UK Hybrid Project Forum

10th March 2021

Department for Business, Energy & Industrial Strategy

1

Welcome and Introduction

Chris Fox

Head of Europe and Offshore, BEIS

Department for Business, Energy & Industrial Strategy

Housekeeping

- Due to the number of attendees, the microphones and the chat function have been disabled for this webinar.
- You can submit questions via the Q&A function. However, please note that we won't be able to respond to all of your questions during the webinar.
- Please refrain from posting anonymously, as we won't be able to respond to you following the webinar.
- While we welcome all views and strive to be transparent, we reserve the right to not publish any comments or questions which are deemed inappropriate.

Agenda

1	10:00 am	**Welcome and Introduction**	**BEIS –** Chris Fox, Head of Europe and Offshore
2	10.05 am	**Keynote speech**	**UK Minister Anne-Marie Trevelyan,** Minister for Business, Energy and Clean Growth
3	10:15 am	**North Seas Energy Cooperation (NSEC)**	**Belgian Minister Tinne Van der Straeten,** President of NSEC
4	10:25 am	**Offshore Transmission Network Review**	**BEIS –** Chris Fox, Head of Europe and Offshore
5	10:30 am	**BEIS' programme of engagement with North Sea countries**	**BEIS –** Ben Zaczek, Head of Interconnection and Future International Projects
6	10.45 am	**Forward look to COP26**	**BEIS –** Ed Webber, Deputy Director, International Climate Action
7	10:50 am	**Electricity Interconnectors and MPIs**	**Ofgem –** Stuart Borland, Head of Interconnectors and Offshore Coordination
8	11:00 am	**Multi-Purpose Interconnectors: A key to unlocking offshore wind**	**National Grid Ventures –** Jon Butterworth, Managing Director
9	11:10 am	**Developer perspective on hybrid projects**	**Vattenfall –** Danielle Lane, Head of Market Development Offshore & Country Manager for the UK
10	11:20 am	**Experiences and lessons learnt from Kriegers Flak**	**50Hertz** – Marco Nix, Chief Financial Officer
11	11:30 am	**View from Europe**	**Wind Europe –** Giles Dickson, Chief Executive Officer
12	11:35 am	**Q+A**	**All presenters,** chaired by Giles Dickson
13	11:57 am	**Closing Remarks**	**BEIS –** Chris Fox, Head of Europe and Offshore

2

Keynote speech

Rt Hon Anne-Marie Trevelyan MP, UK Minister for Business, Energy & Clean Growth

3

North Seas Energy Cooperation

Minister Tinne Van der Straeten,

President of the North Seas Energy Cooperation, Belgium

4

OTNR Context and Objectives

Chris Fox

Head of Europe & Offshore, BEIS

Department for Business, Energy & Industrial Strategy

OTNR Context

2050 Net Zero

10 Point Plan

68% Reduction in GHG by 2030

COP26 Glasgow 2021

40GW by 2030

>3GW per year

18GW Interconnection by 2030

- Under the current regime, offshore wind developers connect their projects to the onshore grid by individual point-to-point connections, an approach designed when the 2030 offshore wind ambition was just 10GW
- In light of the new, ambitious offshore wind target of 40GW by 2030 as set out in the Prime Minister's Ten Point Plan, and the expectation of more offshore wind beyond that to deliver net-zero by 2050, radial offshore transmission links are not likely to be economically and environmentally optimal for many areas.
- However, delivering 40GW of offshore wind by 2030 is challenging and requires a rate of deployment of >3GW per year. This equates to 1 turbine being installed each weekday throughout the whole of the 2020's.
- We currently have 6GW of interconnection, which supports security of supply, reduces prices and provides an important source of flexibility needed to integrate renewable energy.
- With the huge growth in offshore wind, GB is expected to become a net exporter of excess green energy, potentially as early as 2026, and in our Energy White Paper we set an ambition of reaching at least 18GW of interconnection capacity by 2030.
- The regulatory framework for developing and connecting offshore wind and interconnection is complex and involves multiple government departments, regulators, statutory bodies, devolved administrations and industry parties.

OTNR Objective & Workstreams

Ensure that the transmission connections for offshore wind generation are delivered in the most appropriate way, considering the contribution offshore wind is expected to make towards net-zero by 2050. This will be done with a view to finding the appropriate balance between environmental, social and economic costs.

1	**Early Opportunities**	• Capitalise on early opportunities for coordination through identifying inflight projects that have the potential to coordinate with changes to, or existing flexibility within, current regulatory framework.
2	**Pathway to 2030**	• Enabling achievement of 40 GW target for 2030 by increasing central coordination and accelerating delivery of the required onshore and offshore grid infrastructure
3	**Enduring Regime**	• Design and implement the changes necessary for more efficient connection of early-stage and future offshore wind projects
4	**Multi-Purpose Interconnectors**	• Deliver near-term changes to facilitate the development of MPIs before 2030 and develop an enduring regime for the longer term.

Multi-purpose interconnectors

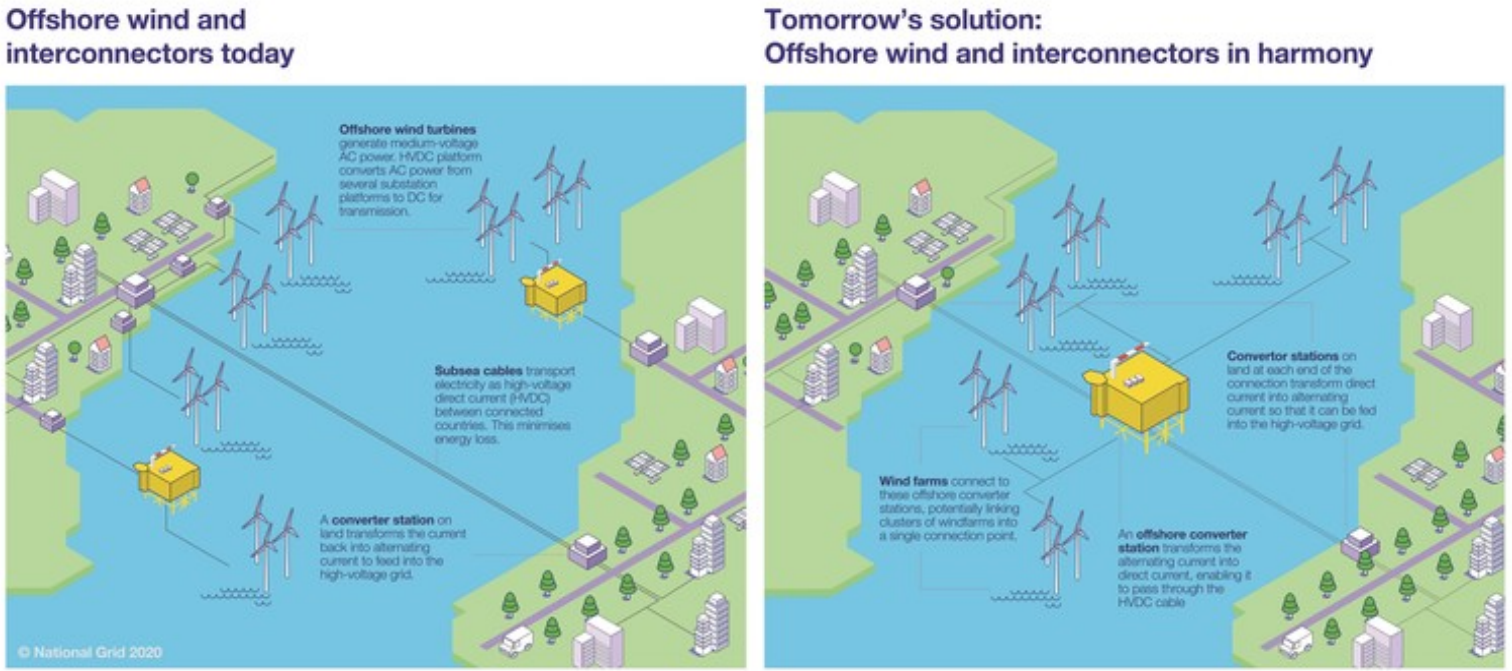
Within each workstream we will consider the validity of options' design and associated regulatory change to support MPI projects

