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# Offshore Grid Options Position Paper

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# Executive Summary

The offshore ambition adopted in the Climate Action Plan (CAP) is welcomed by IWEA. Industry will play a pivotal role in delivering the renewables generation required to meet Ireland's climate targets and reaching 70% renewable electricity by 2030. The increase in electricity demand from the heating and transport sectors, coupled with an increase in large energy users, primarily from increased development of data centres, will mean offshore wind is needed to decarbonise the Irish energy system, achieve emission reduction targets, meet increasing electricity demand, increase the security of electricity supply and contribute to the "*green economy*".

Industry is committed to engaging with policy makers and other stakeholder to tackle challenges associated with establishing an offshore industry in Ireland. Renewable energy will require a clear, robust and efficient policy framework to deliver in a timely and low-cost manner by 2030 – not simply via support mechanisms, but also through planning and grid policy and their effective and efficient interaction. Industry input into forming these measures, and the importing of international learnings from other jurisdictions, will be key to the success of Ireland achieving its climate targets. Policy formation needs to be set, implemented and managed across traditional government body boundaries. Considering the scale of ambition expressed in the CAP, these governance and accountability structures will be key to its success over the next decade.

In terms of capability, many of IWEA's members are already operating successfully at a global scale within international jurisdictions; and have the experience and competence to deliver offshore wind projects at scale in Ireland and to attract the right supply chain – provided the necessary policy framework and route to market is in place. There is more concern from industry on the ability to align onshore grid developments with the development of offshore grid connections. Regardless of whether projects are connected via single radial spurs or meshed offshore grid, the onshore grid capacity must available. This is to ensure that projects are not subject to high levels of constraint, which will have a direct impact on RESS auction bid prices, and ultimately project viability. Capacity firmness and assumptions of availability and performance are further industry concerns.

There are several major challenges facing the Irish offshore industry, which may impede the timely delivery of offshore wind projects to meet the 2030 climate targets set. These challenges are largely categorised into grid, planning and consenting, auctions and supply chain. Interaction is required across each of these areas for a properly functioning and globally competitive industry.

The critical factor in any decision related to a grid delivery model should be the ability of that model to facilitate the achievement of Irelands 2030 targets. The grid delivery model must be able to

accommodate, *at least,* CAP volumes within a timely manner, and to ensure a development pipeline beyond this as we plan for the future requirements beyond 2030.

It takes approximately 10 years to develop, consent, design, finance, construct and commission a typically sized offshore wind farm. With the additional time required to put all the policy measures for a centralised model in place needed in Ireland (including potentially a centralised leasing, planning interest and consenting regime), it is industry's position that this effectively rules out connection prior to 2030.

On balance, industries position is that a developer-led approach with close and continuous engagement with the EirGrid is preferred at least to 2030. For existing projects, the offshore grid developers that are already doing all the marine surveys necessary for the consenting process have considered all options relating to both grid connection cables and the generation asset. The majority of these developers already have significant experience in successfully delivering offshore projects elsewhere and are currently best placed consent and build the assets required.

Should, for any reason, a centralised model be adopted as the long-term approach, a suitably long-term transitionary pathway must be considered which recognises the impact to the current development pipeline and future renewable energy targets. We would recommend a phased transition approach to implement this is taken, with substantial levels of industry consultation throughout this process. Work must begin immediately to provide enough certainty that this model could be introduced to support projects in the early 2030s onwards.

# Table of Contents

# 1 Introduction

Under the Climate Action Plan 2019 (CAP), EirGrid are charged with developing an options paper for offshore grid models by Q1 2020. EirGrid have commissioned Navigant Consulting to develop the relevant options paper. Navigant have engaged the offshore wind industry through IWEA to gain an initial and high-level understanding of industry opinion, preference and expertise relating to offshore grid models.

This engagement was through the medium of a 45-minute meeting where Navigant provided a series of questions prior to seeking industry sentiment. The intention being this would feed into the development of the "*Offshore Grid Options*" report, which is the EirGrid deliverable under the CAP. This position paper provides a written response on the questions proposed by Navigant and is structured in the order of questions provided prior to the meeting. Accordingly, each chapter represents a question area, and each sub-section answers the specific question which was posed by Navigant to IWEA and its members.

This position paper was developed to continue the engagement with Navigant and EirGrid on suitable Offshore Grid models for Ireland. Given the critical importance of this model selection in respect of the enablement (and functioning) of an offshore industry in Ireland, IWEA would particularly welcome continued discussion with EirGrid and Navigant following the submission of this paper. The following questions were posed by Navigant for which a response was sought:

**General Questions**

1. What would be the role of industry in achieving Ireland's climate targets?
2. What would be the most important drivers for selecting a centralised or decentralised grid delivery model?
3. What do you understand by 'centralised' and 'decentralised'?
4. What do you see as main benefits/drawbacks of either model?
5. Would there be a preference for either model from industry perspective, why?
6. What do you see as main challenges for realising the Climate Action plan wind ambitions in Ireland?
    a. More specifically the offshore wind ambitions.
7. Who would be the main stakeholders for the centralised vs. decentralised discussion?

**Technical Questions**

1. How important would it be to align grid developments to facilitate offshore wind developments with onshore grid development?

2. What would be required from industry to get approximately 3.5 GW of offshore wind online on the east coast by 2030? What do you see as the main challenges?
3. How much experience does industry in Ireland have to build and operate offshore wind farms?

**Financing Questions**

1. How would a centralised vs de-centralised offshore grid model impact developers from a financial perspective and is one or other model preferable in this regard?
2. How should the onshore and offshore transmission assets be funded e.g. developer, UoS or state?

**Policy Questions**

1. What is the industry's view on the current legacy projects and how they should be treated with regard to the Enduring Model?

**Other Questions**

1. What do you see as main decision-making criteria for selecting a grid delivery model?
2. In your view, who is best placed to consent and build the onshore and offshore transmission assets required?
3. In your view, who is best placed to take ownership of the offshore grid?

# 2 General Questions

## 2.1 What would be the role of industry in achieving Ireland's climate targets?

The offshore ambition adopted in the CAP is welcomed by industry and industry is fully committed to delivering on this ambition.

Industry will play a pivotal role in delivering the renewables generation required to meet Ireland's climate targets as stated in the government's CAP. *At least* 3.5GW of offshore wind is anticipated to be required as part of the picture for reaching 70% renewable electricity by 2030. A further pipeline of offshore wind is also required to be ready to come online in the years beyond the 2030 milestone, to ensure Ireland can continue to meet future generation requirements and national and EU related clean energy and sustainability ambitions to 2050. The European Commission has also set a long-term vision for a climate-neutral economy by 2050, and many publications have argued that in order to achieve that, the power system will need to be carbon-neutral by 2040. This has been identified in EirGrid's recent Tomorrow's Energy Scenarios 2019[1] publication and the Irish government is now consulting on how to achieve this 2050 decarbonisation goal[2].

In 2018, IWEA commissioned Baringa Partners LLP (Baringa) to undertake a fully costed study of a 70% renewable electricity system in Ireland. This study incorporated key integration measures identified as being required to enable this penetration of variable renewable electricity on Ireland's grid. Following the publication of Irelands CAP in June (which aligned to the targets outlined in the Baringa study), IWEA has undertaken a body of work to begin to identify and help to address the policy challenges in reaching this 70% ambition.

To try to analyse the aggregate impact of all these points, the IWEA has formed a specific '70 by 30' Committee and has developed a specific generation pipeline analysis tool in order to assess industries ability to deliver on a 70% RES-E target. The IWEA offshore wind pipeline and project delivery timelines have been inputted into the tool and policy asks are evaluated with a view to focusing attention on solving policy bottlenecks (particularly relating to consenting, grid and route to market) that will materially impact upon the delivery of these targets as an industry.

The ultimate objective of the work is to identify a series of policy, regulatory and other associated measures required to enable the delivery of the offshore wind CAP targets. Underpinning all of this is

[1] EirGrid - Tomorrow's Energy Scenarios 2019 - http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-TES-2019-Report.pdf

[2] DCCAE - Long-Term Strategy on Greenhouse Gas Emissions Reduction - https://www.dccae.gov.ie/en-ie/climate-action/consultations/Documents/8/consultations/Public%20Consultation%20on%20the%20Long-Term%20Strategy%20on%20Greenhouse%20Gas%20Emissions%20Reduction.pdf

the ambition to ensure policy makers can deliver a framework which delivers the lowest cost solutions for decarbonisation. Renewable energy will require a clear, robust and efficient policy framework to deliver in a timely and low-cost manner by 2030 – not simply via support mechanisms but also through planning and grid policy and their effective and efficient interaction. Industry input into forming and implementing these measures, with evidence-based studies and the importing of international best practice from other jurisdictions, will be key to the success of Ireland achieving its climate targets.

We would specifically highlight that many of IWEA's members are already operating offshore wind generation successfully at a global scale in international jurisdictions and have the experience and competence to deliver offshore wind projects at scale in Ireland – provided the necessary policy framework and route to market is in place. IWEA believes that Ireland can utilise the world leading skills, experience and expertise built up over the last two decades across academia, system operators, regulators, and the entire renewable industry to help deliver a cost-effective sustainable future for Irish citizens. We believe there are significant improvements that can be made to how effectively and efficiently projects can be delivered in Ireland. Ultimately, achieving this will increase the likelihood of achieving 70% renewable electricity and reduce costs for the consumer.

