wind development process which may benefit from closer cross-border collaboration.

Rules for local content: Legal requirements for local content could act as a barrier or a boost for the development of the Irish offshore wind supply chain.

SUPPORTING INFRASTRUCTURE

Grid: As in all countries which are moving to renewables, securing a grid connection can be challenging and the grid across the island of Ireland needs investment and expansion.

Ports: Given the limited number of ports across the island of Ireland with the capability needed to deliver offshore wind projects, collaboration across the island could help get projects into the water.

BUILDING LOCAL SUPPLY

Skills: Developing a new industry will require the development of new skills and drawing upon a wider pool across the island of Ireland could provide an opportunity.

Supply chain: Companies entering the offshore wind sector, particularly SMEs, face significant challenges which InterTradeIreland may be able to help alleviate.

Clusters: There is a lot of activity for offshore wind clusters across the island of Ireland, but there is a lack of coordination.

Workshop session

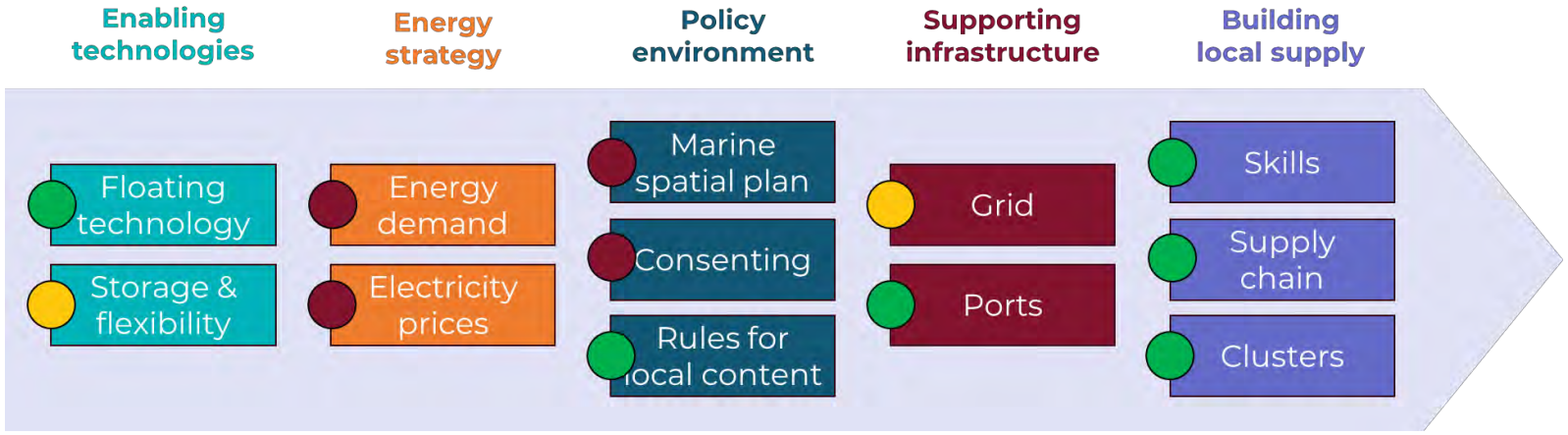
Where should InterTradeIreland focus?

Given InterTradeIreland's unique role, it is important to focus on the constraints where there is the highest potential for impact. Everoze ran a workshop with the InterTradeIreland team to identify the priority constraints to focus on. The constraints were categorised based on the RAG criteria described in the table on the right.

Clear role to play
- Floating technology development
- Rules for local content
- Skills
- Supply chain
- Clusters

Require an informed position
- Storage & flexibility
- Grid

No clear scope for ITI
- Energy demand
- Electricity prices
- Consenting
- Marine spatial plan



RAG	Meaning
Green	ITI likely have a clear role to play
Amber	ITI should have a clear informed position on this topic and may need to interact with other stakeholders
Red	No clear scope for ITI to cover; this constraint is already well covered by other entities

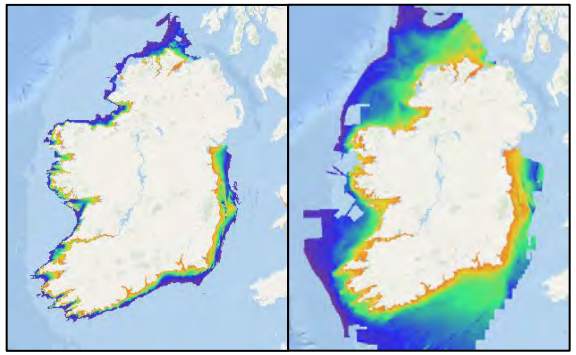
Constraints with a clear role to play for ITI

FLOATING WIND TECHNOLOGY DEVELOPMENT

Context

The bathymetry around the island of Ireland only allows for the development of offshore wind in a relatively small area close to shore using fixed foundations; which has historically been down to around 60 metres of water depth as illustrated in the image below. In order to deploy the 37 GW ambition in Ireland, pushing traditional fixed bottom foundations into deeper waters, floating foundations, or other novel deep-sea foundations will be required.

Although there have been large scale pilot plants for floating wind, such as the Kincardine and Hywind wind farms, the technology is still in development with key technical challenges that still need to be addressed, and the overall cost needs to be reduced. Supporting research, development and innovation in floating offshore wind could help develop the local supply chain and unlock significantly more seabed for development.



Bathymetry of Ireland with depths down to 60 m (left) and down to 150 m (right)

Specific challenge

In Northern Ireland, there does not seem to be a significant focus on offshore wind R&D. There are no Offshore Renewable Energy Catapult (OREC) facilities in Northern Ireland, or a clear research cluster for floating wind.

In Ireland, there are 3 main facilities for offshore wind R&D:

1. Lir National Ocean Test Facility (Lir-NOTF)
2. SmartBay – Spiddal
3. Atlantic Marine Energy Test Site (AMETS) – Belmullet

There is also a commitment in owering Prosperity to develop an Offshore Wind Centre of Excellence and a floating wind demonstrator project

Developing a stronger R&D ecosystem for offshore wind across the island of Ireland, and particularly in Northern Ireland, could help to boost the development of the local supply chain. It could be beneficial to align research priorities with the areas of focus for the supply chain, and increase cross-border collaboration for research, to avoid duplication and ensure that R&D efforts are additional across the island of Ireland.

How can InterTradeIreland help?

There are several ways that ITI can support an all-island approach to floating wind technology development:

1. Aligning research priorities across the island of Ireland
2. Supporting the link between research priorities and supply chain opportunities, as identified in Work Package 3
3. Promoting cross-border research collaboration, with industry, government agencies, and academia

Constraints with a clear role to play for ITI

SKILLS

Context
The development of a new industry across the island of Ireland will require significant volumes of new skills and transfer of skills from existing industries. There has been a significant amount of study in both the UK and Ireland on the skills requirements for the offshore wind industry.