What are Multi-Purpose Hybrid Interconnectors?

Hybrid or Multi-Purpose Interconnector Projects combine offshore wind with market-to-market interconnection and have the potential to provide more coordinated and efficient offshore development.

Potential benefits include:

- Cost reduction compared to reference case
- Consumer benefits
- Trigger new offshore wind and interconnector capacity
- Reduced spatial/environmental impact
- Efficient use of offshore network
- Transition to Net Zero 2050



This image shows a comparison of offshore wind and interconnectors today with point-to-point connection, with a potential future hybrid solution where offshore wind and interconnectors work in harmony. Source: National Grid.

5

BEIS Programme of Engagement

Ben Zaczek, Head of Interconnection and Future International Projects, BEIS

Engagement with North Seas neighbours

- Common decarbonisation ambition
- OTNR may only address half of the issues
- Work with and learn from near-neighbours to ensure approaches are compatible
- EU-UK Trade and Cooperation Agreement
- Concepts to real-world projects
- FCDO Prosperity Strategy

Foreign, Commonwealth & Development Office

Department for Business, Energy & Industrial Strategy

This image shows the offshore wind potential in Europe for the Atlantic, Baltic and North Sea. Source: WindEurope.

Bilateral Ministry-Ministry Engagement

Netherlands, Germany, Ireland, Denmark, Belgium, Norway

Industry Workshops and Deep Dives

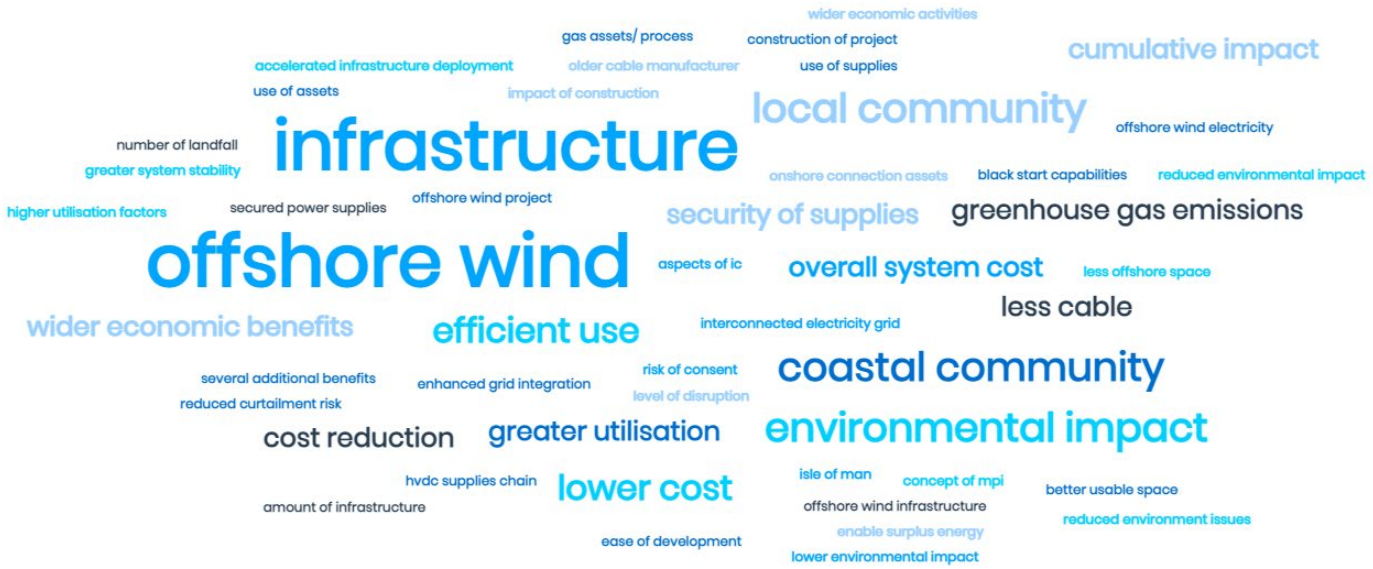
Attendees include:

- Ministries
- Regulators
- Wind developers
- Transmission companies
- Interconnectors
- Investors
- Academics

Example questions:

- What are the socio-economic and wider benefits of multi-purpose interconnectors?
- What lessons can the UK learn from other projects?
- What are the key considerations in the future of multi-purpose interconnector development?
- What role should Government and Regulators take to enable multi-purpose interconnectors to be built?
- What should the cooperation priorities be for the UK?

- **What are the socio-economic and wider benefits of multi-purpose interconnectors?**



This word cloud shows offshore wind, infrastructure, environmental impact, local community and coastal community as key words.

"We need that wind production to be connected to larger markets and with more flexibility, so we need those wind farms connected to a larger base so that's where we see the most benefit with hybrid projects."

"Environmental and spatial planning benefits, less infrastructure and landing points, and higher utilisation factors of the infrastructure built."

"More efficient use of offshore wind assets, reducing costs."

"Balancing of wind energy that differs regionally"

- **What lessons can the UK learn from other projects and key considerations?**

This word cloud shows regulatory framework and market arrangements as the top key words.

