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26th June 2020

To whom it may concern

Consultation to Inform a Grid Development Policy for Offshore Wind in Ireland

Transmission Investment, as one of the leading independent operators of offshore wind transmission, welcomes this opportunity to respond to the above consultation.

Transmission Investment manages one of the largest offshore electricity transmission portfolios. Our managed portfolio of Offshore Transmission Owner (OFTO) assets includes the connections to seven GB offshore wind farms, and we will take over management of a further two offshore wind connections in 2020 – in total a portfolio of approximately 2.5GW and £2bn in capital employed. We are the largest manager of offshore wind transmission in GB, which is the largest offshore wind market in the world.

Transmission Investment is a strong advocate of introducing competition into the delivery of transmission as a means to introduce innovation into the sector and to reduce costs to consumers.

Transmission Investment is also leading, in partnership with the French national grid company RTE, the development of a proposed 1400MW HVDC interconnector between France and Britain via Alderney ("the FAB interconnector project"). This project was granted cap & floor regulatory treatment in 2015 and whilst it continues to experience Brexit related delays, it will commence construction as soon as the regulatory process allows.

We have provided our responses to the specific consultation questions in Annex 1 to this response, focussing on the planning and delivery of the offshore wind grid assets, being those assets between the offshore wind farm itself and the point of connection to the existing onshore grid system.

We have also provided in Annex 2 an alternative model for consideration by DCCAE which allows for the competitive delivery of the offshore grid assets for the reasons expanded upon later in this letter.

We would like to expand on what we see as the implications of two of the guiding principles in the selection of the most appropriate grid development policy for offshore wind in Ireland: notably that the policy needs to fit the context, and that the roles of development and delivery need to be clearly defined and can be separated.

Context and Consequences for Grid Design

Our understanding of the Irish context is that it contains the following features:

- Overall target of 3.5GW of offshore wind by 2030:
- Offshore wind projects range in size between 330MW and 1000MW (cf Table 2.2 of the Navigant report[1]);
- All offshore wind project located off the East/South coasts of Ireland (see Figure 1 below);
- Distances from the onshore grid are typically less than 50km with all less than 100km (as the crow flies);
- Grid connection point capacity at nine east coast substations ranges from 350MW (Arklow) to >800MW (Woodland, Poolbeg South and Finglas) – although only 1.5GW in total capacity is available before reinforcement required;
- More than one spare bay is available at six of the nine substations considered.

Figure 1 - Locations of proposed Irish offshore wind farms (courtesy of 4C Offshore)

In this context, and whilst a more detailed study would be necessary to confirm, it is likely that the most economic offshore wind grid connection scenario that would meet the 2030 target would be characterized by:

- Between four (4) and eight (8) offshore wind projects in total
- All located on the East/South coasts of Ireland
- All connected to the onshore high voltage transmission system using AC technology (whilst in theory a 1000MW project could be connected via a DC link this would both require an increase in the largest loss covered on the Irish system, and be prohibitively expensive given the distances involved);
- Requiring only one, two or at most three export cables per project (at present circa 400MW can be transmitted on a single AC 220kV offshore export cable, this may have increased by the time the projects in question are procured);
- And only one bay at the onshore grid connection point per project for projects up to 700MW (based on largest loss limit of 700MW as for Celtic interconnector) and two bays for projects over 700MW (up to the maximum project size noted above). It should be noted that projects will normally require a separate onshore substation, even if the offshore wind farm export cable is of the same voltage as the onshore grid to which it is connecting, in order to marshal several smaller offshore export cables into one or more larger cables that can be connected

[1] Final Report: Offshore Grid Delivery Models for Ireland, Navigant, 31 March 2020

to fewer spare bays at the onshore grid connection, and to provide connection facilities and space for voltage control and power quality equipment (such as reactive compensation and harmonic filter equipment).

The scope for co-ordination would therefore likely be limited to:

- Ensuring that the onshore grid connections points for these four to eight offshore wind farms are selected so as to minimise onshore and offshore grid costs in aggregate;
- Planning shared connections for projects to reduce the number (and therefore environmental impact), and cost, of onshore and offshore AC cables;
- Planning shared connections for projects in order to optimise the use of limited spare bays at substations;
- Co-ordinating offshore and onshore cable routes (even if each project has dedicated cables) in order to minimise environmental impact and public disturbance during construction.