We believe our homes, cars and business can be powered by green electricity from renewable energy sources on the island of Ireland and is reflective of the ambition shown in the CAP 2019. Ensuring the decarbonising the energy sector will be crucial to continuing to attract Foreign Direct Investment (FDI) and delivery of wider climate action targets, for example the roll out of EVs and heat pumps – a key policy pillar of the wider CAP. Overall electrification will play a crucial role in a low-carbon energy system in Ireland, as it will:

- Increase the overall efficiency of the energy system;
- Enable low-cost renewable electricity to be used for the heat and transport sectors; and
- Transfer carbon emissions from the non-ETS sector over to the ETS sector (which to date has performed much better in relation to decarbonisation).

Ireland's electricity demand is expected to grow by between 22% and 47% over the next decade[3], representing the need for an additional renewable generation capacity of approximately 10,000 MW. There are expected to be an additional 1 million people living in Ireland by 2040 based on Government projects, indicating that this trajectory may not slow down beyond 2030. This increase in demand from the heating and transport sectors, coupled with an increase in development of large energy users such

[3] EirGrid - Tomorrow's Energy Scenarios 2019 - http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-TES-2019-Report.pdf

as data centres, will mean the implementation of offshore wind, at scale, is needed to address demand growth. In summary, offshore wind is needed to decarbonise the Irish energy system, achieve emission reduction targets, meet increasing electricity demand, increase the security of electricity supply and contribute to the "green economy". Planning our electricity system on a decade-by-decade development basis, with a 10-15-year implementation period for major projects, is no longer sufficient and will likely prevent 2030 targets being achieved.

We believe the most immediate actions within CAP to facilitate the necessary offshore wind growth, in the first instance for 'Legacy' projects include:

- Implementing a transitional protocol to deal with 'Legacy' projects to accelerate timelines for delivery by Q4 2019;
- Issuing grid connection offers to 'Legacy' offshore wind applicants by Q2 2020;
- Enacting the Marine Planning and Development Bill by Q3 2020; and
- Holding an offshore wind specific RESS auction planned for Q2 2021, subject to sufficient competition.

The CAP subsequently sets out the key deliverables to achieve the 'Enduring' category of offshore wind farms. This will require substantial engagement by all parties to deliver on 2030 ambitions. When the Irish Government implements an aligned and functioning regulatory framework, Ireland's ambition can be realised. We would identify the Offshore Wind Industry Council in the UK as a good international reference approach to facilitate the strategic development of the offshore wind industry in Ireland.

In summer 2019, IWEA commissioned The Carbon Trust to carry out an assessment of the capability of Ireland's supply chain to achieve the ambitions set out in the CAP. This report, which will be published in early 2020, indicates that 3.5 GW of fixed bottom offshore wind installed to 2030 would equate to an investment worth €8.6 billion.

The Carbon Trust's analysis has also highlighted that public and private stakeholders have an integral part to play in realising the projected growth in offshore wind in Ireland. The industry is committed to engaging with policy makers and other stakeholder to tackle challenges associated with establishing an offshore industry in Ireland. We have identified that constructive relationships need to be built and maintained, with open dialogue, to ensure we can maximise our natural resources; while bringing local communities and the general public along with us in recognising the value to society.

Figure 1 below illustrates the interaction required by all parties in ensuring the implementation of an offshore wind sector in Ireland.

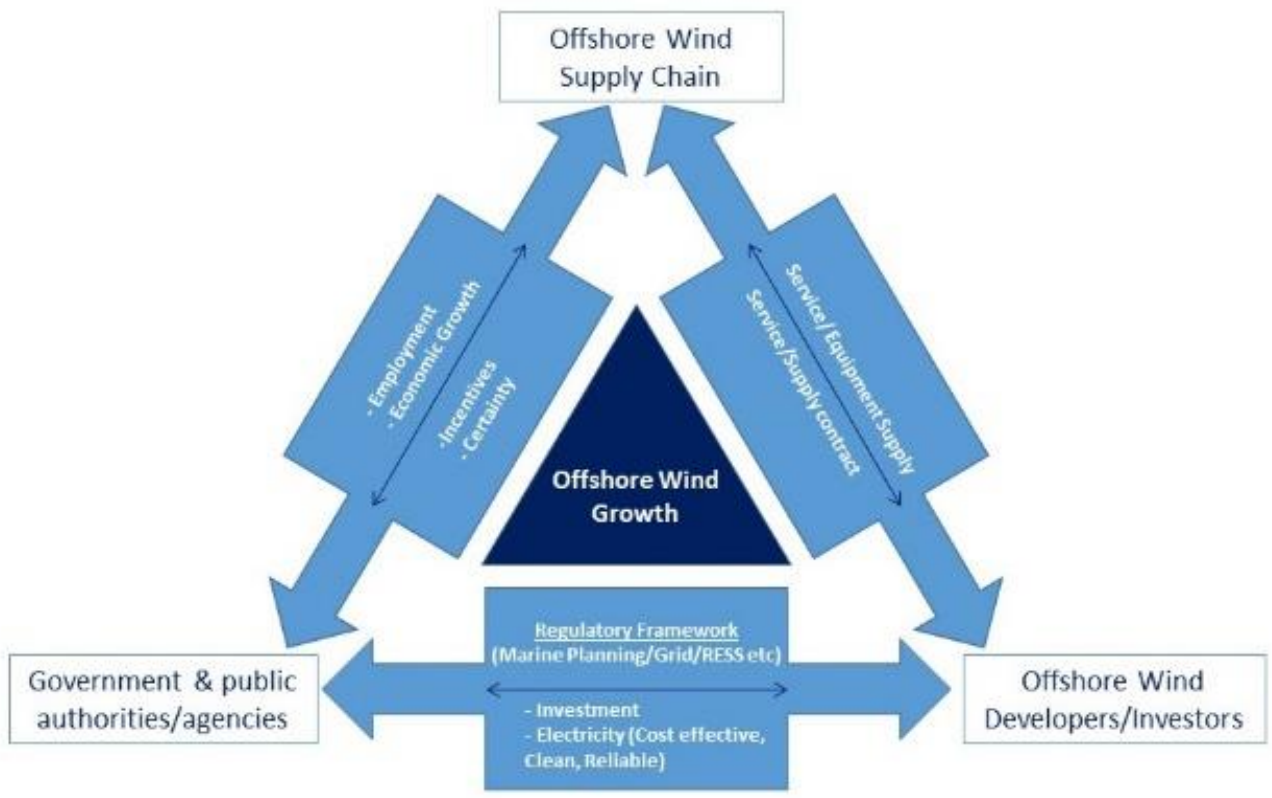


**Figure 1: Stakeholder collaboration to ensure offshore wind growth**

Some of the wider recommendations from The Carbon Trust's report include, for illustration:

- Creating a formal programme to facilitate dialogue between all industry participants regularly to progress the industry including, government departments & agencies, project developers & investors, supply chain companies including port authorities/companies;
- Plans to consider how the technical potential of offshore wind can be fully exploited with consideration given to the advancement of an offshore wind grid network that has the potential to export to the UK and mainland Europe; and
- The Irish Government should consider the creation of offshore wind enterprise hubs at ports under an enterprise zone model to incentivise international companies to set up in Ireland which will increase the number of companies available to the offshore wind projects and increase local content.

## 2.2 What would be the most important drivers for selecting a centralised or decentralised grid delivery model?

There are several factors which should be considered when determining the right offshore grid delivery model for Ireland. These can be summarised as follows:

- Ensuring the ability to deliver on 2030 targets;
- Market confidence in the ability to plan and deliver the infrastructure;
- Ability of TSO & Government departments to deliver the necessary legislative and regulatory structures to give the necessary look ahead, with reliable and regular market accessibility;
- Ensure the financial viability of projects (certainty, risks and costs);
- Consideration of the cost-benefit analysis to the consumer; and
- Planning for grid capacity required to deliver the model.

The first critical factor in any decision related to a grid delivery model should be the ability of that model to facilitate the achievement of 2030 targets. The CAP sets out a goal for at least 3.5 GW of 2030 and the grid delivery model must be able to accommodate, *at least,* this volume within that timeframe. Factoring in issues like financing, commissioning, handover, and other practical considerations must be made. This means grid must be available well before this date to achieve the 2030 target.

The current pipeline of offshore wind development in Ireland now exceeds 12 GW, with the first projects capable of delivering power from 2025 onwards. It is critical to consider what can be delivered by each grid delivery model between 2025 and 2030. In each case, the capability of developers and the System Operator (SO) to deliver this infrastructure, and its subsequent impact on generation volumes realised, should be a key consideration.

To progress either grid model, or a hybrid approach of both the centralised and decentralised models and any appropriate transitionary arrangements will require legislative and regulatory changes. The ability of the Government, Regulator and System Operator to make the required changes to deliver either a centralised or decentralised model, must be factored in. It will be important to consider this while also taking account of the timescale associated with these changes, and the necessary delivery period. If it takes too long to deliver on one model or another, this will have a subsequent detrimental impact on the ability to delivery necessary volumes to meet 2030 targets; and the sustainability of the offshore industry.