In Ireland, Green Tech Skillsnet has focused on coordinating the development of the relevant skills for the renewable energy and green technology sectors.

Northern Ireland does not seem to have an equivalent of the Green Tech Skillsnet. In 2014, there were plans for the Energy Skills Training Network to lead the development of skills for the energy transition in Northern Ireland, however the network does not seem to still be active. There is a Green Energy Skills Industry Reference Group, which is a sub-group of the NI Skills Council, however this is only an advisory body.

Specific challenges
There are two key challenges that need to be addressed for the development of relevant skills across the island or Ireland:

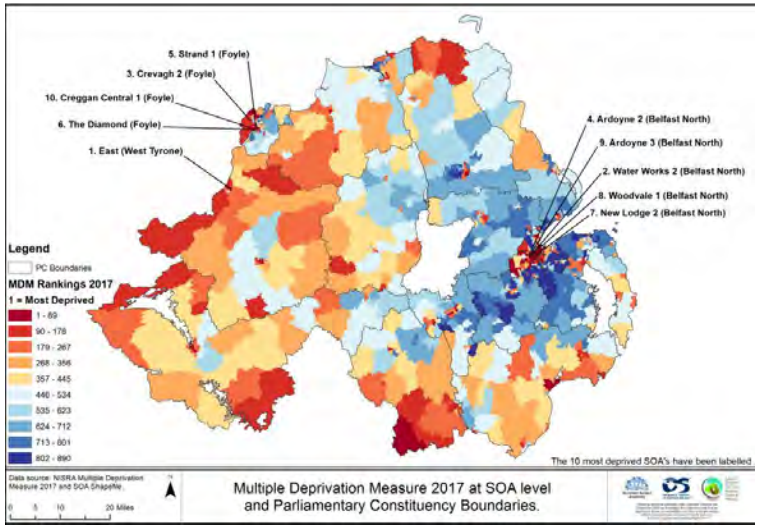
1. Legislative and administrative barriers can hinder access to the skills required for delivering offshore wind projects across the border
2. Lack of energy transition skills coordination at an all-island level

How can InterTradeIreland help?
InterTradeIreland can support the development of the necessary skills for the offshore wind industry across the island in 3 ways:

1. Assess the barriers for skills transfer across the border
2. Support the development of a stronger coordinating body in Northern Ireland, based on the approach of Skillsnet in Ireland, or the Energy Skills Partnership (ESP) in Scotland
3. Encourage an all-island approach to skills development by creating a forum for skills agencies, colleges, universities and other skills development entities from across the island to collaborate

Constraints with a clear role to play for ITI

LOCAL CONTENT RULES



Context

Local content rules are a growing trend in the offshore wind industry, with key policies emerging in the UK and EU.

- Clean Industry Bonus (CIB) in the UK rewards offshore wind developers with projects in England, Scotland and Wales for investing in deprived areas across the UK. For Northern Ireland this is data zones in deciles 1-5 on overall deprivation (see map right). It does also allow for investment in any companies, including outside of the UK, that have set or committed to a Science Based Target.
- The EU Net Zero Industry Act (NZIA) will require Ireland to integrate some local content requirements, however this has not yet been implemented. Other requirements on cyber security and sustainability may also present opportunities.

Specific challenge

Local content requirements and mechanisms are one of the mechanisms used by governments to drive investment in local supply chains. For companies, it can be difficult to understand and navigate these requirements, and there is a risk that these requirements will push supply chain companies away from considering the supply chain as an “all island” ecosystem, by creating different incentives either side of the border.

How can InterTradeIreland help?

These local content requirements pull away from an all-island approach to supply chain. There are two ways that ITI can respond to this:

1. **ITI could play a role in helping companies navigate these complex mechanisms** and supporting them in understanding which investments would be eligible for CIBs or any other local content requirements. For the current CIBs, this can be delivered by ensuring Irish companies have committed to science-based targets.

2. **Lobbying for all-island local content.** There is also a lobbying and policy opportunity for ITI to work towards local content definitions which are inclusive of investments both sides of the border. The CIBs are expected to evolve in future auctions, any future Northern Irish subsidy mechanism could include local content requirements with a focus on Northern Ireland, and the future Irish mechanisms are not yet defined, therefore there could be a role for ITI in bringing an all-island approach to local content to the attention of policy makers and pushing for it to be included in future mechanisms.

Constraints with a clear role to play for ITI

SUPPLY CHAIN

Context
The growth of offshore wind to meet deployment targets across the island of Ireland, but also in the wider North sea basin, requires significant expansion of the supply chain. There are a number of companies that have successfully moved into the sector on both sides of the border. These companies have focused on servicing projects in other geographies, alongside opportunities at home when they are available.

Specific challenge
There are key challenges faced by SMEs when moving into offshore wind:

- **Uncertainty**: the project pipeline and timelines are highly dependent on various political and non-political players including grid, consenting, planning and subsidy regime.
- **Geographical constraints**: companies need to understand the geographic market in which they are likely to be competitive, as some packages can be exported globally, particularly in the development phase, whereas other opportunities will be restricted to local projects, particularly in the operational phase.
- **Cash flow**: the size of contracts in offshore wind can be very difficult to manage for smaller contractors. This is a key barrier to entry for SMEs.
- **Tier 1 control**: the control over the supply chain sits with tier 1 contractors who often push excessive risk down onto their suppliers.
- **Entry point**: for outsiders, it can be very difficult to work out who their clients are in the offshore wind sector. Developers, tier 1 suppliers, turbine OEMs and others are all key clients for different parts of the supply chain at different phases of project development

Overall, the offshore wind market can be challenging for supply chain companies, and ensuring they have the right support to enter the market is important.

How can InterTradeIreland help?

There are multiple different routes for ITI to help address these challenges, however to have the highest impact it is key not to duplicate the activity of other agencies.

1. Provide a clear signposting to the toolbox of support both sides of the border
2. Assess the gaps in support for the supply chain
3. Use the outputs of WP3 to focus on strengths and complimentary supply chain areas

Constraints with a clear role for ITI

CLUSTERS & GROWTH CENTRES

Context
The island of Ireland needs to build up the local offshore wind supply chain. In other markets across the North Sea, the development of a robust supply chain has been supported by developing a growth centre, generally at a port. The examples of Montrose, Blyth and Esbjerg in WP2 show that there needs to be a clear area of supply chain focus that is relevant to multiple industries and supported by key companies that anchor the supply chain locally.

The cluster model can support the development of these growth centres by providing a one stop shop for the whole supply chain. As seen with the unification of the clusters in Scotland, it can be better to provide a single unified voice with regional centres in a hub and spoke model rather than duplicating effort across many smaller clusters.

Specific challenge
The development of many different clusters is mainly a challenge in Ireland; by contrast, in Northern Ireland NIMO seems to be the main entity for the maritime supply chain. There is a lack of coordination and joined up thinking on clusters across the island of Ireland.