It is likely therefore that the scope for co-ordination will only become apparent when it is known which of the four to eight projects will be selected to meet the 2030 target. Four, larger and geographically distant (from each other) projects would provide little scope. Eight, smaller projects, at least some of which were geographically close to each other, may provide greater opportunity.

If the intention is to deliver more offshore wind during the period from 2030 to 2050, in order to achieve net zero carbon emissions by 2050, given the long time it takes to develop and deliver offshore grid infrastructure, the legacy of the offshore grid systems that will be constructed in the near-term and the economic asset life of these systems, then it would be worth considering now what the enduring grid development policy for offshore wind in Ireland needs to be to deliver on these longer-term targets.

Roles, Conflicts and Competition

The consultation document quite correctly recognises that roles can be differentiated with responsibility handed over from one party to another in respect of the same asset at a defined milestone. An example is the hand-over of the (offshore) grid aspects under Option 3 from the TSO to the offshore wind developer at the end of the permitting stage. We consider this ability to assign responsibility for the offshore grid assets in particular is helpful in ensuring a model under which both the benefits of a co-ordinated "plan-led" approach (in terms of planning a system which has the least overall system cost and environmental impact) can be gained, whilst retaining the ability to select the most appropriate party to deliver (procure, construct, own and operate) each offshore grid asset.

In our view, where there is the potential for co-ordination, the system operator (EirGrid) should be responsible for the planning of a system, onshore and offshore, which has the least overall system cost and environmental impact. Only by having a single body who can take a view of the whole system can these aspects be weighed appropriately. It is also important that this single body is independent from any party that would deliver the assets so as not to be incentivised to bias the system plan in one direction or another.

The handover milestone could be at an early stage, when the onshore grid connection points and the capacity and topology of the grid have been defined, or at a later stage when permitting has concluded (as in option 3 above).

As the consultation document recognises, it is important that where there are shared assets there is the avoidance of any conflict of interest that could arise if these assets were delivered by a single offshore wind developer. However, we would argue that these conflicts could arise much earlier than the operational stage, and in fact are, if anything, greater and more likely to arise during procurement and construction. We would advocate therefore that any shared assets should be developed, procured, constructed, owned and operated by a transmission company that is certified as complying with the unbundling requirements.

Finally, in respect of roles, we note that whilst the OFTO model is considered as a European example (for example in Figure 2 in the consultation document), delivery of the offshore grid by an independent grid company has not been included in any of the options described. The GB model has shown that competition can be used to select parties to competitively own and operate offshore grids at costs that are lower than incumbent transmission owners (empirically this has been shown to be the case as one incumbent transmission owner bid unsuccessfully to become an OFTO in the first two OFTO tender rounds). More recently, the GB system operator has run a competitive tender process to procure voltage control services (the most competitive bids involve the construction of high voltage transmission assets – shunt reactors) in which the incumbent transmission owner was only third most competitive (and the winning tender being almost 50% less costly that the incumbent). There are also examples of competition in electricity transmission in North and South America which demonstrate the significant cost savings that can be garnered from the competitive delivery of electricity transmission. Indeed, both the states of Massachusetts and New Jersey have recently passed legislation enabling the competitive procurement of offshore wind transmission.

In our view, if shared assets are to be a feature of a co-ordinated offshore grid, then these would be best delivered through an open and competitive process.

We hope you find our response helpful. We would be happy to provide further input on any aspect as required.

Yours faithfully,

[redacted]

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Annex A – Responses to specific questions

Question	Response
1) With respect to key driver (i), cost levels, which of models 1,2,3,4, or variant of these, delivers the most satisfactory results? Which features of the model, or variant, are the most influential for your given choice?	We think this is an important question as cost is ultimately paid for by consumers. In our experience the model needs to have competitive delivery of assets if it is to produce the least cost for consumers. This is not a feature of model 4 as it currently stands and so in this model the role of EirGrid or ESB in delivery should be replaced by a competitively appointed transmission provider, responsible for delivering the offshore grid system planned by EirGrid. We think the cost comparison from the Navigant report should be treated with extreme caution as: • The sponsors of the report[2] from which the cost comparison results come are monopoly TSOs; • There was only a small sample size of projects used from these TSOs; • Some of the projects quoted have not yet been constructed; and • All the TSO costs come from unverifiable TSO internal costs. The cost comparison report responds to an earlier report procured by a developer (Orsted) which has the opposite conclusion – i.e. that developer costs of offshore wind transmission are significantly lower than TSO costs[3]. Perhaps a less biased picture may be obtained from Ofgem analysis which shows that competition in the financing and operation of offshore wind transmission assets provides significant cost benefits compared to provision by either developer or incumbent TSOs[4, 5].
2) With respect to key driver (ii), environmental impact, which of models 1,2,3,4, or variant of these, delivers the most satisfactory results? Which	We think that the environmental impact should largely be determined at the planning stage and therefore that those options which can obtain the