The timeline to implement the grid model chosen, or the timeline associated with any possible transition from one grid model to another, must be clearly set out at the earliest possible stage to allow industry sufficient time to adopt the chosen grid model. The development timeline for an offshore wind project is approximately 10 years, so providing an indication of the grid model(s) to be implemented not only for the 2020s, but also for the 2030s will be essential through this work.

In considering centralised versus decentralised, another important factor will be confirmation of areas which are zoned or approved to develop offshore renewable infrastructure. "Centralised" for grid delivery but de-centralised or semi-decentralised for site allocation is seen as adding further risk, complexity and uncertainty. Thus, another important factor will be the areas which are zoned, or otherwise approved, to develop offshore renewable energy and associated infrastructure and how the wider process works. For either grid model, a significant volume of information on the approved sites will be needed for developers to progress offshore wind infrastructure. There has been a significant amount of time and financial investment put into assessing multiple areas of the sea surrounding Ireland by many of IWEA's members. This existing knowledge should be considered, and it needs to be recognised that building up a similarly detailed models and datasets for newly zoned areas in a centralised model will require substantial additional time (and further financial investment).

It will be important to consider the end cost associated with each model. This is necessary to demonstrate value to the consumer/exchequer and to deliver projects as efficiently and effectively as possible. Such comparisons should factor grid development costs, operational costs, financing costs - all of which will have a direct impact on RESS auction bids and Ireland's ability to complete on the global Corporate Power Purchase Agreement stage. In respect of the period 2020-2030, the benefits of speed of delivery, CO2 emissions cost abatement, the avoidance of EU fines and Ireland's potential reputational damage (i.e. FDI impacts, etc.) should be also considered. We appreciate that it is unlikely a full cost-benefit analysis of both models could be carried out in the timescales for this options paper. However, a clear understanding of the impact of an immediately implemented decentralised and centralised options model on project delivery timelines by 2030 is a crucial consideration.

Lastly, an important consideration is the additional grid infrastructure required to allow the 3.5 GW the capability to export onto the transmission system and to enable firm connections for the new offshore wind generation. Without sufficient grid capacity to export power, the cost of offshore wind and all renewable generation increases. EirGrid's "*East Coast Generation Opportunity Assessment*[4]"

[4] EirGrid's East Coast Generation Opportunity Assessment: http://www.eirgridgroup.com/sitefiles/library/EirGrid/East-Coast-Generation-Opportunity-Assessment.pdf

outlined how a quantity of generation in specific parts of the East Coast could deliver with relatively minor grid infrastructure requirements. This would allow some of the early offshore wind projects to progress with relatively minor transmission system upgrades required and contribute to Ireland's interim 2020 to 2030 targets, as well as the overall 70% renewable electricity target.

However, the selection of a grid connection model for offshore should consider the broader impacts of connecting 3.5 GW to the grid and plan for the future beyond 2030. This should be done considering not just Ireland's East coast, but all of Ireland's future wind pipeline – including the South and West coasts. It may be the case that different grid models work better in different parts of the system, depending on the specific circumstances of each area.

## 2.3 What do you understand by the "centralised" the and "decentralised" grid model?

The selection of the grid delivery model in Ireland should consider the best approach to deliver the 'Legacy' projects located on the East Coast, and the 'Enduring' projects located on the East Coast and elsewhere, in the shortest timelines considering the likely durations needed for buildout. It will take time to manage and implement the new grid delivery model, and transitionary period and this should be considered.

The definition of a centralised and decentralised delivery model is critical for the understanding and evaluation of future policy direction and the eventual decision regarding the future grid delivery model of choice within Ireland.

It is worth noting that either model, if designed and implemented properly, can be successful within the Irish context, just as both models are widely used across other European jurisdictions.

**This response assumes that a centralised grid delivery model would align with a future procurement / auction process for subsidy / access rights. In other words, under a centralised grid delivery model, the winner of capacity/ volume within the RESS auction would have to right to transmit power from their windfarm (via the offshore grid assets and connection with the onshore grid system).**

On a very basic level, a centralised delivery model means the central planning and permitting by the Government and network operator(s) to deliver and operate the necessary grid infrastructure, both on and offshore, that will enable the delivery of a specified level of offshore capacity within a specified area, within specified timescales.

A key aspect of a centralised delivery model is the pre-planning and designation of areas for Offshore Renewable Energy (ORE) and the intended volumes to be delivered. The grid infrastructure is designed, developed with the full information available to developers regarding the specific sites, location, type and size of connection and (following the successful outcome of the auction and acceptance of the grid offer) built to enable the timely and efficient connection and transmission of the desired capacity from the associated offshore wind farms.

A centralised delivery model would remove the risk and obligation from the developer to design and build out the necessary grid infrastructure, with all the attendant environmental and planning obligations, and place it on the Government / Regulator / Independent Body tasked with the design and delivery of such a plan.

As the grid development costs are not borne by the developer and the available location of sites are open to all market participants, any bids for future subsidy / competitive auctions are purely cost based, as any differentiation on site, previous grid delivery experience and or access to supply chain is removed from the cost calculation. In theory this will help to drive costs down, although the grid costs will be borne by customers elsewhere. If a “grid only” centralised model is implemented there is further cost risk to the end customer because of a possible disconnect between forward planning of a centralised grid failing to fully integrate with the end planning and consenting regime, including zoning. In the centralised model, the developer is usually only responsible for the plan and permitting of the generation assets, the inter array cables and connecting to the J Tubes on the offshore substation.

By way of illustration, the diagram in Figure 2 from TenneT provides an illustration of the different responsibilities for grid within in the Dutch centralised model.

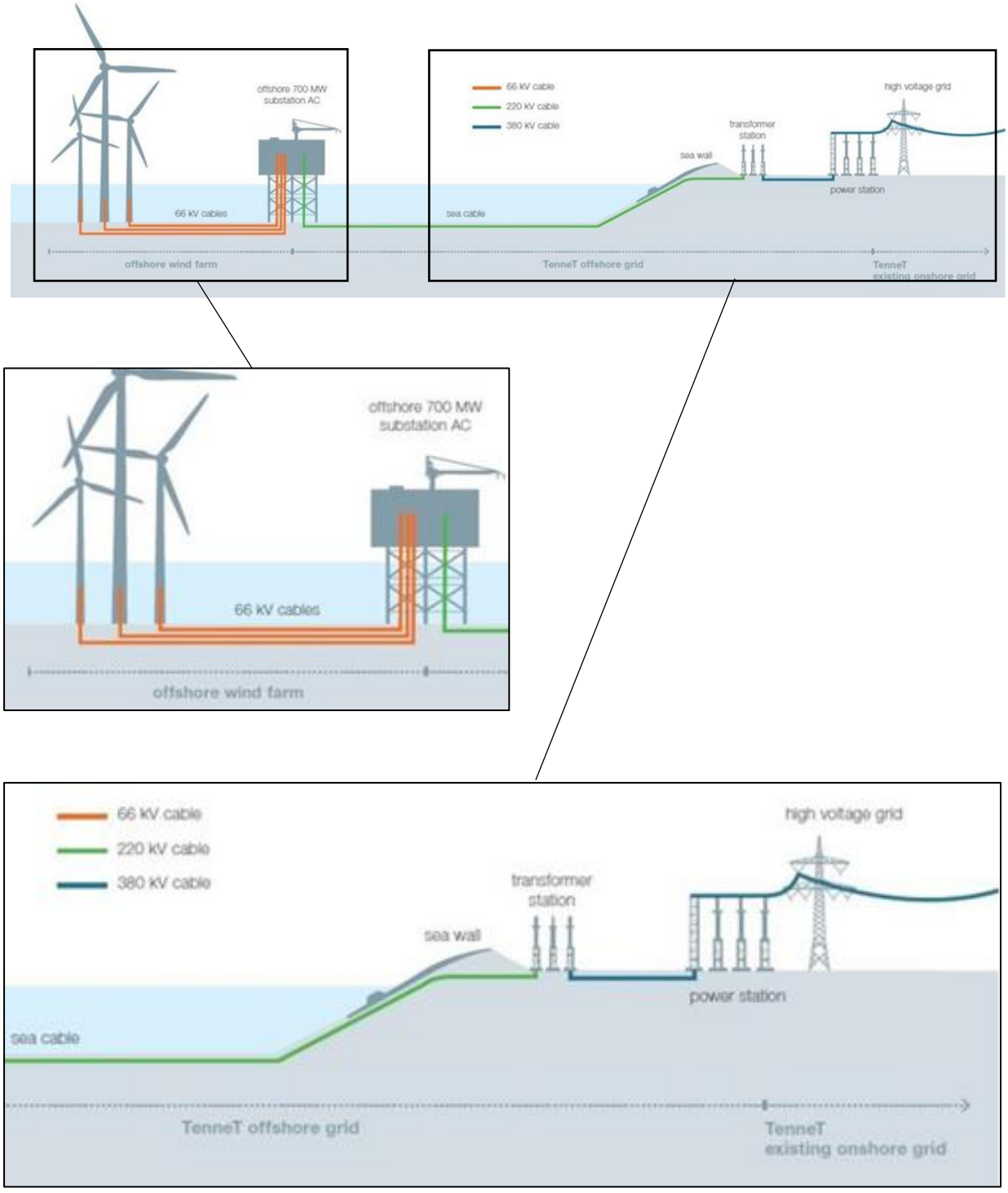


**Figure 2: Example Responsibilities in Centralised Model (based on TenneT)**

In contrast, a decentralised model is effectively the existing model which has been operating in Ireland. The developer is responsible for all aspects of their offshore project, including the design, build and management of the offshore infrastructure assets as well as the connection up to and

including the onshore substation. As the developer would own the assets, at least during the design and build phase, the developer can choose their supply chain / contractors whilst retaining the obligation to coordinate and manage the whole project.