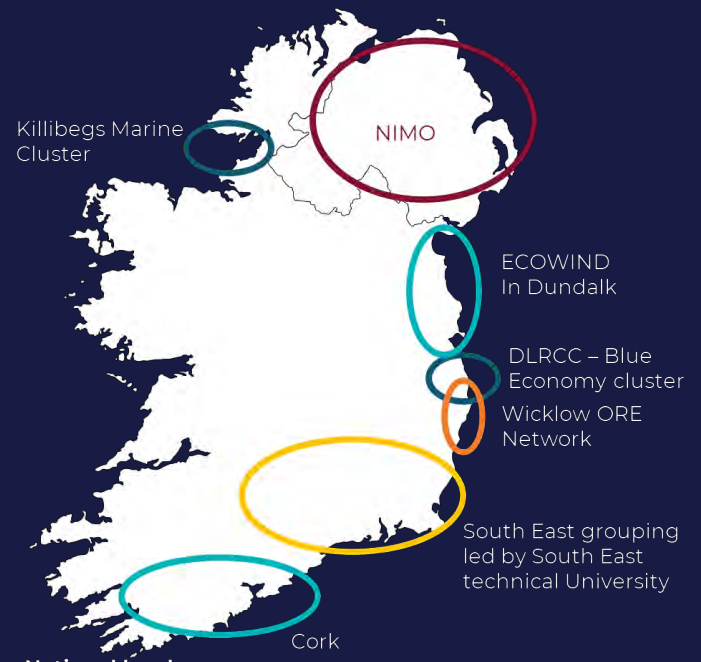
How can InterTradeIreland help?

Based on the capability assessment in WP3, InterTradeIreland is well positioned to push for an all-island approach to clustering and growth centres.

1. **ITI can develop a clear evidence-based narrative to support an all-island approach to clustering**, which covers both the potential benefits of additionality between NI and Ireland, and a clear understanding of areas of competition. Bringing a clear, evidenced based argument for collaboration could help push towards a coordinated approach across the island that avoids the duplication seen across the clusters in GB, and builds on the supply chain strengths either side of the border.

2. **ITI could provide support and facilitate the conversations and help navigate any politically sensitive topics**. Some previous discussions of an all-island have been hindered by a lack of awareness of political sensitivities in Northern Ireland, for example using the terminology of an Irish cluster.

Examples of clusters and regional groupings



National level:
- Enterprise Ireland Gael Offshore Network
- Wind Energy Ireland

Note: This is not an exhaustive list of clusters and regional groupings across the island of Ireland.

Constraints where ITI requires an informed position

Balancing supply and demand to ensure grid stability in an electricity system that relies heavily on variable renewable generation, such as wind and solar power, is a significant challenge. The electricity grid needs to move from a system designed to transport electricity from large single producers of power with a controllable output to a distributed power generation system where power is generated in new locations, including offshore, from sources that cannot always ramp up on demand.

As discussed in the case study of the Danish electricity grid in WP2, this can be solved by increasing dispatchable power, building interconnectors, increasing energy storage and relying on novel technologies and flexibility services. However, even with the implementation of these solutions, the grid will also need to be invested in and expanded to integrate the expansion of renewables and increases in electricity demand to decarbonize through electrification of heat and transport.

STORAGE & FLEXIBILITY

In order to integrate high proportions of renewable energy onto the grid, significant amounts of energy storage and flexibility will be required. This includes technologies such as:

- Grid scale Battery Energy Storage Systems (BESS) have seen significant growth in other markets for example the GB grid
- Long Duration Energy Storage (LDES) such as flow batteries, compressed air energy storage, thermal storage, CO2 storage, green hydrogen or novel battery chemistries (e.g. iron-air)
- Electrical vehicle-based technologies like smart charging or vehicle to grid (V2G)
- Smart management of energy consumers including behind the meter battery storage and solar, heat pumps, and industrial power users,.

These technologies have seen slow progress across the island of Ireland due to a lack of clear regulatory framework and market mechanisms to support their deployment. The GB grid provides an example of how rapid deployment can be, particularly for BESS, once the right mechanisms are in place with over 3 GW being deployed each year.

Suggested position
ITI should be supportive of the development of clear targets, policies and support mechanisms for the deployment of storage and flexibility technologies as these will help enable the offshore wind industry.

GRID

The grid is one of the most significant hurdles to the deployment of renewables across the island of Ireland. Renewable projects are struggling to secure grid offers and those that do are facing significant curtailment constraints, and BESS projects face limits on import capacity due to competition with datacentres in Ireland. For offshore wind projects, there is an added layer of complexity in the construction and ownership of the offshore transmission infrastructure which brings power back to shore. In Northern Ireland, this infrastructure is to be built, owned and operated by the developer; while in Ireland the specific arrangements changes between the different ORESS rounds.

Grid is a cross-border topic in Ireland, with the power market operating across the whole island, and the ownership of the grid across the island of Ireland sitting with EirGrid. Although SONI in NI is operated independently, these entities collaborate to manage the grid across the island. Despite the cross-border nature of the grid, it is unlikely that there is a key role for InterTradeIreland to play in this space, other than being aware of the need for expansion of the grid to enable the deployment of renewables.

There may be some opportunities for SMEs in the development of a net-zero grid for grid optimisation, monitoring and other software services.

Suggested position
ITI should generally be supportive of investing in the grid to ensure it is able to manage the deployment of large volumes of renewables, particularly offshore wind.

Constraints with no clear scope for ITI

MARINE SPATIAL PLANNING

Marine spatial planning is the process of planning the deployment of offshore wind farms across the available seabed, whilst balancing then needs of other marine users and the environmental constraints on the seabed.

Cross border collaboration could be needed given that most available seabed for fixed foundation offshore wind in Northern Ireland is close to the Irish border. However, this was not identified as an area where ITI could play a significant role.

ENERGY DEMAND

In order to achieve the 37 GW offshore wind ambitions in Ireland, there will need to be significant additional demand given that the current peak demand is less than 8 GW across the island of Ireland. Alternative offtakes and novel uses for the energy are of interest in Ireland – such as green energy parks.

Increasing energy demand by attracting energy consumers and wider energy strategy is unlikely to be an area that ITI can influence.

ELECTRICITY PRICES

High electricity prices across the island of Ireland are a challenge for the supply chain and the development of any green hydrogen or e-fuel industries. Offshore wind can play a role in decreasing the cost of power in Ireland.

Overall, although power prices are an all-island issue, ITI does not have a clear route to impact them and therefore this is not a priority area for this project.

CONSENTING

Consenting in Ireland is difficult with a history of Judicial Review. The set up of environmental courts in the South is expected to help speed up the Judicial Review process. Resourcing & offshore knowledge within planning departments is also a challenge on both sides of the border but improving.

One aspect that could benefit from cross-border collaboration is cumulative cross border impacts. These may be a challenge in future due to location of fixed wind in NI and Ireland being close to the border. Collaborating now could allow the authorities to pre-empt cross-border cumulative impact concerns.