"UK and EU legislators will have a key role in the development of the framework. Ideally, they should start with a common set of definitions and understanding of the relevant concepts."

"Market design should be acceptable to all stakeholders involved (developers + countries)"

"Kreigers-Flak example may not be the long-term solution and future certainty crucial."

- **What role should Government and Regulators take to enable multi-purpose interconnectors to be built?**

This word cloud shows anticipatory investment, private sector and regulatory framework as key words.

"Develop a clear regulatory framework - without it, it will not be possible for parties to invest with confidence"

"Put a stake in the ground - establish a vision for what the North Sea energy network will look like in 2050, create the regulatory and market framework, that enable capital to be deployed and projects to get built."

"A degree of integrated planning across jurisdictions: not only of IC projects and related grid, but also of OSW leasing and planning."

- **What should the cooperation priorities be for the UK?**

This word cloud shows mutual interest as the top key word.

"Political support and all need to see the benefits. Market design will also be key and current rules did not anticipate hybrid asset."

"Clarify the governance set-up on North Sea offshore cooperation."

"Set up intergovernmental coordinating group to develop plans, policies and regulations to facilitate the development of hybrid interconnectors."

Key lessons

- Huge interest and ambition across the region
- Broad scope of potential benefits
- Complex barriers - will require coordination across actors
- Government leading role in providing clarity of direction and legal and regulatory framework
- Common barriers to be addressed collaboratively

Next steps

- Feed in the outputs of workshops to the OTNR
- Welcome engagement with OTNR and provide updates on our work
- Further bilateral engagement and multi-lateral collaboration with North Seas neighbours

Collaboration towards common solutions

6

Forward look to COP26

Ed Webber

Deputy Director, International Climate Action, BEIS

PARIS GOALS

Reduce emissions
Adapt and build resilience
Mobilize finance

Nationally Determined Contributions (NDCs) and Long Term Strategies (LTSs)

Evidence strong national action

Negotiations

Build international consensus

Campaigns

Drive international collaboration and green resilient recovery

- International Engagement and Partnerships
- Civil Society engagement and Year of Climate Action
- Presidency convening power
- Domestic leadership

The Energy Transition Campaign has 5 elements

These will support countries to phase out coal and focus on clean power

Phase out of coal power

Engaging key countries to join the Powering Past Coal Alliance and commit to coal phase out, with developed countries taking the lead

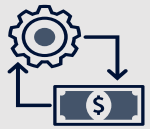
End international coal financing

Pushing back on international coal finance

Focus of the Energy Transition Council

More attractive clean energy offer

MDBs and donors support developing countries to increase use of renewables and commit to reduce new coal pipeline, a moratorium on coal, or refreshed national energy plans



New financial framework

Establishing financial and technical assistance to support a just transition away from existing coal

Product efficiency call to action

Doubling the efficiency of key products sold globally by 2030.

COP Opportunities

COP26 Green Grids initiative

- Aim: to coordinate expansion and strengthening of grids to facilitate a rapid expansion of renewables
- Proposing political and technical cooperation:
  - High level political agreement, potentially building on existing initiatives, e.g. India's One Sun One World One Grid (OSOWOG) vision
  - Technical cooperation through acceleration of regional initiatives and peer-to-peer knowledge exchange between regions, drawing on UK expertise and partners on North Seas cooperation

Energy Transition Council (ETC)

- Working-level country dialogues: 14 ETC countries & regional sessions with Africa and Asia Group countries.
- Collaboration from the international community on green grids. Regional power trading is a key area of interest for many participating.

Powering Past Coal Alliance

- GB's Electricity System Operator, National Grid, joined the PPCA in July 2019, bringing their wealth of experience and knowledge of decarbonising a Grid system while maintaining energy security. Welcome others to join.

Opportunities to get involved

- Engagement in policy development and technical support for the Green Grids initiative and ETC process
- Race to Zero, event-hosting, UK pavilion participation

7

Electricity Interconnectors and MPIs

Stuart Borland

Head of Interconnectors and Offshore Coordination, Ofgem

Department for Business, Energy & Industrial Strategy

Aim and contents

Session aim: To provide an update on Ofgem's regulation of electricity interconnectors and multiple-purpose interconnectors (MPIs).

Contents:

I. GB's approach to interconnector development
II. Ofgem's cap and floor regime
III. Ofgem's work on MPIs
IV. Our interconnector policy review – next steps

Context

Interconnectors can support the delivery of our major energy policy goals. We introduced the cap and floor regime in 2014 to encourage investment in new electricity interconnectors in order to realise these benefits.

We are currently considering future regulatory approaches via our IC Policy Review, both for 'classic' interconnectors and for MPIs.

4 GW → **6 GW** → **9.8 GW** → **15.9 GW** → **TBC…**

IC capacity prior to C&F regime

IC capacity now

IC capacity incl. projects under construction

IC capacity incl. projects with Ofgem approval

Department for Business, Energy & Industrial Strategy

Energy White Paper (Dec 2020) sets an ambition to realise at least **18GW by 2030**. Highlights contribution of ICs to decarbonisation.

Climate Change Committee

6th Carbon Budget (Dec 2020) highlights role of interconnectors as enabler for Net Zero.

nationalgridESO

NOA 2021: Optimal range of **16.9 GW to 27.7 GW** of interconnection in 2040.

Developers: Pipeline of **32GW** of connection offers in NGESO IC register.