The developer would be required to liaise directly with the TSO to connect to the onshore transmission system and would be responsible for ensuring all the necessary planning and permitting requirements, including all the environmental assessments and mitigation, are managed.

Both models are feasible, and both have their strengths and weaknesses, all of which can be impacted by the existing levels of experience within the market.

## 2.4 What do you see as main benefits or drawbacks of either model?

The benefits and drawbacks of both delivery models are outlined in the below table. Please note that the below summary is related to the delivery model only. Associated and major issues relating to the subsidy regime / route to market, planning and environmental, legal and bankability issues, etc. are not included. Nor does the below consider the considerable impacts on current or planned offshore wind developments in Ireland and what it would do to industry confidence and development pipeline if these are not given due regard.

| | **Advantages** | **Disadvantages** |
|---|---|---|
| **Decentralised delivery** | • Developer has control over associated grid project timelines and costs. Cost certainty and project delivery timelines are very important for project financing and bid certainty.<br>• The developer-led projects will focus on developing the best sites first, which can reduce costs and ensure quicker delivery.<br>• Competitive forces in terms of auction process and connections will drive downward pressure on prices. | • Can run the risk of inefficient grid development and multiple onshore connection points which can increase stakeholder challenge and dissatisfaction and increase overall system cost.<br>• Grid development is not coordinated which can cause increased burden for TSO's planning resources and can reduce visibility on long term development pipeline. |

| | | |
|---|---|---|
| | • Reduce risk of TSO setting grid delivery price and not improving / delivering cost reductions.<br>• The financial and development risk for the offshore grid remains with developer, rather than the consumer. | |
| **Centralised delivery** | • The coordinated bundled approach reduces the risk of misalignment between offshore buildout and onshore grid planning as well as alignment to future forecasts for areas of demand.<br>• Centralised planning and delivery can enable the TSO (or other entity) to benefit from economies of scale and improved efficiencies.<br>• Removes need for scoping and grid development studies on an individual project level.<br>• Enables greater control on the volume of generation and time of delivery.<br>• Results in developers solely competing on cost to deliver the generation – not grid costs. | • Significant development and design needed up front, which could significantly delay or risk the establishment of an offshore industry in Ireland (and likely to prevent the achievement of 2030 targets).<br>• There is a current lack of expertise, experience and capability in designing and developing centralised planning (and permitting) in Ireland.<br>• Policy alignment, definition and implementation timelines are likely to prevent the achievement of 2030 targets.<br>• There is a significant risk to go-live of generation projects if the TSO is late delivering the infrastructure.<br>• If required volume / capacity changes significantly it may be more difficult to bring forward additional capacity in a timely manner.<br>• Significant connection costs may be recovered under TUoS. |

## 2.5 Would there be a preference for either model from industry perspective, why?

The strong position of industry is that to achieve 2030 targets a de-centralised model is required for the duration of the RESS scheme, if not the entire 2020's. Should a centralised model be preferred in the longer term, it must have a sufficient transitionary pathway and recognise the impact to the existing development pipeline.

It takes approximately 10 years to develop, consent, design, finance, construct and commission a typically sized offshore wind farm. With the added time required to put all the policy measures for a centralised model in place needed in Ireland, including central consenting regime, it is industry's position that this effectively rules out connection prior to 2030.

Significant concern is also registered in respect of the coordination, or lack thereof, between planning and leasing and the grid development models. Given the quantity of development expenditure to date, and the risk of delivery and development hiatus associated with a transition to an enduring centralised model, we would strongly be against a hard transition to a centralised model. Due cognisance is required of the large volume of projects in development which has been based on the only development pathway available to them; and the reality of the time necessary to switch to a fully centralised model. A centralised system can be delivered in parallel with decentralised developments – so long as there is sufficient time and resource available to provide investor certainty and interest.

Experience to date has shown that onshore delivery timescales and costs are one of the major risks in the development of a wind farm. We would argue that EirGrid and ESBN will already be at capacity in delivery of the onshore grid connections for onshore wind farms and the non-contestable sections of offshore grid connections, and they should concentrate on this out to 2030. We recommend priorities would be best focused on delivering necessary upgrades to ensure capacity, minimise constraints and to support firm connections.

An increase in risks to projects will ultimately lead to higher LCOE levels and energy costs to the consumer. Further recent policy approaches being progressed, such as grid delays being excluded from force majeure and placing all risk on the developer as per the draft RESS 1 terms and conditions[5] raise significant concerns to the ability of a centralised offshore grid model to deliver necessary volumes to meet 2030 targets. Without accountability and reliance on EirGrid and ESB to deliver the

[5] DCCAE - November RESS Industry Briefing - https://www.dccae.gov.ie/documents/RESS-1_Auction_Stakeholder_briefing-Presentation.pdf

necessary infrastructure, and no protection to the developer if delays occur, severely increased risk could prevent projects achieving finance in some circumstances.

Examples of delays to transmission infrastructure upgrades across the country are front and centre to industry concerns on deliverability and financing risks. For example, comparing the planned transmission system in EirGrid's Grid25 report[6] published in October 2008, to what has been delivered to date highlights the various planning and societal issues surrounding the delivery of grid over the past decade in Ireland. Industry has not yet seen evidence that a centralised offshore grid could be planned and delivered to a 2030 timeframe as a result. Therefore, decentralised grid models currently provide the cheapest delivery method, the fastest connection times, the programme certainty, and allow project level risk management to enable projects to ensure an adequate and financeable route to market approach.

Industry believes that EirGrid and ESBN do not have sufficient time to develop the necessary teams to build out offshore grid connections in the timescales required for early stage enduring projects. For example, the incumbent developers already have teams in place developing, designing, planning and procuring the offshore grid and substations. For EirGrid to centralise this, as well as the wider transmission system planning, will take a number of years.

We cannot emphasise strongly enough that this will result in a serious delay in delivery of offshore wind, failure to meet Government targets and an increased cost to LCOE, bid process and ultimately cost to the consumer.

Should centralised be the selected preferred approach, a long-term transitionary arrangement from a decentralised model is an absolute requirement. Future optionality can be ensured by ensuring initial Legacy and Enduring offshore connections developed as decentralised but are built to EirGrid specification. Once there are multiple offshore nodes suitable for creating an offshore mesh grid, or otherwise, should this be desired, then EirGrid could adopt this infrastructure and construct the any other offshore links as may be required.

Precedent experience of initial offshore grid connection delivery for wind farms has demonstrated delays in TSO led grid which has resulted in costs for both the developer and customer. In Germany the TSO system operator failed to deliver grid connection in time for the initial development of

[6] EirGrid - Grid25 Report - October 2008 - http://www.pleanala.ie/misc/PCI/PCI1/DAF2/Volume%203B/Reference%20Material/EirGrid%20(2008)%20Grid25%20Strategy.pdf

offshore wind, leading to a shortfall of circa 1.5 GW of offshore grid connection by 2014, and to €1bn in foregone revenue (in this case it was payable by consumers).

In recent years, the German model has signalled a transition from a decentralised model to a centralised model. Even where this transition had been well communicated to industry years in advance, there are still unconsidered issues arising today leading to increased uncertainty for developers.

We strongly recommend that if a long-term centralised model is decided upon, that planning for this model begins immediately and that industry are consulted upon throughout the process. It will take a substantial level of time and investment to implement this model successfully; however, with the right planning and levels of engagement, we believe it is possible to deliver an efficient centralised model for the early 2030s and beyond to enable Ireland to meet its longer term climate objectives.

## 2.6 What do you see as main challenges for realising the Climate Action Plan wind (offshore) ambitions in Ireland?

In an international context delivering 3.5 GW is not a huge target. Yet achieving offshore wind targets in Ireland will be challenging, specifically with respect to current policy implementation and the associated development timeline. Therefore, we believe first and foremost, a crucial part of the CAP is the system of governance that is proposed to ensure the necessary policy is in place; and correctly interacting between the areas of planning, legal, grid and route to market. Policy formation needs to be set, implemented and managed across traditional government body boundaries. Considering the scale of ambition expressed in the CAP, these governance and accountability structures will be key to its success over the next decade. It is important that industry is involved with, and has confidence in, this system of governance to ensuring the actions detailed within the CAP are kept to the required timelines; and those responsible for delivering them held responsible and accountable.