[2] Connecting Offshore Wind Farms, Navigant, July 2019

[3] Market Design for an Efficient Transmission of Offshore Wind Energy, DIW, May 2019

[4] Evaluation of OFTO tender Round 1 Benefits, CEPA & BDO, May 2014

[5] Evaluation of OFTO Tender Round 2 and 3 Benefits, CEPA, March 2016

features of the model, or variant, are the most influential for your given choice?	benefits of co-ordination should have the least environmental impact.
3) With respect to key driver (iii), future proofing and technologies, which of models 1,2,3,4, or variant of these, delivers the most satisfactory results? Which features of the model, or variant, are the most influential for your given choice?	We expect that in the context there would be only limited differences between the models with respect to future proofing and technologies, given the likelihood of all AC connections and the relative ease with which these systems can be interconnected or added to. Those models which allow for anticipatory investment in grid infrastructure may be able to obtain some benefits of scale.
4) With respect to key driver (iv), required infrastructure, which of models 1,2,3,4, or variant of these, delivers the most satisfactory results? Which features of the model, or variant, are the most influential for your given choice?	We would not expect the incumbent grid companies (ESB and EirGrid) to have more experience of offshore grid assets than the offshore wind farm developers, many of whom are large European utilities with ten years or more experience of constructing offshore grid assets, or indeed ourselves who have almost ten years of operating offshore grid assets.
5) With respect to key driver (v), compatibility with Relevant Projects, which of models 1,2,3,4, or variant of these, delivers the most satisfactory results? Which features of the model, or variant, are the most influential for your given choice?	Cleary developer-led models are most likely to be compatible with what has already been done by developers in terms of consenting their projects. However, this does not mean that a developer needs to deliver the offshore grid assets for its project. An alternative would be for a transmission company (preferably appointed through a competitive process) to build the offshore grid assets using the land rights and consents obtained by the developer and in accordance with applicable standards.
6) With respect to key driver (vi), social acceptance, which of models 1,2,3,4, or variant of these, delivers the most satisfactory results? Which features of the model, or variant, are the most influential for your given choice?	No comment
7) With respect to key driver (vii), facilitating the timely development of offshore wind capacity to achieve the 2030 target, which of models 1,2,3,4, or variant of these, delivers the most satisfactory results? Which features of the model, or variant, are the most influential for your given choice?	This largely depends on how quickly the necessary policy and legal changes can be made. If there is a significant time attached to this then a transitional period utilizing model 1 would enable projects to enter construction in a most timely fashion, perhaps with these assets then being required to be transferred to a transmission company post-commissioning (as in the OFTO model).

8) Rank the key drivers in order of importance 1-7, which have the greatest impact on the choice of model.	No comment
9) How important is it for Ireland to develop an indigenous offshore wind energy industry? How best can an indigenous industry be developed?	No comment
10) How should onshore and offshore grid connections be optimised? For example, should consideration be given to common hubs for adjacent projects?	Whether consideration should be given to hubs depends on the technology used, the location and sizes of the offshore wind farms, the distances from shore (and from each other), the available grid capacity and the environmental constraints. As noted in our covering letter, at this stage it is unclear therefore whether hubs will be the optimal grid design. Offshore hubs, if they are part of an optimal design, as shared transmission assets should be delivered by a transmission company that meets unbundling requirements. It should be noted that they are also likely to involve a degree of anticipatory expenditure, in that the hub may need to be constructed ahead of need and potentially even ahead of certainty of full need.
11) Are there any further considerations which might reduce the cost to the consumer?	As noted in our covering letter, competition in the delivery of electricity transmission has been shown around the world to reduce costs to consumers and we would recommend that DCCAE considers the use of the competitive delivery of the offshore grid assets instead of ESB or EirGrid.
12) Currently, developer compensation is not provided for delayed delivery of grid connections to renewable generators connecting to the network. Should developer compensation arrangements be provided for delivery of offshore grid connections to renewable projects? Similarly, who is best placed to bear the outage risks under the various options?	Clearly compensation should not be payable if the offshore wind developer is responsible for the delivery of the offshore grid connection. If a transmission company is responsible then the transmission company should have strong incentives to complete on time (penalties for late delivery). However, these incentives/penalties should be appropriately sized and limited if they are not to increase overall costs to consumers. Similarly, in the operational stage, the owner of the offshore grid should be incentivized to maximize availability, but again with suitable limits on incentives/penalties. The availability incentive mechanism under the OFTO model works well in this respect. It is limited so that an OFTO can only lose 10% of its revenue in any one year and 50% of a year's revenue across five years for a single event. It has incentivised our performance over the