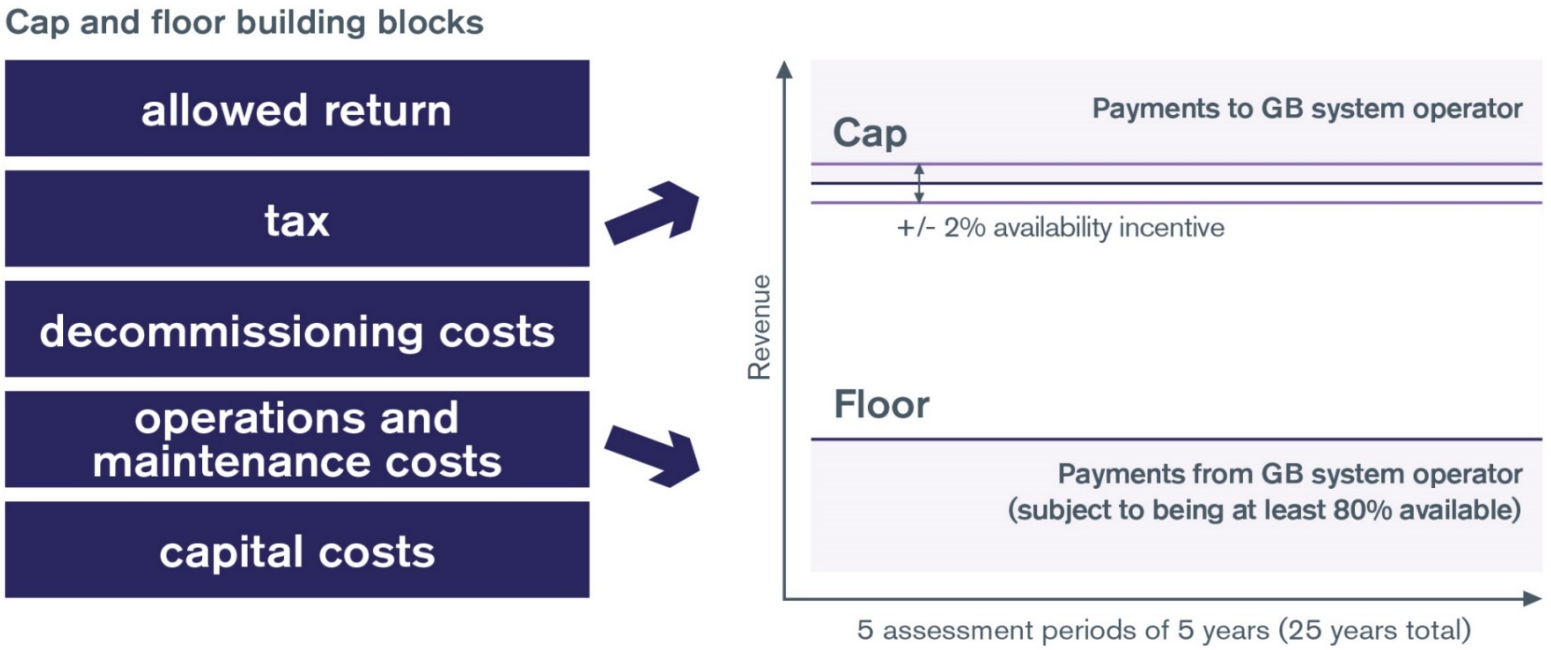
GB's approach to interconnector development

Non-regulated model: Exemptions from European legislative requirements

- Developers can apply for exemptions from certain aspects of European and UK legislation. The only route to realise investment until 2014.
- BritNed (GB-Netherlands, 2011); ElecLink (GB-France, 2022).

Regulated model: Cap and floor regime

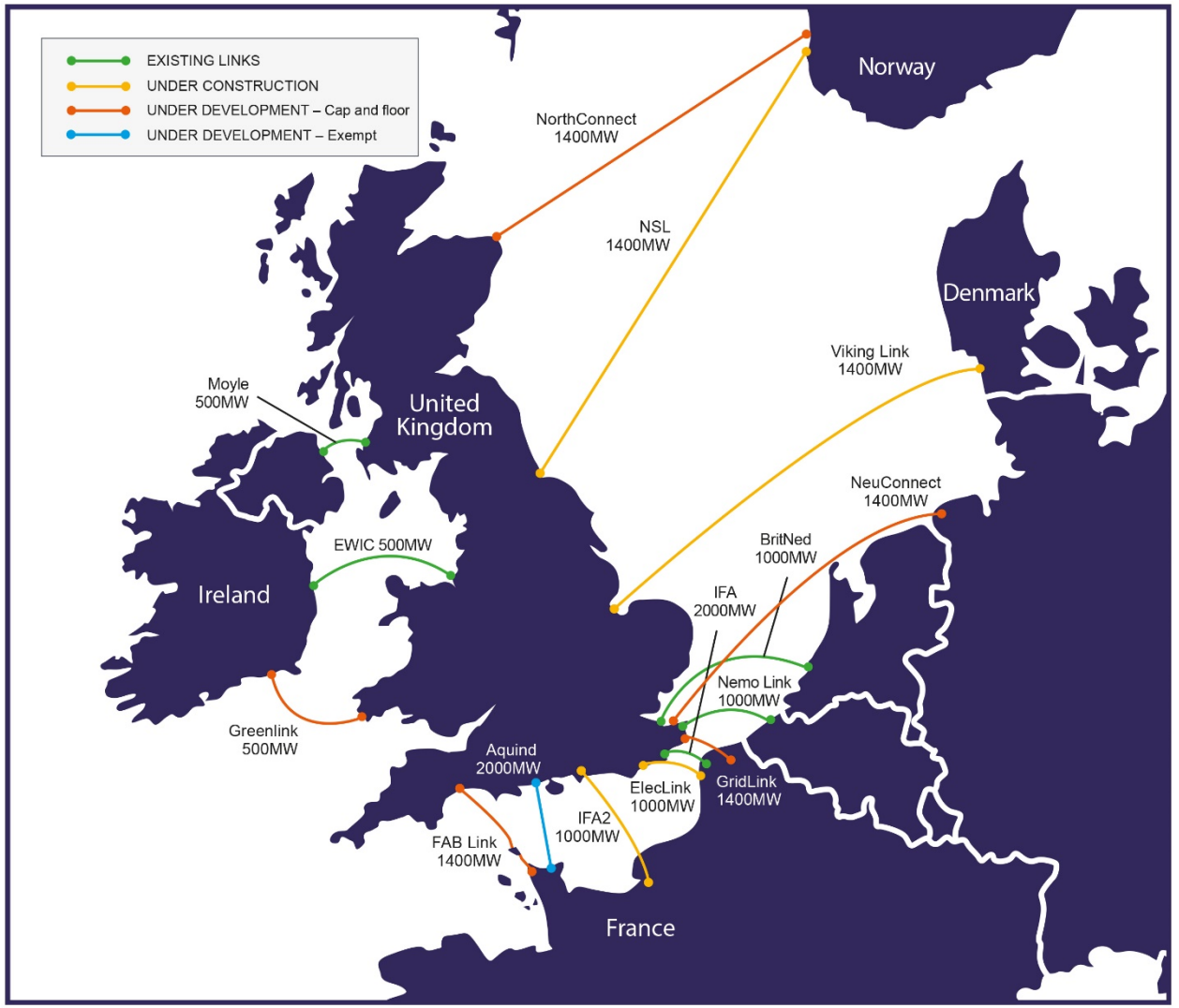
- Cap and floor regime provides developers with a minimum return (floor) and a limit on the potential upside (cap) for a 25-year period.



This graph illustrates GB's cap and floor regime for interconnector development.

Project pipeline

To date, we have approved up to a **maximum of 15.9GW** total capacity. However, it is not certain that all of these links will go ahead.



This image shows electricity interconnection links between GB and Europe. This includes existing and potential links.