In more specific terms and in an Irish context, there are several major challenges facing the offshore industry, which may impede the timely delivery of offshore wind projects to meet the 2030 climate targets set. These challenges are largely categorised into grid, planning and consenting, auctions and supply chain. Examples are given below, where appropriate, of timelines that were set out in the CAP and which have already slipped, and their knock-on effect on subsequent steps in the offshore development program.

### 2.6.1 Restrictions in grid capacity

A lack of transmission capacity is one of the major concerns in meeting the 70% renewable target. There is currently a lack of transmission capacity in areas of the grid where the IWEA's analysis shows that renewable projects are planning to connect - both for onshore and offshore.

Many connected renewable generators are already seeing high levels of constraints (~5%) due to network limitations, and there is a high risk that both new and existing projects could face constraint levels in the double figures if the necessary grid infrastructure is not put in place for the future pipeline. We need to forward plan grid in Ireland. If the SO's wait until the renewable projects have been consented or have received a connection offer before starting to design and consent grid reinforcement projects, there will be insufficient network capacity to accommodate the volume of renewables needed for 2030 and beyond. Projects will not be able to connect within RESS timelines and project finance will be challenging given that all this risk is intended to sit with the developer, i.e. no Force Majeure event for grid delay (as per the RESS 1 Terms & Conditions referenced in section 2.5), nor any other financial or other real penalties on the SO. We strongly recommend EirGrid begin progressing grid reinforcements through their grid development process based on the strength and certainty of the future renewables pipeline, rather than waiting for projects to obtain planning consent and accept connection offers.

This is especially the case in relation to the "East Coast Generation Opportunity Assessment"[7], which has already identified relatively minor grid reinforcement projects needed to release additional grid capacity for the connection of early offshore wind projects located on the East Coast. There are sufficient volumes of Legacy and early-stage Enduring projects located on the east coast to progress with these upgrades immediately, on the premise they will be required in the mid-2020s regardless of initial auction outcomes. While the East Coast Assessment report provided very useful analysis for the early offshore wind projects, further work is required to consider projects in combination and to plan for future additional capacities.

It is also timely for an extensive study regarding available capacity and likely grid reinforcement works that will be needed to be carried out for the rest of the country, namely the South, West and North regions, like the analysis carried out in the East Coast assessment. There are excellent renewable resources available off the West, South and North coasts of Ireland, and it is imperative that the grid system needs to facilitate this are identified and planned for in a timely way.

[7] EirGrid's East Coast Generation Opportunity Assessment: http://www.eirgridgroup.com/sitefiles/library/EirGrid/East-Coast-Generation-Opportunity-Assessment.pdf

Smart and innovative solutions being developed under initiatives such as DS3 and FlexTech[8], are welcome but must be supplemented with actual and extensive grid reinforcement to future proofing the grid for 2030 and beyond.

### 2.6.2 Timelines required to deliver the relevant grid infrastructure

The typical development timeline for a new overhead line or substation may take along as 10-15 years[9]. Therefore, the anticipated timelines for EirGrid to deliver the necessary grid reinforcements required for 3.5 GW of offshore wind projects are a major concern. The necessary East Coast reinforcements have already been identified; however, as mentioned previously, the relevant infrastructure needs for the rest of the country needs to be identified as soon as possible and all of this needs to be in place prior to offshore connection timelines.

The recent news relating to progress and timelines for the Celtic Interconnector have been positive. Further progress and updates on other infrastructure such as the North-South Interconnector, and the additional GB interconnector planned for 2040 mentioned in the Tomorrow's Energy Scenarios would be welcome, in terms of creating further capacity for future offshore generation.

### 2.6.3 Issues with the grid connection process

Projects that successfully obtain planning permission, join a queue for grid offers. Between 2008 and 2018 there was no system operator grid offer process to issue new connection offers to projects that secured planning, and so many projects that received planning permission during this period where unable to gain access to the grid. Depending on future rules on batch processing, projects face a potential lengthy wait before being eligible to receive a grid connection offer. Many projects may only learn of their actual connection method once they have sight of their grid connection offer. If a project requires a further planning consent for their grid connection, this will result in a number of years work to prepare the application, along with any required environmental studies, submit the application and receive a consent, again subject to potential appeals and judicial reviews.

2018 saw the first round of applications, ECP-1, processed under a new system. However, despite many applications for batteries, solar farms, wind farms and other generators, the CRU only processed 1,000 MW of new generation, within which priority was given to 400 MW of applications for DS3 System Service provision. When ECP-1 published its decision in August of this year it revealed that they had received applications for connections amounting to approximately 5,300 MW, more than

[8] EirGrid's FlexTech Integration Initiative: http://www.eirgridgroup.com/site-files/library/EirGrid/FlexTech_Forum-slide-pack-June-2019.pdf

[9] IWEA PR5 Pre-Consultation Submission to the System Operators - https://iwea.com/images/files/20191120-iwea-pr5-pre-consultation-submission.pdf

five times the volume available. The rate at which the CRU is processing these applications means there is a growing backlog of renewable energy projects which have received planning permission but are waiting years to connect to the electricity grid. This undermines their chances of participating in the RESS scheme. IWEA recommends that Ireland's Grid Connections Policy, known as the Enduring Connection Policy (ECP), must enable offshore wind energy to connect as quickly as possible, and that the CRU should give an indication on the future connection offer process for Enduring offshore wind projects as early as possible. Delivery of related actions in the CAP for 'Legacy' and 'Enduring' are both key to ensure that the processing of connection offers does not become a bottleneck in the delivery of offshore wind.

From 2020 to 2030, Ireland is planning on doubling the volume of connected renewables, in half the time previously taken. Given the influx of grid connection applications (both onshore and offshore), the ability of the SO's to process grid connection offers in a timely manner will be extremely challenging, presenting a strong likelihood (based on past experiences) that developers will face significant delays.

Currently there is no line of sight as to when offshore projects can apply for grid connection (other than Legacy projects). Given the timescales of these projects the grid connection process should be allowed to happen in line with the consenting process. This is important to consider, given that there is still an opportunity to influence the Marine Planning and Development Management (MPDM) Bill. Parallel consenting for offshore and onshore assets is also key in minimising potential delays.

The current lack of a connection offer process which delivers firm capacity is a major challenge for offshore developers. Following recent developments in the Clean Energy Package, projects which are connecting under non-firm connections may be exposed for losses relating to transmission constraints[10]. The potential issuing of non-firm connection offers for offshore wind farms, and the resulting lack of revenue certainty, creates income instability which in turn will create difficulties for developers when seeking project finance and ultimately increase auction pricing.

The lack of available information on a project's grid connection method also creates delay in securing planning permission and land rights for these works. This issue can be significant on offshore projects and in particular on projects in the East Coast. Additionally, the lack of certainty on the connection method, and subsequently the deep and shallow grid costs is likely costs is likely to result in higher bid prices in the auction system, with knock on effects on consumer prices.

[10] IWEA Position Paper on the Clean Energy Package - https://iwea.com/images/files/20191115-iwea-position-paper-on-priority-dispatch-and-compensation-for-constraint-and-curtailment.pdf

Recent High Court judgements have changed long-standing custom and practice in relation to the provision of wind farm grid connections and their requirement for planning permission and/or EIA/AA. Although the relevant court judgements related to wind farm grid connections, they have far-reaching implications for utility services and linear developments across multiple industry sectors. This is not just an issue for the wind energy sector; it is an issue for many industries and sectors that rely on electricity and other utility services for their everyday operation. Three specific issues are highlighted that require the urgent action of various Government departments or regulators.

The first issue relates to very serious challenges to applying for planning permission for linear elements of larger development projects along public roads. IWEA recommends the Department of Housing, Planning and Local Government to amend the SI No 600/2001 Planning and Development Regulations 2001, which is within the powers of the Minister for Housing, Planning and Local Government and specifically the required contents of planning permission applications relating to landowner consent.

The second issue relates to who owns the land under a public road in which utility services are typically installed and the challenges created for developers by the new requirement to obtain landowner consent to install new utility services along public road corridors. This creates a situation where projects could be subject to lengthy delays, or frustrated entirely, if a small number of landowners refuse to give permission. IWEA recommends the Department of Transport, Tourism and Sport amend the Roads Act to provide for the installation of utility services in road corridors, mirroring what was previously done via the Water Services Act to allow for the installation of water services in public road corridors.

The third issue relates to powers available under the Electricity Regulation Act, as administered by the Commission for the Regulation of Utilities (CRU), that allow the holder of an authorisation to construct an electricity generating station (e.g. a wind farm) to avail of and to exercise ESB's power to lay electricity lines along, across, or under any street or public road. IWEA recommends the CRU to update its guidance documents on applications for section 48 and 49 consents.

### 2.6.4 Constraints and curtailment issues

The lack of firm connection offers means that new offshore generators will not be compensated under constrained conditions, as set out in the IWEA Clean Energy Package Position Paper cited previously. This concern is increased when combined with the possibility that sufficient grid capacity infrastructure may not be put in place in time. The financial implication of these non-firm connections will be reflected in higher auction costs.

The offshore industry would welcome as much additional data and information as possible for each scenario and year in the final TES 2019 publication and the subsequent System Needs Assessment, so that industry can accurately forecast future constraint and curtailment levels required to deliver the lowest possible RESS auction bids.