There are other entities that are working on this issue, and it is unlikely to be an area where ITI can help address the issue.

Recommendations

WP5

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Document control

REVISION	A
AUTHORS	David Thomason
STATUS	Draft
CHECKER	Una Brosnan
APPROVER	Paul Reynolds

Version History

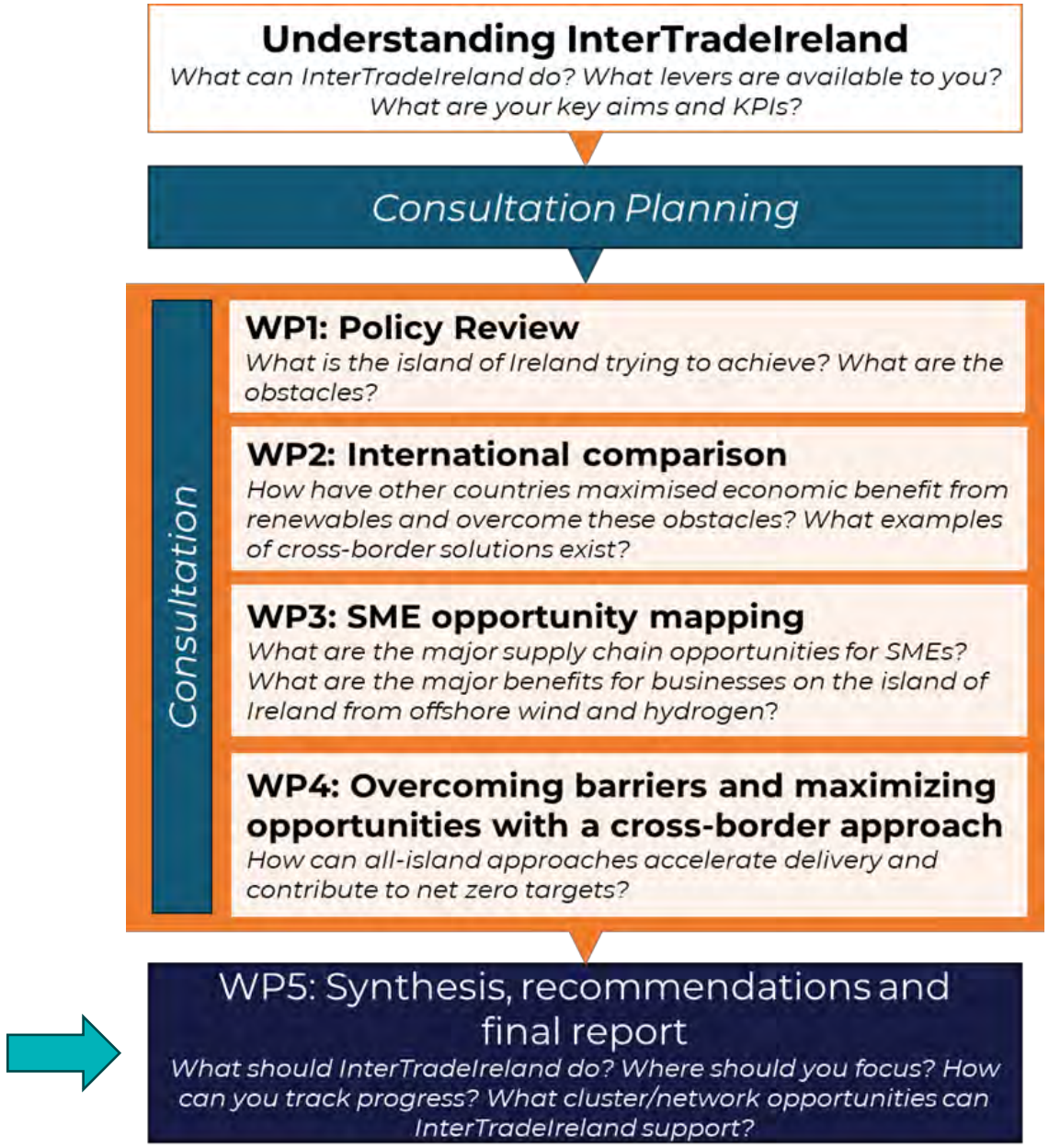
A	Initial version	11/02/2025

WP5: Recommendations

Purpose & context:
This document is provided as the main deliverable under Work Package 5 as described in section 4.6 of proposal ITI001-P-01-A.

This report provides:

- An overview of the required context to understand the recommendations that have been developed in this work package
- A write-up of the assessment process and workshop
- The list of top 10 recommendations along with who the relevant stakeholders are for each recommendation



CONTEXT

Offshore wind timelines across the island of Ireland

There is significant activity developing an offshore wind project pipeline in the Republic of Ireland, and to a lesser extent in Northern Ireland too. Despite this activity on the policy front, it is important to understand that the opportunities for the supply chain may still be a few years away given the high risk of Judicial Review in Ireland moving project timelines to the right, and the lack of timeline certainty in Northern Ireland.

The supply chain opportunities to support the development process have already seen the growth of Irish companies such as Green Rebel Marine and XOCEAN.

The North Irish Sea Array (NISA) is expected to have a decision on consent in 2025. The project's location close to the border could provide an opportunity to explore cross-border collaboration on a specific project.

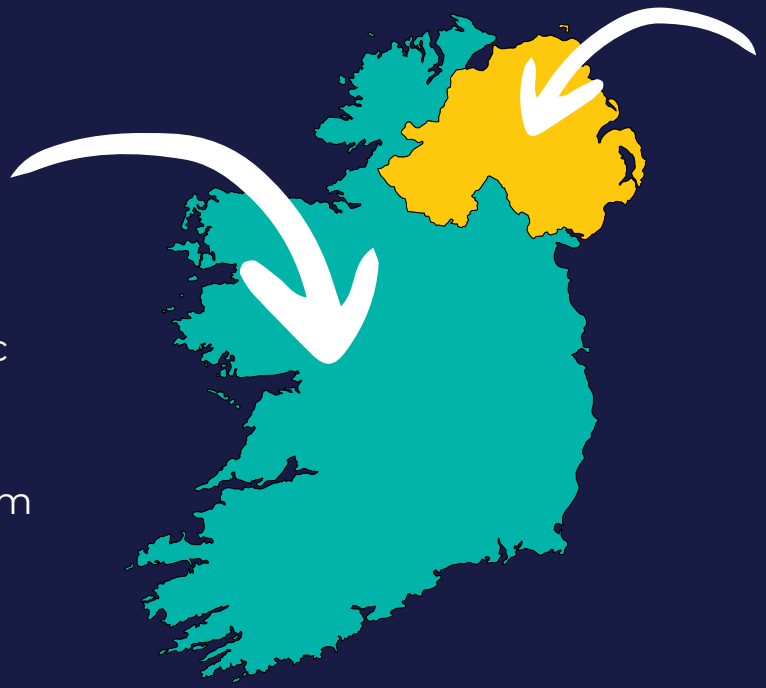
Although the project pipeline may seem large and could provide a significant opportunity for local supply chain growth, it is important to keep project timelines in mind as many of the opportunities on the map on the right are not expected to enter operations until the early 2030s. The following slide provides an overview of the development process as seen in GB.