Ofgem's work on MPIs

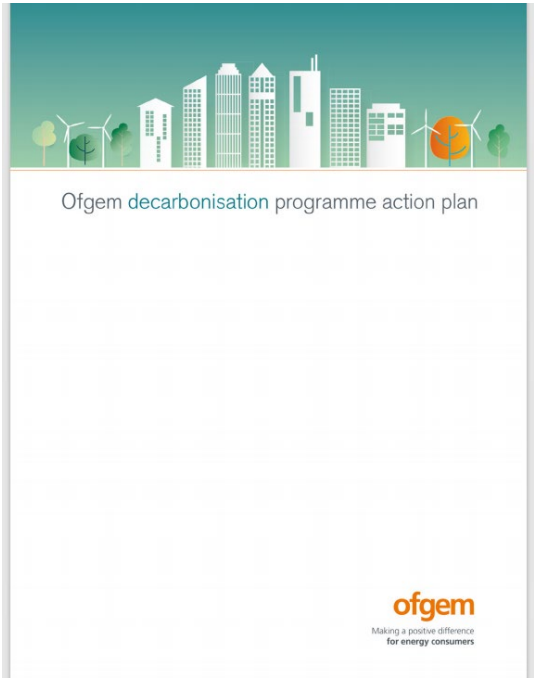
Previous work: Integrated Transmission Planning and Regulation (ITPR) project, 2015

*"**We will maintain continuity in the regulatory treatment of an existing transmission asset if it evolves into an MPP**, and work with relevant parties to determine the most appropriate treatment of projects that are MPPs from the outset.*

*For projects that evolve into MPPs, this means that **we will look to ensure the GB regulatory arrangements don't require a change in ownership, and that owners of an existing asset are at least as well off from forming an MPP, providing the MPP is economic and efficient**. Treatment of specific MPPs will also need to consider EU requirements, for example requirements relating to unbundling and third party access. Clarity in the regulatory approach for MPPs will mean this potential barrier to investment in flexible and coordinated network solutions is removed."*

Ongoing engagement on regulatory issues for MPIs and meshed grids, including through the North Seas Energy Cooperation (NSEC), CEER, and multilateral engagement with interested governments, regulators, developers and industry.

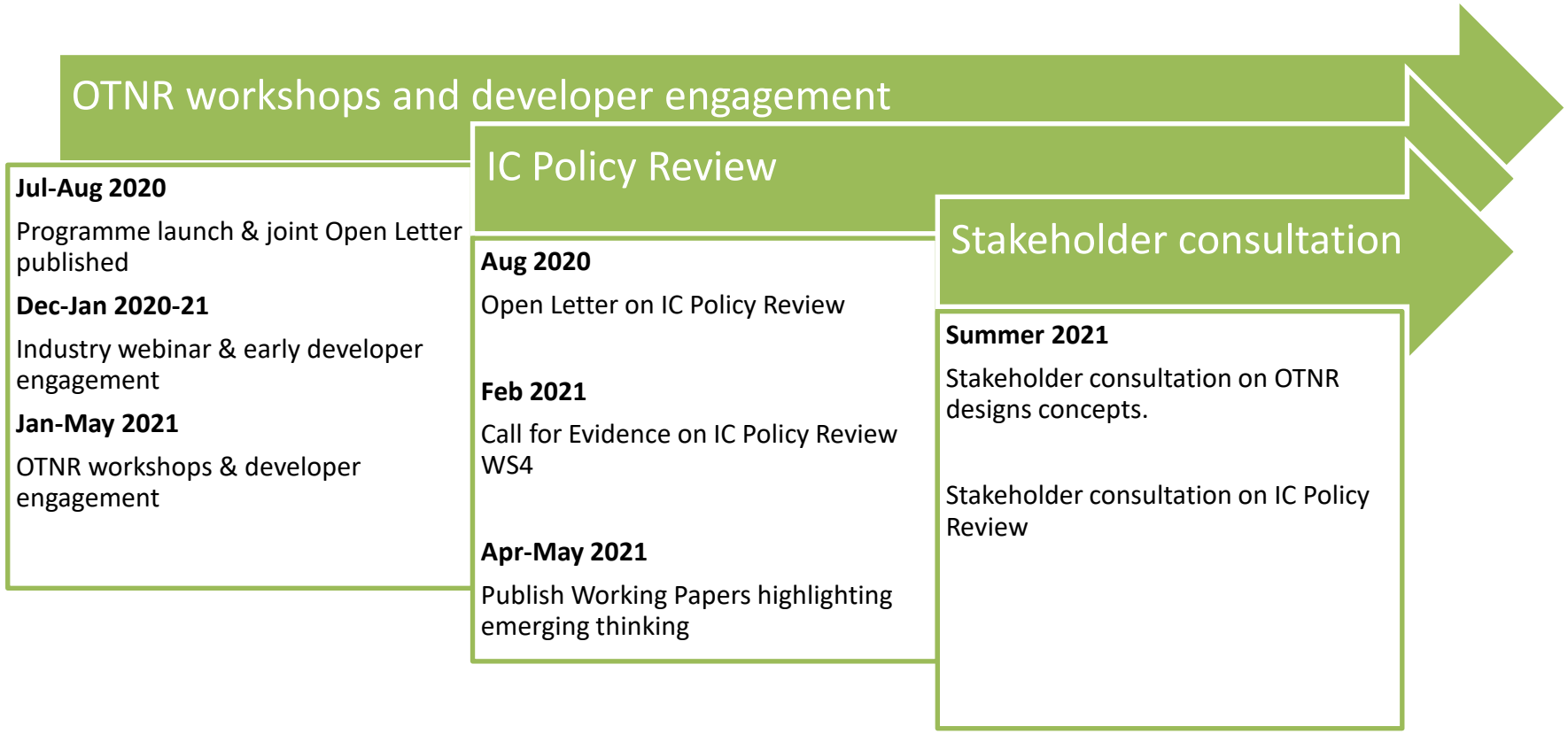
Commitment to exploring offshore grid coordination in our **Ofgem Decarbonisation Action Plan** – February 2020



Ofgem's work on MPIs

Offshore Transmission Network Review

- The OTNR seeks to enable the delivery of **early opportunity MPIs** and to develop an **enduring regime for MPI delivery** beyond 2030.
- We are currently working with BEIS and developers, focusing on the identification of barriers within the regulatory framework and potential solutions, while ensuring alignment with our ongoing **Interconnector Policy Review**.



ofgem Making a positive difference for energy consumers

Ofgem's Interconnector Policy Review

The primary objective of our interconnector policy review is to **establish whether there is a need for further GB interconnection capacity** beyond those projects currently with regulatory approval.

If so, the secondary objective of this review is to **consider Ofgem's approach to the regulation of future GB interconnection**.