### 2.6.5 Stakeholder resourcing and response times/accountability

Many offshore stakeholders are facing huge upheavals, with processes and policies likely to deviate largely from business-as-usual practices to meet the volumes and timelines needed for the 2030 targets.

For each stakeholder, these changes will require allowances for training and adjustment periods. It is imperative that the needs of each Government department and agency are defined accurately and resourced sufficiently. The timelines and volumes involved in meeting our energy targets are very tight, and insufficient resourcing along any of the steps of the process may cause delays, with knock-on effects of potentially preventing the energy targets from being met.

Whichever grid model is ultimately chosen, developing the requisite grid infrastructure, and processing the offshore planning and grid connections in the timelines required will necessitate resourcing and budget spend on the part of all stakeholders involved.

### 2.6.6 Consenting issues

Figure 3 was developed by the IWEA Offshore Committee earlier in 2019 after the MPDM draft bill was released and to inform a discussion at a cross departmental Government workshop. It is an indicative programme for consent under the MPDM bill and a challenging programme with no allowance being made for judicial review or the time necessary to move to a centralised model. It now seems that the proposed enactment date of the MPDM in 2020 was optimistic, as at the launch of the National Marine Planning Framework (NMPF) in November, the Department of Planning, Housing and Local Government (DHPLG) gave an presentation on the MPDM and said that enactment of the MPDM is scheduled for 2021. This effectively pushes the, already challenging, timeline below out another year. As a result, we are not yet 12 months into the CAP, yet we are a year behind the consenting timelines previously indicated in that report.

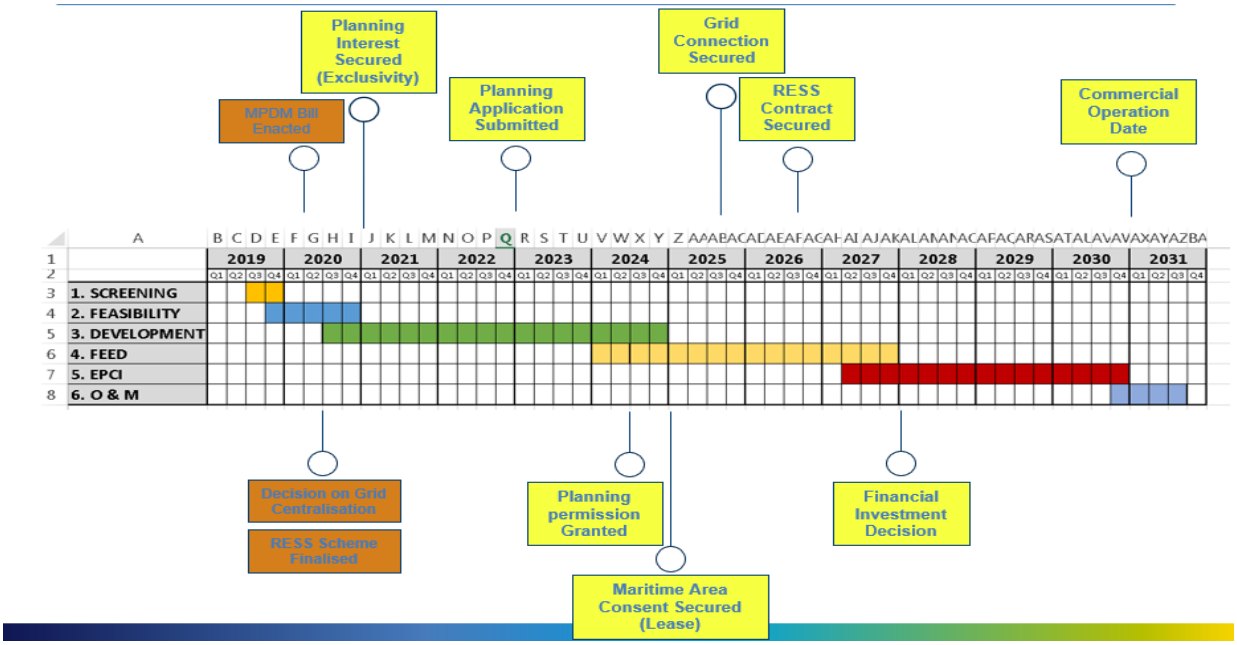


**Figure 3: Illustrative Project Development Programme in Ireland**

### 2.6.7 Forward visibility and planning for the Renewable Energy Support Scheme

The security of a route to market for offshore projects is imperative - insufficient frequency of RESS auctions will mean that projects are waiting for a route to market. Any delays to the detailed design and offshore RESS auctions will create challenges for offshore projects. Not only are the auction dates needed for offshore, clarity on the specific terms and conditions are needed for the offshore auction. The terms and conditions of RESS 1 are due for publication for consultation in December 2019; however, it has been indicated that this will not provide information on future auctions, volumes or timelines for future RESS auctions. There are several concerns that need to be addressed urgently for RESS 1 with better look ahead on similar points for later auctions:

- What is the updated timeline for each RESS auction?
- What volumes are being considered for subsequent RESS auctions?
- What oversubscription volume percentage will apply each auction?
- What are the terms and conditions for future auctions, including offshore specific terms and conditions?
- Will there be a Technology Specific Cap or a Minimum Technology Threshold in future RESS auctions, and if so, to what levels would these be set?

### 2.6.8 Supply chain

Paul O' Regan, Harbour Master and Chief Operations Officer of Port of Cork has stated that, except for the Harland and Wolff facility in Belfast, Ireland does not have the appropriate infrastructure to facilitate the offshore industry. He estimated that the ports would need approximately seven years to develop the infrastructure required for the offshore industry.

However, from an immediate perspective, it is a challenge to instil confidence in the supply chain and begin engagement given that some of the most immediate projects are without consent or grid connection offers. There is a concern that if policy certainty is not achieved, the port infrastructure upgrade works will not be ready in time for the first offshore wind projects.

With an offshore pipeline of 12.3 GW there is a tremendous opportunity for Ireland to create an indigenous supply chain for the offshore industry. In this scenario, the wind energy projects will have no alternative but to construct these projects using port facilities from other jurisdictions.

### 2.6.9 Other

There are several further uncertainties which are summarised as:

- Details and timelines of the long-term pathway for the grid model transition, and the implications for developers;
- What will be the consequences of this grid delivery model study? For example, will the outcome of this study also inform the consenting and zoning process? Lack of joined up thinking across zoning, planning and grid development and will create paralysis and prevent the establishment of offshore in Ireland;
- Timelines for new offshore consenting legislation (MPDM);
- Supply chain – very hard to get any engagement in a global context without consent/grid and clear regulatory and policy context;
- Non-firm nature of grid connection offers;
- Expected length of time it will take EirGrid to deliver grid reinforcements required for 3.5 GW of offshore and previous experience with delays delivering onshore transmission upgrade projects;
- Awarding of Planning Interests (PI) to developers;
- Delays to projects in planning (potential legal challenges etc.), judicial review process in Ireland;
- Lack of available information on grid connection method will creating delay in securing planning permission for these works, open legal challenges again and create land access issues; and
- How the timing of auctions will interact with decision on centralised / decentralised grid delivery.

## 2.7 Who would be the main stakeholders for the centralised vs. decentralised discussion?

The following are a list of the main stakeholders which should be consulted on the decision for a centralised or decentralised grid model:

- Offshore Wind Developers;
- Industry Representative Associations - IWEA, NOW Ireland;
- CRU;
- The Government of Ireland and DCCAE, DHPLG and DAT; and
- The Offshore Wind Supply Chain.

If EirGrid or Navigant would like to arrange for discussions with the key elements of the Supply Chain, IWEA would be happy to facilitate these discussions.

# 3 Technical Questions

## 3.1 How important would it be to align grid developments to facilitate offshore wind developments with onshore grid development?

It is extremely important to align onshore grid developments with the development of offshore grid connections. Regardless of whether projects are connected via single radial spurs or meshed offshore grid, the onshore grid capacity must available. This is to ensure that projects are not subject to high levels of constraint which will have a direct impact on RESS auction bid prices and ultimately project viability. The "East Coast Generation Opportunity Assessment" highlighted several, relatively minor, grid upgrades and reinforcements to unlock further capacity on the East Coast for early offshore wind project connections. Upgrades to the South East coast, and an additional circuit from Carrickmines to Poolbeg, are critical to deliver clean energy to the large demand in Dublin and ultimately begin the delivery of 3.5 GW of offshore wind by 2030. However, further reinforcements will ultimately be required to enable the full capacity to deliver.

It is vital that scoping and consenting activities for these reinforcements commence now, in order to align with offshore wind connections. In addition, scoping and consenting activities for reinforcements identified by the System Needs Assessment studies, carried out as part of the Tomorrows Energy Scenarios, should aligned with the delivery of offshore connections and this should provide a pathway to firm access.

## 3.2 What would be required from industry to get approximately 3.5 GW of offshore wind online on the east coast by 2030? What do you see as the main challenges?