CONTEXT

What does success look like?

IRELAND

- 5 GW of offshore wind by 2030
- 37 GW of offshore wind by 2050 based on developing energy exports
- Robust local supply chain & local economic development
- Develop an innovative enterprise ecosystem
- Establish a floating wind demonstrator
- Develop major industrial hubs around key deployment and O&M ports



NORTHERN IRELAND

- 1 GW of offshore wind from 2030
- Development of local supply chain supporting projects across the UK and Ireland
- Strong focus on Belfast port

InterTradeIreland

ITI connects and helps businesses across the island to trade cross-border, collaborate, innovate and attract investment.

Through its unique role ITI identifies opportunities for North-South collaboration that accelerate economic growth and help deliver shared policy priorities.

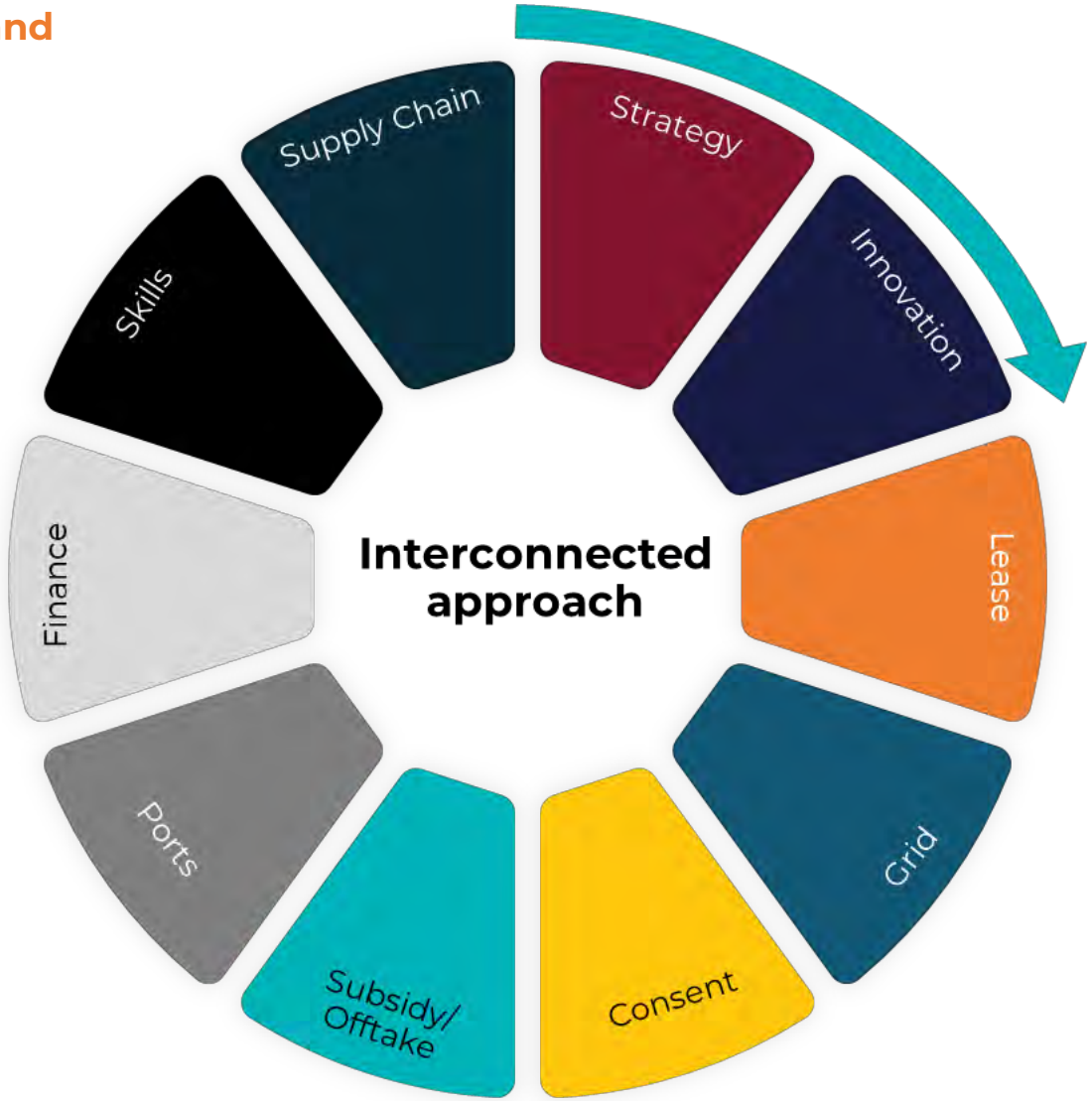
Interconnected approach

Promoting one offshore wind industry across the island of Ireland

The schematic to the right shows the different elements (or segments) needed to nurture an offshore wind sector. Each segment is likely to be the responsibility of different organisations or departments, and this is unlikely to change. However, it is crucial to appreciate the interconnectedness of these different elements and to seek alignment across them. The added complexity for InterTradeIreland is that this set of stakeholders is duplicated either side of the border.

ITI can help provide this interconnectedness through:

1. **Mindset** – appreciate the interconnections and facilitate the connectedness.
2. **Clarify** – clarify and agree strategic priorities or principles across the island of Ireland, which can feed into decision making across each of the segments – i.e. what does the island of Ireland want from offshore wind? What are the priority subsectors to grow and support either side of the border?
3. **Nudge and track** – InterTradeIreland can nudge towards an all-island approach to offshore wind and track the development of the supply chain across the island.



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Supply chain: Companies entering the offshore wind sector, particularly SMEs, face significant challenges which InterTradeIreland may be able to help alleviate.

Clusters: There is a lot of activity for offshore wind clusters across the island of Ireland, but there is a lack of coordination.

Constraints mapping workshop session

Where should InterTradeIreland focus?