WS1 – Critical review of the cap and floor regime

WS2 – Socio-economic market modelling

WS3 – Review of the wider impacts of interconnection

WS4 – Multiple Purpose Interconnectors

WS5 – Consolidation

Targeted stakeholder engagement

Interested in contributing to the review, or for any updates on our progress?
Please get in touch at: Cap.Floor@ofgem.gov.uk

ofgem Making a positive difference for energy consumers

Workstream 4 - MPIs

Summary

This workstream will:

- Review whether the final conclusions of our ITPR project on MPIs remain fit for purpose.
- Consider options for the regulation of MPIs and how this might interact with our regulatory approaches to point-to-point interconnectors. We will consider this alongside our ongoing work on OTNR.

Call for Evidence – February 2021

- How should we treat MPIs? Are they a new, single asset class, or can each of their parts be treated separately?
- Is the C&F a potentially suitable regime for MPIs? Are there more suitable regulatory models?
- Wider topics: licencing and unbundling, charging arrangements, revenue regulation.

Timelines:

- One-to-ones/interviews – March/April 2021
- Working Paper consultation on MPIs – Late Spring 2021
- Recommendations and next steps – Summer 2021

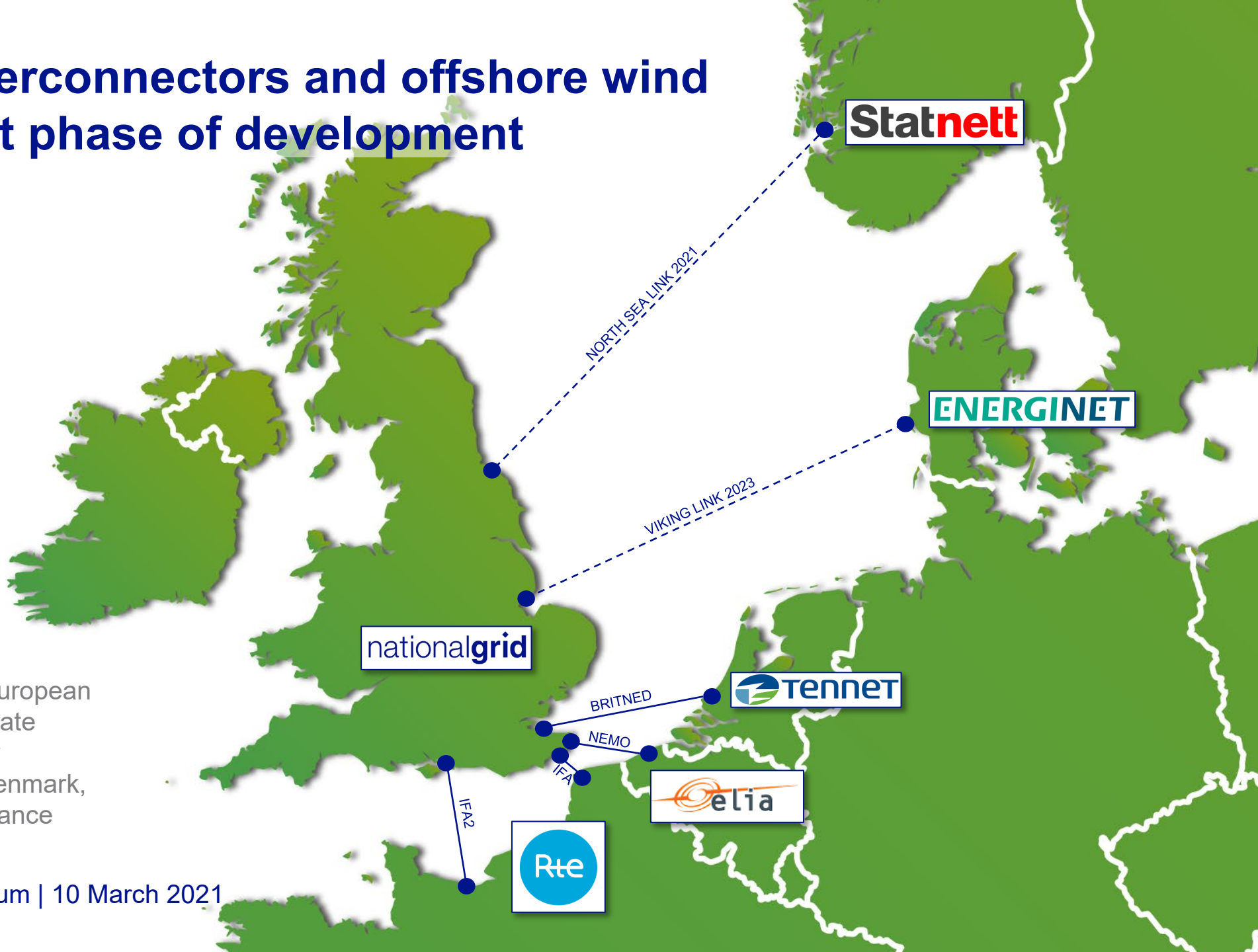
8

Multi-Purpose Interconnectors: A key to unlocking offshore wind

Jon Butterworth

Managing Director, National Grid Ventures

Point-to-point interconnectors and offshore wind represent the first phase of development