From an industry perspective, the decentralised model is deemed to offer the best chance of delivering on 2030 targets for the several reasons outlined in section 2.5. The Government needs a coordinated approach to deliver 3.5GW of offshore wind by 2030. Significant cross-departmental co-ordination will be required, necessitating strong leadership and clear accountability.

DCCAE needs to manage an efficient and transparent process to enable the timely award of Planning Interests. Developers will not be able to commit significant project development expenditure on survey and design work until such point as exclusive interest in the sea-bed is secured.

The supply chain needs to see a pipeline of projects being developed so that Ireland can be viewed as a market with critical mass and worthy of investment. Ireland will be competing in a global marketplace for limited resources (installation vessels, specialist contractors), so providing certainty on project delivery (on a market wide basis) is key. Ensuring Ireland captures the maximum economic growth and job creation requires an integrated innovation strategy identifying strengths and opportunities within the indigenous supply chain.

An efficient offshore consenting process is imperative. As drafted, the MPDM Bill provides for An Bord Pleanála to adjudicate on planning consent for new offshore wind developments. While ABP has significant experience in assessing large scale complex infrastructural projects through the Strategic Infrastructure Development (SID) process, sufficient resources need to be put in place both in ABP and the key statutory consultees to ensure that projects are assessed properly and within a reasonable timeframe.

The risk of potential legal challenge through judicial review will remain high but can be mitigated through rigorous decision making in accordance with planning guidelines and legislation (the NMPF, Marine Planning Guidelines and all other ancillary guidelines need to be robust in nature). Dedicated onshore elements of project connections should ideally form part of the overall EIAR for an offshore wind project. This will eliminate the risk of project splitting becoming a potential source of legal challenge. A formalized process of engagement between the developer and the SO will be required prior to the making of a planning application to confirm the full extent of works required.

Certainty regarding RESS support and volumes is also key. The industry requires strong investment signals and the timing of future RESS auctions in conjunction with associated volumes needs to be clearly communicated. If consented projects are left waiting for an opportunity to bid into a RESS auction for a long period of time, then this will serve to undermine continued investment in the industry.

A predictable and transparent mechanism for securing a grid connection offer and ultimately firm access is also required.

## 3.3 How much experience does industry in Ireland have to build and operate offshore wind farms?

New market entrants with experience from the UK and mainland Europe will drive the industry forward, in conjunction and or in partnership with existing developers with deep knowledge of the

Irish market. With proximity to the UK offshore market, we expect a similar ultimate profile of large utilities and experienced developers who are owning and operating offshore wind farms in Ireland. Current participants are such as but not limited to SSE, ESB, Innogy, Statkraft, Fred Olsen, Parkwind, Energia, Equinor, DP Energy, Lightfield Limited and others. Furthermore, there are significant opportunities for other possible entrants to the market in Ireland such as Ørsted, EDF and several other large utilities.

In October 2019, IWEA carried out a survey of the current development pipeline for offshore wind which highlighted there is now 12.3 GW in active development. A summary of this pipeline, and the developers of this pipeline, is provided in Figure 4.

Additionally, to provide an example of the development pipelines and experience of just some of the developers entering into the Irish market, SSE and innogy have provided information on their experience which can be found in Appendix A.

| Offshore Wind Pipeline | | | | |
|---|---|---|---|---|
| Offshore Wind Farm | Capacity (MW) | Developer | Foundation | Stage |
| Arklow Bank 2 | 520 | SSE Renewables | Fixed | Consented |
| Codling Wind Park | 1,100 | Fred Olsen, Hazel Shore | Fixed | Consented |
| Oriel | 330 | Oriel, Parkwind, ESB | Fixed | In planning system |
| Codling Wind Park Extension | 1,000 | Fred Olsen, Hazel Shore | Fixed | In planning system |
| Dublin Array | 600 | Innogy, Saorgus | Fixed | In planning system |
| Skred Rocks | 400 | Fuinneamh Sceirde Teoranta | Fixed | In planning system |
| Braymore Point | 800 | SSE Renewables | Fixed | In development |
| Celtic Sea Array | 800 | SSE Renewables | Fixed/ Floating | In development |
| Clogherhead | 500 | ESB, Parkwind | Fixed | In development |
| Cooley Point | 500 | ESB | Fixed | In development |
| Helvick Head | 1,000 | Energia | Fixed | In development |
| Kilmichael Point | 500 | ESB | Fixed | In development |
| NISA | 750 | Statkraft | Fixed | In development |
| Clare Offshore Wind Farm | 700 | DP Energy | Floating | In development |
| Sligo Offshore Wind Farm | 500 | DP Energy | Floating | In development |
| Inis Ealga | 700 | DP Energy | Floating | In development |
| South Irish Sea project | 1,000 | Energia | Fixed | In development |
| Block 30 (Off Shore Wind) | 600 | Lightfield Limited | Floating | In development |
| Total | 12,300 | | | |

**Figure 4: Offshore Wind Pipeline in Ireland from October 2019**

# 4 Financing Questions

## 4.1 How does a centralised vs de-centralised offshore grid model impact developers from a financial perspective; and is one or other model preferable in this regard?

An important consideration is as to whether one option will negatively impact on the ability of project to acquire financing.

In terms of project delivery, the concerns with respect to delivery of a centralised approach outlined in this paper, and the potential delays resulting from extra up-front government/network company, should be considered within the context of project finance-ability. If the connection build is in control of the project itself, as much as possible, it will increase control over the ability to deliver to schedule, and thus increase certainty.

However, in general we would expect de-centralised to require higher spends by the developers themselves, given that the offshore developer may need to finance the de-centralised grid. However, commercial parties could potentially deliver cheaper solutions (e.g. higher debt shares which could result in lower Weighted Average Cost of Capital) for such builds.

In the UK, which uses a decentralised model, the developer delivers the assets and they are subsequently sold through a competitive tender to an OFTO for operation once the construction of the offshore transmission assets is completed. For such a model, or in the case where the developer retains the assets themselves, we would anticipate that the offshore wind farm should pay for the shallow connection asset (as per onshore) but the deep reinforcements should be paid for by TUoS.

In contrast, for a centralised TSO build model, we anticipate that all offshore grid costs would be socialised through tariffs and collected from electricity users.

In summary, from a project financing perspective both solutions are workable. This is notwithstanding concerns with respect to delivery and delays, highlighted in this document with respect to a centralised model, and the negative impact these could have on project finance-ability.

## 4.2 How should the onshore and offshore transmission assets be funded e.g. developer, UoS or state?

In a de-centralised offshore model, the offshore wind farm should pay for the shallow connection asset (as per onshore) but the deep reinforcements should be paid for by TUoS. In a centralised offshore grid model, the offshore network becomes part of the meshed network so should be funded by TUoS. The offshore developer pays for the shallow connection up to the EirGrid offshore node.

In both approaches long-term forward planning will be required to achieve 2030 targets, and this is seen as a key risk to facilitating adequate capacity on the system.

# 5 Policy Questions

## 5.1 What is the industry's view on the current legacy projects and how they should be treated with respect to the Enduring Model?

Legacy project developers have on average spent 5 – 7 years in developing their projects (some of the earliest projects have been in development for up to 20 years), which include offshore grid route and landfall assessment, geophysical and geotechnical surveys, bird and marine mammal surveys and front end design of the offshore substation and cable; and have a "head-start" on any work that EirGrid would propose to do under a centralised grid model. These projects should not be delayed in building their grid connections, regardless of the grid model chosen but especially if there is a decision to transition to a centralised offshore grid system. Specifically, they are needed as soon as possible to create a functioning offshore supply chain for the 'Enduring' projects to follow.

Many of the current Legacy project developers have previous successful experience of delivering offshore grid assets. They are already in the midst of using their own in-house teams, along with a tried and tested supply chain of suppliers, consultants and contractors to build out the offshore grid connections, further building on lessons learned from previous projects. The recent experience of these developers will be invaluable in ensuring that grid connections are built on time and to budget and will help ensure timely delivery of the Legacy offshore projects, overall value for the consumer and prove the offshore industry in Ireland for the Enduring projects yet to come.

Obviously, the UK is our closest neighbour and happens to be the largest and most mature offshore wind market in the world. For several technical, political, legal and social reasons the risks on UK projects will be mirrored in Ireland, and it therefore probably provides the best comparison for grid development in the Irish market. In the UK a developer led model has been successfully utilised for several years, originally under a developer build and operate and latterly under an Offshore Transmission Operators (OFTO) arrangement. The UKs latest Contracts for Difference Auction (CFD) resulted in a strike price of circa £45/MWh (€52.56/MWh). 95% of the capacity awarded (circa 5GW) was to offshore wind projects. In ensuring value for Irish customers in the medium term, the results of the UK CFD auctions provide the best argument for a developer led decentralised offshore grid approach. In 2017, an International Energy Agency (IEA) report also showed that the UK had some of the lowest offshore wind grid connection LCOE costs in a comparative study of seven countries. This is indicated in Figure 5 where distance to cable landfall against LCOE for modelled sites and impact of changing baseline distance-to-cable landfall.