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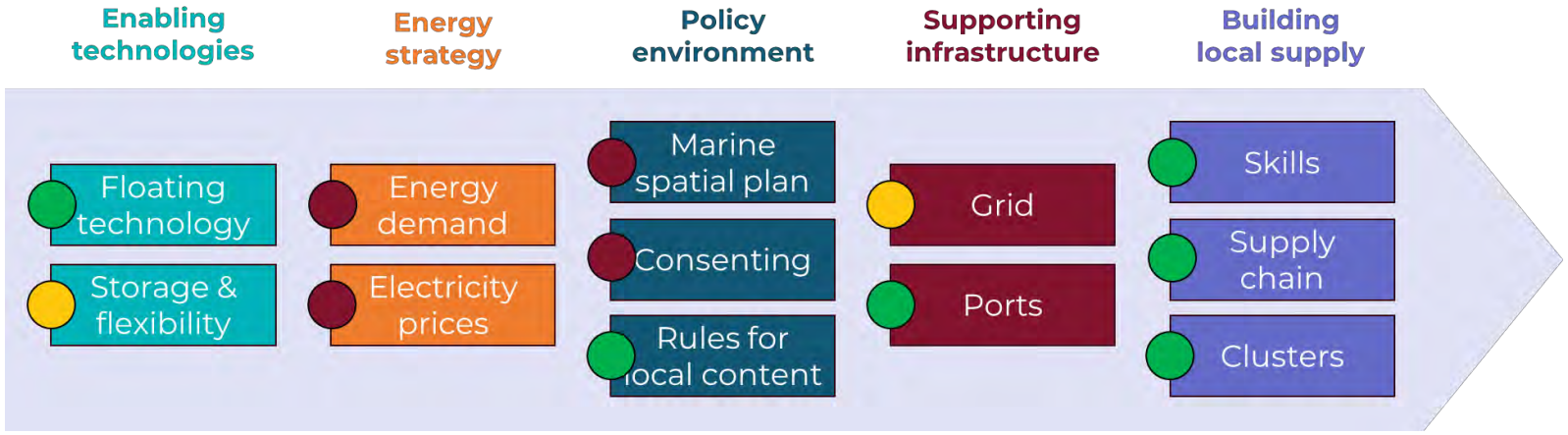
- Consenting
- Marine spatial plan



RAG	Meaning
Green	ITI likely have a clear role to play
Amber	ITI should have a clear informed position on this topic and may need to interact with other stakeholders
Red	No clear scope for ITI to cover; this constraint is already well covered by other entities

Know what you want to grow

Target priority sub-sectors

There is good competence across Ireland and Northern Ireland in 'Wind Turbine Generator & foundation assembly - engineering support services (onshore)', 'Ports, navigation and logistics' and 'Electrical, onshore substation & grid connection works'.

The analysis shows Northern Ireland has stronger capability in:

- Cable support services
- Spares
- End of life reprocessing

The analysis shows Ireland has stronger capability in:

- Surveying
- Technical consultancies
- Small vessels
- Moorings and anchors

Working with agencies either side of the border to ensure that supply chain initiatives and targets are complementary rather than competitive is a potential role for InterTradeIreland to play.

Sub-sector	Ireland	Northern Ireland
1. Surveying:		
2. Technical consultancies:		
3. Environmental / sustainability tech:		
4. WTG/FOU assembly - engineering support services (onshore):		
5. Cable support services:		
6. Electrical, onshore substation & grid connection works:		
7. Ports, navigation and logistics:		
8. Small vessels:		
9. Spares		
10. Training providers:		
11. Moorings and anchors:		
12. End of life reprocessing:		

- Strong commercial footprint now
- Emerging capability
- Some capability
- Limited capability

Smooth the supplier journey

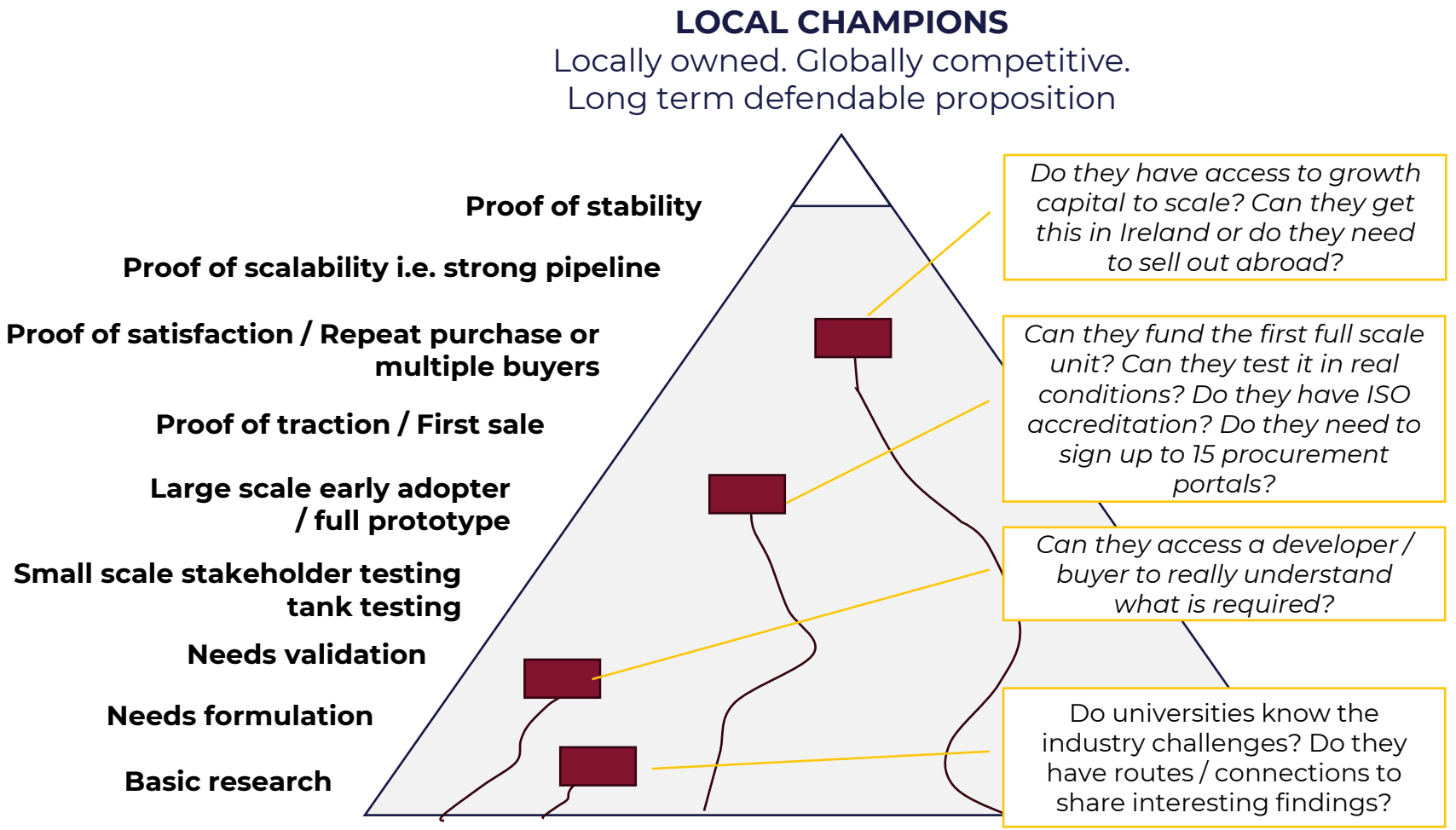
Understand the supplier experience – and then remove blocks and barriers

The supplier's journey into offshore wind can be thought of as like climbing a mountain – at the top are those rarified things: large, globally competitive companies, with a long-term defendable proposition, ideally locally owned and headquartered. Local champions.