	last 10 years to achieve in excess of 99.9% availability as measured by the availability incentive mechanism.
13) Are there any further drivers which should be considered when assessing a grid delivery model suitable for offshore wind development in Ireland?	No comment
14) Overall, which model, or model variant, is most appropriate as an enduring grid delivery model for offshore wind in the Irish context?	Please refer to Annex 2.
15) It is accepted that a transition towards the chosen enduring grid delivery model will be required to leverage the development of the Relevant Projects in the short term. Taking into account the high-level roadmaps set out at Figures 5 and 6 above, what should this transition look like?	In order to gain a fast start to the process, offshore wind developers could be allowed to develop and build their own offshore grid connections for the first 1.5GW (say) prior to handing over to a competitively appointed transmission owner.

Annex 2 – Alternative Model allowing for Competitive Delivery of Offshore Grid Assets

Project phase	Responsibility	Description	Alternative Model
Pre-development	Zone selection	Selection of location of offshore zone wherein wind farm sites (including transmission assets) could be developed as well as identification and appointment of exclusion zones (e.g. military, shipping, fishing etc.)	DHPLG/DCCAE
	Site selection	Selection of location of offshore wind farm site (including transmission assets) within the selected offshore zone	Developer/State Body
	Timing wind farm roll-out	Timing of offshore wind transmissions asset development	Developer/State Body
	Offshore wind farm transmission asset planning	Timing of offshore wind transmissions asset development	EirGrid
Development	Wind farm consents application	Consents for the offshore wind farm site (including surveys, wind resource and environmental assessments, and any required leases or licences)	Developer/State Body
	Offshore wind farm transmission asset consents – application	Consents for the offshore wind transmission assets (including environmental assessment and any required leases or licences)	CAP[6]/EirGrid (depending on early or late appointment of CAP)
	Financing	Financing of offshore wind transmission assets	CAP
	Final Selection of onshore grid connection point	Final decision on onshore grid connection point	EirGrid
	Functional design offshore transmission assets	High-level design of the functional requirements and specs of transmission assets beyond grid codes and applicable standards (e.g. voltage level, capacity, cable corridor, offshore substation location, landing points, shared assets if applicable)	EirGrid
Construction	Detailed design offshore wind transmission assets	Detailed design of offshore wind transmission assets (e.g. full technical definition of transmission assets, installation methodology, construction timeline etc.)	CAP
	Offshore wind transmission asset construction	Construction and commissioning of transmission assets	CAP
O&M	Ownership and maintenance	Ownership and maintenance of offshore wind transmission assets (including decommissioning)	CAP
	Operation	Operation of offshore wind transmission assets[7]	EirGrid

[6] CAP = Competitively Appointed Provider (of offshore grid assets)

[7] We understand that "operation" here is defined as the controlling of the flow of electricity across the assets as opposed to the role undertaken by a transmission owner in operation who would *inter alia* be responsible for the operational switching and safety management of its assets.

Onshore grid reinforcement	Responsibility onshore grid reinforcement	Planning, specification, consenting (EirGrid) and construction (ESB Networks) of required reinforcements in the onshore grid to facilitate the infeed of offshore wind energy	ESB Networks/EirGrid
Auction Design	Auction type		Amongst sites or Site-specific
	Definition of offshore capacity in RESS auctions		DCCAE
	Selection and definitions of onshore connection points (stations, capacity, timing) for RESS auctions		EirGrid
	Designing and conducting the auction for the CAP		DCCAE/CER /EirGrid
Ownership boundary	Ownership boundary		Onshore

{End}