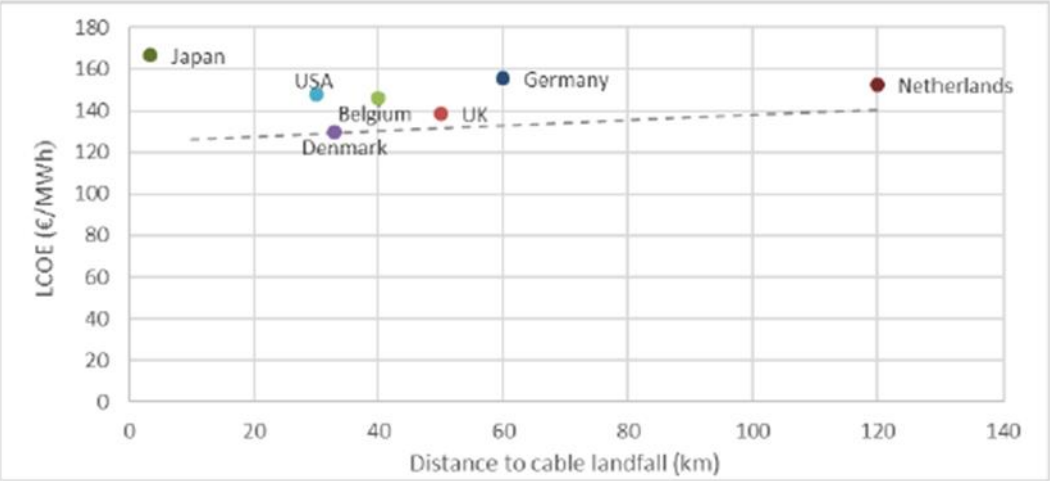


**Figure 5: LCOE based on distance to Landfall**

Currently Legacy offshore wind projects are currently carrying the risk of developing and constructing the grid connection themselves, and to this extent this programme and cost risk is quantifiable (albeit challenging). If grid connection construction were to transition into a centralised process, then this risk to cost and programme becomes unknown. Given the quantity of development expenditure to date, and the risk of delivery and development hiatus associated with a transition to an Enduring centralised model, we would strongly be against Legacy projects being treated in a central model.

Grid connections for legacy project should be issued in line with the CAP Annex of Actions.

# 6 Other Questions

## 6.1 What do you see as main decision-making criteria for selecting a grid delivery model?

This document has discussed several critical criteria for decision making to select a grid model. Rather than repeat the text and reasoning previously written. A summary of three of the critical criterion are:

- The ability to deliver 3.5 GW of Offshore Wind by 2030; however, similar thought should be given to likely 2050 targets and the long-term growth of the market and the suitable grid model, or transitioning grid models, which would be required to achieve these;
- The expertise of TSO in terms of physical infrastructure delivery, skillsets, and expertise to deliver the necessary models, and the CRU in terms of managing regulatory oversight including the impacts on future price control decisions; and
- Cost – what is the most-cost effective solution to deliver value to the consumers of Ireland by 2030 and ensure that the costs achieved are not just low but realisable in a 2030 context.

## 6.2 In your view, who is best placed to consent and build the onshore and offshore transmission assets required?

For Legacy projects, the developer must consent and develop the assets to the point of connection. Deep reinforcements should be consented and delivered by EirGrid/ESB Networks.

On balance, for Enduring projects, industries position is that a developer-led approach with close and continuous engagement with the EirGrid is preferred at least to 2030. For existing projects, the offshore grid developers that are already doing all the marine surveys necessary for the consenting process have considered all options relating to both grid connection cables and the generation asset. The majority of these developers already have significant experience in successfully delivering offshore projects elsewhere and are currently best placed consent and build the assets required.

If a centralised model is decided as being the best solution for the long-term development of offshore grid, we would recommend a phased transition approach to implement this is taken, with substantial levels of industry consultation throughout this process. Work must begin immediately to provide enough certainty that this model could be introduced to support projects in the early 2030s onwards.

## 6.3 In your view, who is best placed to take ownership of the offshore grid?

We would welcome clarity on whether the necessary policies and structures are already in place for a developer to construct, own, operate, and potentially divest the subsea cable and offshore assets?

This query is based on potential issues already experienced in this regard whilst developing an offshore project in NI. An initial consultation and paper were released by UREGNI in 2014, but there have been no updates since, and the lack of a clear process regarding the ownership and operational issues have still not been resolved appropriately.

Industry would welcome specific consultation on the approach to the ultimate ownership and operation of the offshore assets given the complexity and importance of this area.

# 7 Conclusion

We welcome the invitation to make this response in relation to the evaluation of options for grid delivery in Ireland and would welcome further dialogue on this evaluation in due course.

Renewable energy will require a clear, robust and efficient policy framework to deliver in a timely and low-cost manner by 2030 – not simply via support mechanisms, but also through planning and grid policy and their effective and efficient interaction. Considering the scale of ambition expressed in the CAP, these governance and accountability structures will be key to its success over the next decade.

In terms of capability, many of IWEA's members are already operating successfully at a global scale within international jurisdictions; and have the experience and competence to deliver offshore wind projects at scale in Ireland and to attract the right supply chain – provided the necessary policy framework and route to market is in place.

It takes approximately 10 years to develop, consent, design, finance, construct and commission a typically sized offshore wind farm. With the additional time required to put all the policy measures for a centralised model in place needed in Ireland (including a centralised leasing, planning interest and consenting regime), it is industry's position that this effectively rules out connection prior to 2030.

On balance, industries position is that a developer-led approach with close and continuous engagement with the EirGrid is preferred at least to 2030. For existing projects, the offshore grid developers that are already doing all the marine surveys necessary for the consenting process have considered all options relating to both grid connection cables and the generation asset. The majority of these developers already have significant experience in successfully delivering offshore projects elsewhere and are currently best placed consent and build the assets required.

Should, for any reason, a centralised model be adopted as the long-term approach, a suitably long-term transitionary pathway must be considered which recognises the impact to the current development pipeline and future renewable energy targets. We would recommend a phased transition approach to implement this is taken, with substantial levels of industry consultation throughout this process. Work must begin immediately to provide enough certainty that this model could be introduced to support projects in the early 2030s onwards.

# Appendix A. Sample of Industry Operational Experience

## Summary of SSE experience in development of Offshore Wind Energy:

### Operational:

| Project | MEC | % SSE Ownership | JV Partner | SSE Lead Developer | O&M Contract |
|---|---|---|---|---|---|
| Greater Gabbard | 504MW | 50% | Innogy | No | SSE |
| Walney | 356MW | 25.1% | Orsted, Consortium of PGGM and Dutch Ampere Equity Fund | No | Dong Energy |
| Beatrice | 588MW | 40% | Copenhagen Infrastructure Partners, Red Rock Power Limited | Yes | SSE |

### Pre-Construction:

| Project | MEC | % SSE Ownership | JV Partner | CfD Contract | Lead Developer | Delivery Date |
|---|---|---|---|---|---|---|
| Seagreen | 1100MW | 100% | N/A | Yes (454MW) | SSE | 2023/24 |
| Dogger Bank Creyke Bank A | 1200MW | 50% | Equinor | Yes | SSE | 2024/25 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dogger Bank Creyke Bank B | 1200MW | 50% | Equinor | Yes | SSE | 2024/25 |
| Dogger Bank Teeside A | 1200MW | 50% | Equinor | Yes | SSE | 2024/25 |

## Summary of innogy experience in development of Offshore Wind Energy:

### Operational:

| Operational projects 2.5GW (1.1GW innogy share) | | | | |
|---|---|---|---|---|
| **Project** | **Location** | **Capacity** | **COD** | **Current shareholders** |
| **North Hoyle** |  | 60MW | 2004 | GREENCOAT UK WIND 100%; innogy Operator |
| **Rhyl Flats** |  | 90MW | 2009 | innogy 50.1%; GREENCOAT UK WIND 24.95%; MACQUARIE 24.95% |
| **Greater Gabbard** |  | 504MW | 2012 | innogy 50%; sse 50% |
| **Thornton Bank I-III** |  | 325MW | 2013 | C-Power 100% (innogy owns a 27% stake in the consortium) |
| **Nordsee Ost** |  | 295MW | 2015 | innogy 100% |
| **Gwynt y Môr** |  | 576MW | 2015 | innogy 50%; MACQUARIE 20%; SW//M 30% |
| **Nordsee One** |  | 332MW | 2017 | innogy 15%; NORTHLAND POWER 85% |
| **Galloper** |  | 353MW | 2018 | innogy 25%; MACQUARIE 25%; Sumitomo Corporation 12.5%; SIEMENS 25%; ESB 12.5% |

## Construction & Pre-Construction:

**Construction & Route-to-Market secured projects**
**3.2GW (2.4GW innogy share)**

| Project | Location | Capacity | COD | Current shareholders |
|---|---|---|---|---|
| TetraSpar | | 3.6MW | 2020 | innogy 33%; 66%; Stiesdal 1% |
| Triton Knoll | | 860MW | 2022 | innogy 59%; J-POWER EPDC 25%; Kansai Electric Power 16% |
| Kaskasi | | 325MW | 2022 | innogy 100% |
| Dunkirk | | 600MW | 2025 | innogy 33%; EDF ENERGY 50%; ENBRIDGE 20% |
| Sofia | | 1400 MW | 2025 | innogy 100% |

Won via competitive auctions