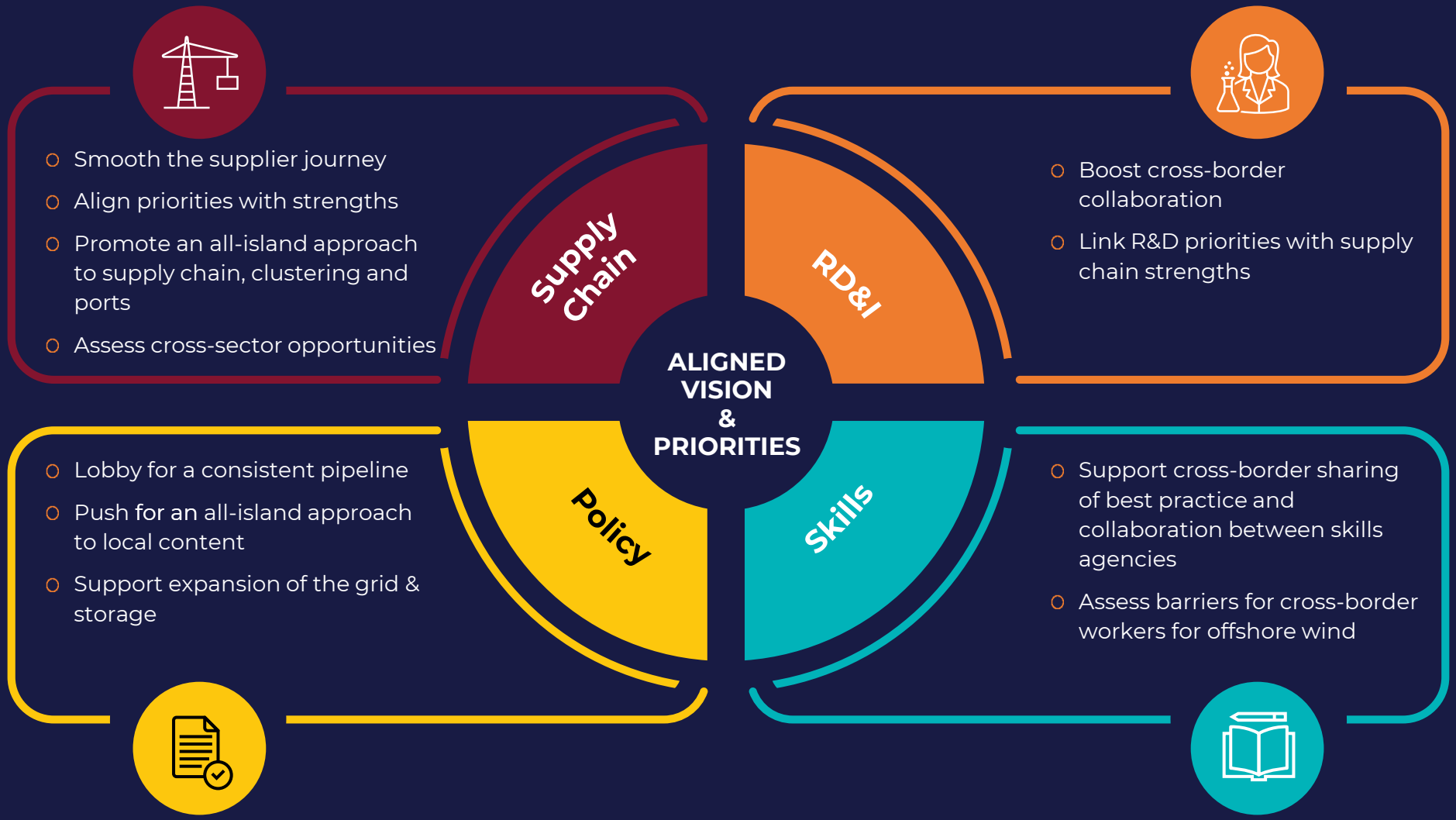
To get there is an often long and arduous journey, with lots of challenges and barriers along the way. The image show an adapted version of Technology Readiness Levels / Market Readiness Levels.

ITI needs to consider this journey, engaging with companies to identify barriers / blocks, co-developing solutions at each stage, focused around the priority areas for the island of Ireland (as discussed on previous slide).

For the island of Ireland, this may mean starting with GB and export opportunities given the large pipeline in the North Sea to build up the supply chain and prepare for local deployment.