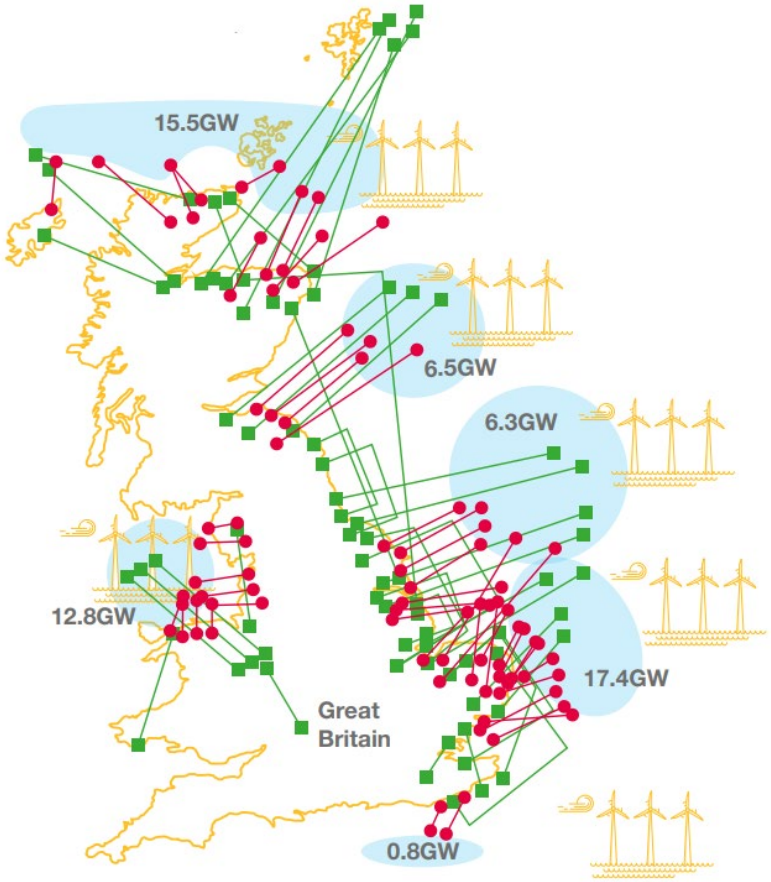


8GW

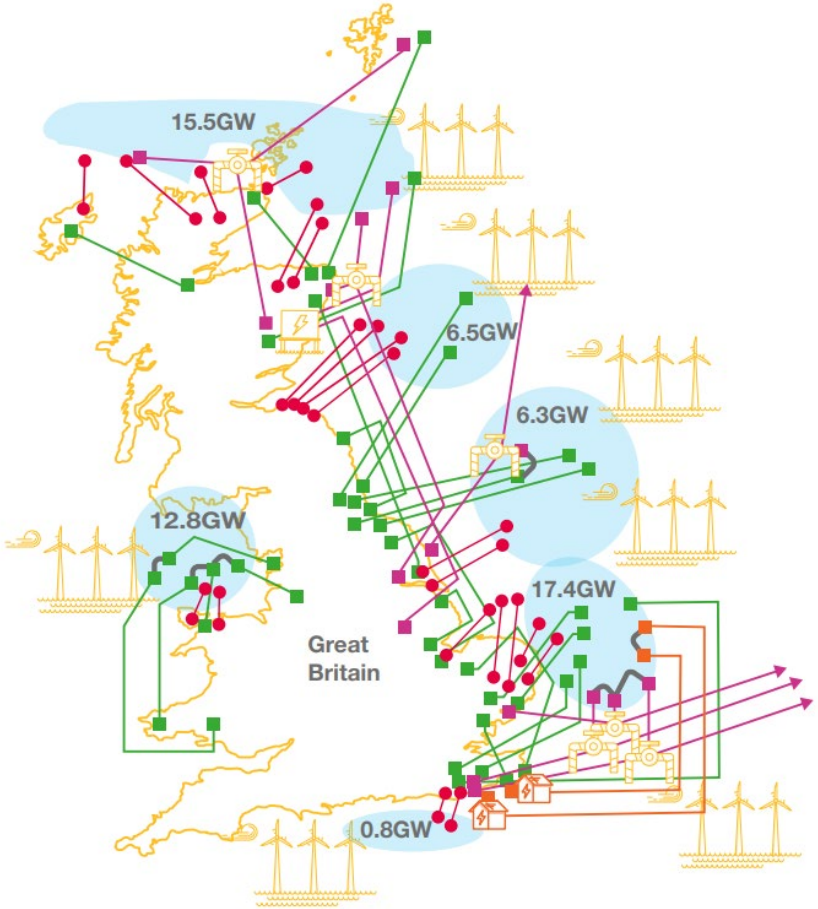
By 2024 National Grid and our European partners will jointly own and operate ~8GW of interconnector capacity connecting the UK to Norway, Denmark, the Netherlands, Belgium and France

Coordination including MPIs offers a cost-effective and environmentally friendly approach to achieve North Sea offshore wind targets

CURRENT APPROACH



INTEGRATED APPROACH



BENEFITS*

Landing points
105 to 30

Onshore & offshore cable
11,585km to 6735km

HVDC substations
57 to 20

* National Grid ESO *Offshore Coordination Project Report*, December 2020

We are working with our European partners to deliver MPI projects by 2030

We have grid agreements for 6.4GW to access target markets by 2030

We are exploring an MPI between GB and Belgium

In September 2020 we announced a partnership with TenneT to connect up to 4GW of offshore wind with interconnectors to GB and NL

MPIs could deliver significant consumer value vs point-to-point connections for GB & EU consumers

Using NGV's 6.4GW of grid agreements as MPIs, enabling the connection of up to 12.8GW of offshore wind in the North Sea, could deliver significant benefits:

21mt

additional carbon emissions savings

Equivalent to 4.6 m cars driven for 1 year

£3.1bn

net socio-economic welfare benefit

From coordination between offshore wind & interconnectors

>50%

reduction in landfalls & DC converters

From 18 GB & EU landfalls down to 8

* Study by Baringa Consultants 2020. Compared to point-to-point solutions. SEW benefits calculated over 20 year period 2030-2050. Analysis did not include onshore transmission or system operations costs.

Together we can change the world: working together we have the power to build a better way to connect and optimise offshore wind

OTNR

BRINGING ALL UK PLAYERS TOGETHER

TCA

FRAMEWORK FOR EU-UK COOPERATION

COP26

GLOBAL LEADERSHIP

nationalgrid

9

Developer perspective on hybrid projects

Danielle Lane

Head of Market Development Offshore & Country Manager for the UK, Vattenfall

10

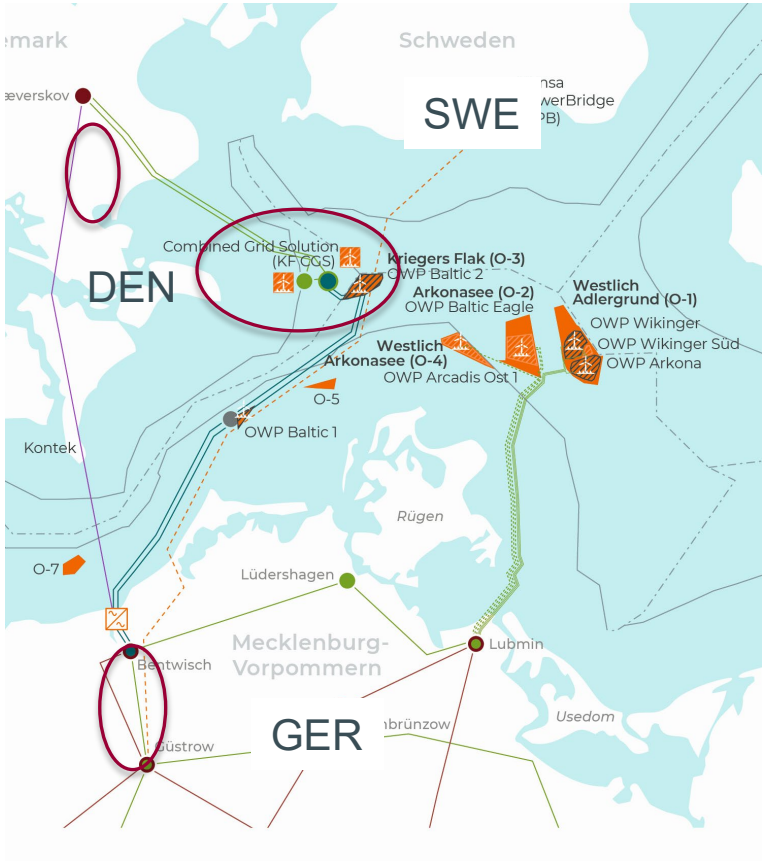
Experiences and lessons learnt from Kriegers Flak