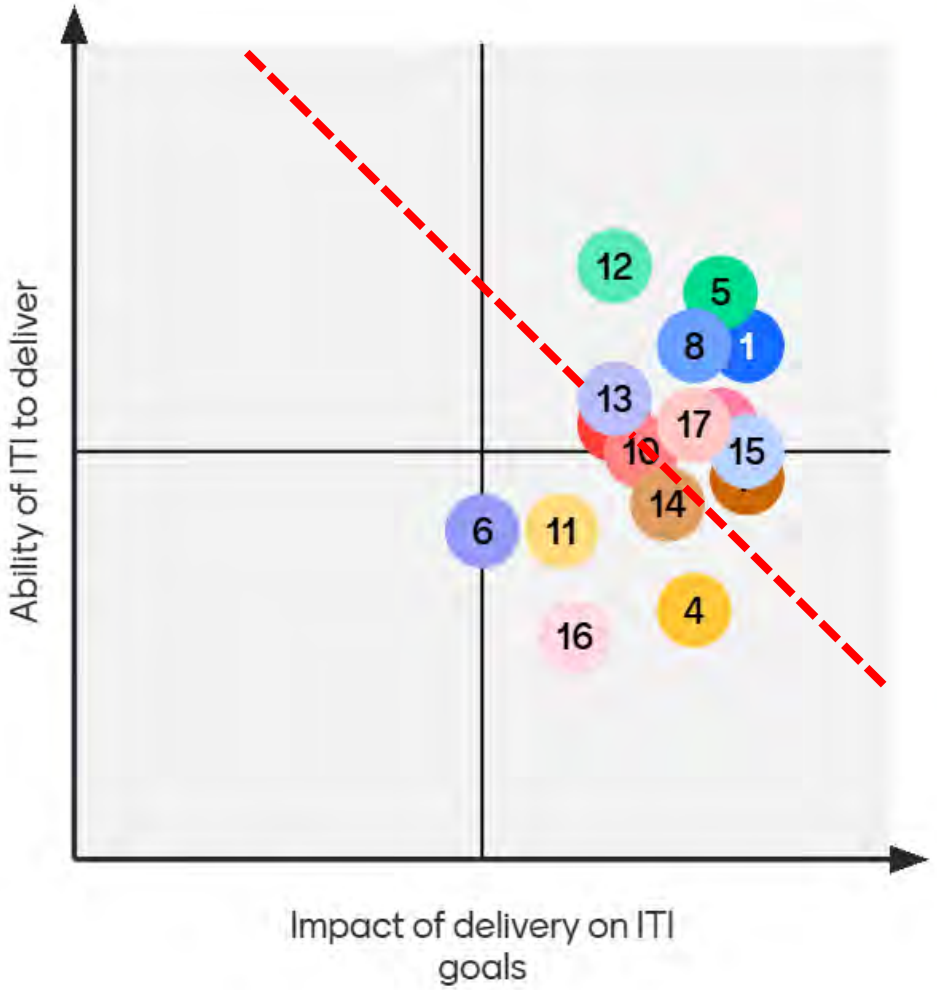


Overview of recommendations for InterTradeIreland



Recommendations workshop with InterTradeIreland

- Everoze facilitated a workshop with InterTradeIreland to assess the ability of ITI to deliver and the potential impact of the recommendations on InterTradeIreland's goals.
- Each of the 17 recommendations in the long list were assessed against these two criteria to provide the graph on the right.
- The top 10 recommendations were identified as those above the dotted red line as these are the highest impact activities which ITI are most able to deliver.
- These are recommendations 1, 2, 5, 7, 8, 9, 12, 13, 15 and 17. They are laid out on the following slide along with the key entities to support in the delivery of the recommendations.



1. Map support schemes and funding for supply chain companies both sides of the border
2. Assess gaps in supply chain support mechanisms
3. Facilitate best practice and learning sharing between UK and Ireland for OSW supply chain development
4. Support coordination of port investment and planning across the island of Ireland
5. Develop an all-island offshore wind cluster
6. Assess cross-sector opportunities (eg. aviation in NI, cyber security in Ireland)
7. Align supply chain priorities to supply chain strengths
8. Align research priorities across the island of Ireland & link to supply chain strengths
9. Promoting cross-border research collaboration, with industry, government agencies, and academia
10. Assess the barriers for skills transfer across the border
11. Support the development of a stronger coordinating body in Northern Ireland, based on the approach of Skillsnet in Ireland, or ESP in Scotland
12. Support cross-border sharing of best-practice and collaboration between skills agencies
13. Help SMEs navigate local content policies
14. Lobby for a consistent project pipeline across the whole island
15. Push for all-island local content
16. Support expansion of grid & storage
17. Develop an all island vision statement

Top Recommendations

Map support schemes and funding for supply chain companies both sides of the border

Evidence base: *WP1 (policy review), WP3 (SME opportunity mapping)*

Relevant stakeholders: *OWGP, InvestNI, DETE, Enterprise Ireland, Gael Offshore Network, NIMO.*

Key output*: *database of funding streams*

First milestone: *terms of reference for mapping exercise*

Links to other recommendations: *Feeds into (2), contextual input for (13)*

Identify gaps in supply chain support mechanisms

Evidence base: *WP1 (policy review), WP3 (SME opportunity mapping)*

Relevant stakeholders: *OWGP, InvestNI, DETE, Enterprise Ireland, Gael Offshore Network, NIMO, UK Gov DBT.*

Key output: *shortlist of focus areas for supply chain policy*

First milestone: *gap analysis of support schemes against supplier needs*

Links to other recommendations: *Draws on output from (1)*

Develop an all-island offshore wind cluster

Evidence base: *WP1 (policy review), WP4 (overcoming barriers and maximising opportunities)*

Relevant stakeholders: *See clusters map on page 56 of WP1 Policy review report.*

Key output: *cluster implementation plan*

First milestone: *defined focus and objectives for all-island cluster*

Links to other recommendations: *draws on output from (7)*

Align supply chain priorities to supply chain strengths

Evidence base: *WP2 (international comparison), WP3 (SME opportunity mapping), WP4 (overcoming barriers and maximising opportunities)*

Relevant stakeholders: *InvestNI, DfE, DETE, Enterprise Ireland, Gael Offshore Network, NIMO.*

Key output: *re-aligned supply chain programmes*

First milestone: preliminary *statement of priorities*

Links to other recommendations: *input to (5), input to (15)*

Align research priorities across the island of Ireland & link to supply chain strengths

Evidence base: *WP4 (overcoming barriers and maximising opportunities)*

Relevant stakeholders: *Universities across the island, DECC, DETE, DfE, InvestNI.*

Key output: *position statement on revised research priorities*

First milestone: *comparative analysis of research priorities and supply chain strengths*

Links to other recommendations: *input to (9)*

Key outputs provided as examples only, appropriate outputs may differ

Promoting cross-border research collaboration, with industry, government agencies and academia

Evidence base: *WP4 (overcoming barriers and maximising opportunities)*

Relevant stakeholders: *Universities across the island, DECC, DETE, DfE, InvestNI.*

Key output: *targeted campaign*

First milestone: *statement of research collaboration benefits*

Links to other recommendations: *draws on (7) & (8)*

Support cross-border sharing of best-practice and collaboration between skills agencies

Evidence base: *WP4 (overcoming barriers and maximising opportunities)*

Relevant stakeholders: *Skillsnet Ireland, Northern Ireland Skills Council (NISC), DfE.*

Key output: *best-practice guidelines*

First milestone: *statement of skills collaboration benefits*

Links to other recommendations: *draws on (5) & (7)*

Help SMEs navigate local content policies

Evidence base: *WP1 (policy review), WP3 SME opportunity mapping*

Relevant stakeholders: *The Crown Estate, DESNZ, DETE, DECC, DfE.*

Key output: *SME local content toolbox*

First milestone: *assessment of local content landscape*

Links to other recommendations: *draws on (2) & (7)*

Develop an all-island vision statement

Evidence base: *WP1 (policy review), WP2 (international comparison), WP3 SME opportunity mapping, WP4 overcoming barriers and maximising opportunities)*

Relevant stakeholders: *InvestNI, DfE, DETE, DECC, Enterprise Ireland.*

Key output: *landmark report*

First milestone: *define overarching objectives and audience*

Links to other recommendations: *can act as a framing document for other recommendations*

Other recommendations

#	Recommendations
3	Facilitate best practice and learning sharing between UK and Ireland for OSW supply chain development
4	Support coordination of port investment and planning across the island of Ireland
6	Assess cross-sector opportunities (e.g. aerospace in NI, cyber security in Ireland)
10	Assess the barriers for skills transfer across the border
11	Support the development of a stronger coordinating body in Northern Ireland, based on the approach of Skillnet in Ireland, or ESP in Scotland
14	Support a consistent project pipeline across the whole island
16	Support rapid expansion of grid infrastructure, reinforcement & storage

DISCLAIMER

This document has been prepared and is issued by Everoze Partners Limited (“Everoze”) to the named Client on the title page in accordance with the contract document ITI001-P-01-A dated 29/08/2024, which governs how and by whom it should be read and used.