Marco Nix

Chief Financial Officer, 50Hertz

Department for Business, Energy & Industrial Strategy

Kriegers Flak – Combined Grid Solution (KF CGS) is the first hybrid interconnector: it connects Germany, Denmark and 4 offshore windfarms

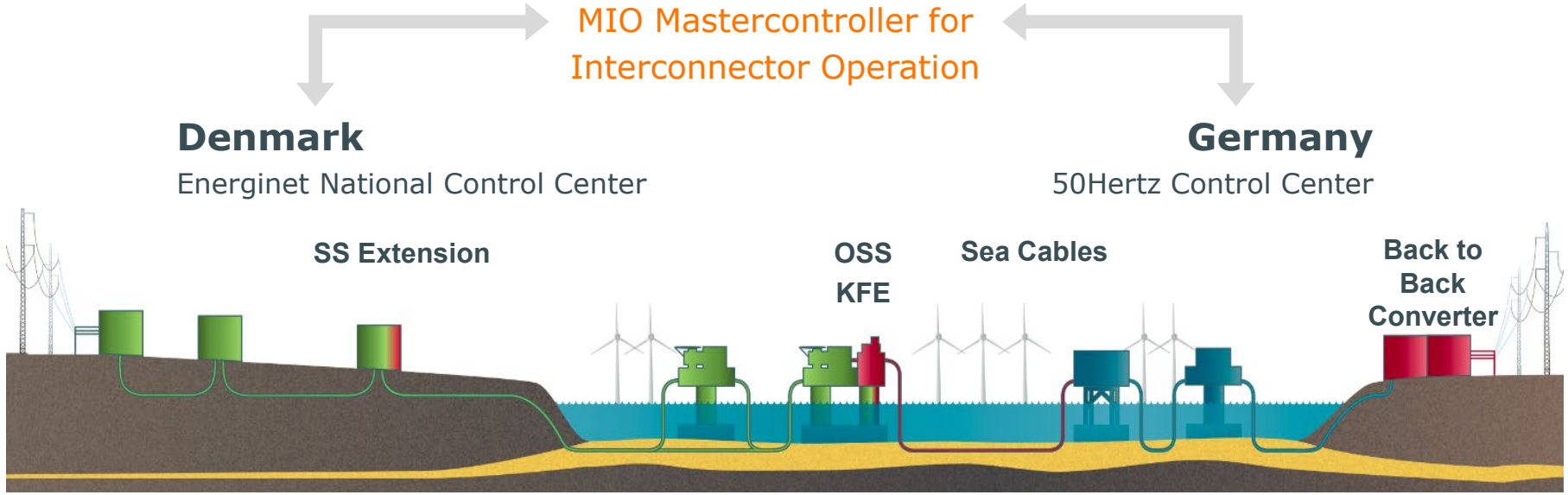


- Radial connections were developed in Germany and Denmark
- Offshore wind farms are so close that interconnection soon came into focus
- Main rational: Security of Supply in Denmark (Seeland Island) and further market convergence
- KF CGS was developed over more than 10 years
- Total costs at 280m€ - much below budget
- Co-financing under EEPR
- Decoupling of frequencies is done onshore via back-to-back HVDC converter

Co-financed by the Connecting Europe Facility of the European Union

This image shows the location of the Kriegers Flak Combined Grid Solution, connecting Germany, Denmark and 4 offshore wind farms.

KF CGS – A common project of 50Hertz and Danish TSO Energinet utilizing existing assets highly efficient



This image shows the Kriegers Flak interconnection between 50Hertz (Germany) and Energinet (Denmark).

Green – existing grid connection Kriegers Flak, Energinet

Blue – existing grid connection Baltic 1+2, 50Hertz

Red – KF CGS infrastructure

KF CGS is the world`s first hybrid interconnector, co-financed by the European Energy Program for Recovery (EEPR).

Co-financed by the Connecting Europe Facility of the European Union

MIO Input Data – *Brain Food*

Wind forecast

Dynamic line rating currents

Actual topology and measurements

Market schedules

Outage Planning

Onshore grid capacity

Co-financed by the Connecting Europe Facility of the European Union

KF CGS provided a wealth of lessons learnt

Technical

- Effectively reduce the risks in the project – reduce offshore to the bare minimum
- Common (international) project engagement / steering
- Reduce complexity in the single project to achieve something tangible
- But stay open up for innovation like MIO
- Consider extension options within radial connections – upgrade readiness

Markets

- Offshore Wind by far the most efficient, reliable and scalable renewable energy source
- Follow a broader (European) Perspective
- Align incentives among the participants (timing, roles) across countries
- Get use of the Northern/Baltic Sea initiatives to come to common initiatives
- Efficient and reliable market rules for Hybrids considering dynamic infeed situation
- Reliable framework over the project lifetime

Co-financed by the Connecting Europe Facility of the European Union

Hybrid projects are an essential part of utilization of Offshore Wind energy …

This image shows the official launch of Kriegers Flak Combined Grid Solution, by 50Hertz and Energinet.

… and require a long-term view, excellent cooperation and a reliable regulatory framework

Co-financed by the Connecting Europe Facility of the European Union

11

View from Europe

Giles Dickson

Chief Executive Officer, WindEurope

12

Q+A

All presenters

Chaired by Giles Dickson

7

Closing remarks

Chris Fox

Head of Europe & Offshore, BEIS

UK Hybrid Project Forum Summary

Key takeaway messages:

- ✓ We recognise that multi-purpose hybrid interconnectors have the potential to play a key role in meeting net zero and will be taking forward work under the OTNR to explore what changes are needed to support the delivery of these projects.
- ✓ Engaging with our North Seas partners is a critical part of our work and we are looking forward to strengthening our cooperation.
- ✓ We will continue working to implement the EU-UK Trade and Cooperation Agreement, including on the North Seas.
- ✓ Policy recommendations and proposed changes to the existing regime will be delivered through a consultation process later this year.

Thank You