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**Offshore Electricity Transmission: Consultation on the Enduring Regime**

Dear Sam

Vattenfall welcomes Ofgem's consultation on the enduring regime and we are pleased to respond. Our response is set in the context of our activities in the UK offshore wind market as well as our offshore wind interests further afield.

In the UK, Vattenfall:

- Owns and operates the 90MW Kentish Flats offshore wind farm
- Has, with ScottishPower Renewables, been awarded the Round 3 Crown Estate lease for the East Anglia Array zone with a potential capacity of up to 7.2GW
- Is currently taking two projects, Ormonde and Thanet, through the transitional OFTO tender process. Thanet is currently under construction and, when complete, will be the largest offshore wind farm in the world at 300MW. Ormonde is planned at 150MW and is nearing construction.

Outside of the UK, Vattenfall:

- With DONG Energy, owns and operates the 160MW Horns Rev offshore wind farm in Denmark
- Owns and operates the 110MW Lillgrund offshore wind farm in Sweden

As is evident from our portfolio, Vattenfall has made substantial strategic investments in offshore wind energy and is committed to maintaining and enhancing its world-leading position in offshore wind. Furthermore Vattenfall's activities in the UK are driven by our investment in people – we have taken over what was AMEC Wind Energy and see the expertise therein as a major and valuable asset. Over the last year Vattenfall's presence has expanded with offices in Edinburgh and London and project-centred activity across the UK.

All of this activity is naturally the result of our assessment of the UK and its renewables market as an attractive environment in which to do business. As with any company, we regularly review our portfolio and update assumptions and financial projections in line with greater understanding of rules, regulations, politics and general outlook. We understand that conditions can change and that we must make judgements based on the confidence instilled in us by the overall picture.

This process of embedding ourselves in the UK market and gaining an operational level working knowledge of the market has been our main focus to-date. Obviously a major part of this has been to remain abreast of the development of the offshore transmission regime, and to work through the ramifications for our projects.

A key learning curve for all concerned has been the ongoing transfer of assets during the transitional tenders. Vattenfall is taking its Thanet (300MW) and Ormonde (150 MW) wind farms through the OFTO tendering process. Our assets represent two of the nine projects being tendered and over a fifth of the capacity being tendered in the first transitional round. Clearly this experience will shape our views, expectations and aspirations for the enduring regime and for our Round 3 East Anglia Array project as it is taken forward with ScottishPower Renewables.

Vattenfall therefore very much welcomes the opportunity to comment on Ofgem's updated proposals for the enduring regime. We very much support Ofgem when you say that "*refinement of the regulatory regime is a collaborative process*" and that you are "*keen to work with stakeholders to further refine proposals.*" Given our aspirations, investments and activities, Vattenfall is well placed to provide input and we look forward to working with Ofgem over the next few months and years ahead on an enduring regime.

We acknowledge that the development of this regime has seen, on occasion, an antagonistic dynamic between Ofgem and the industry. We feel that mutual respect and trust will be extremely important going forward and we very much hope to contribute to a productive working relationship with Ofgem. The expertise required to make this regime work is in short supply and it will be essential to capitalise on all that stakeholders can contribute. We are at your disposal should you wish to canvass us on any point.

The remainder of this response considers the different areas in which a generator engages directly in the offshore transmission regime. We have provided our comments on the key issues.

**The connection application process**

Vattenfall has onshore and offshore projects contracted for connection at distribution and transmission. Two projects are operational and others are at various pre-connection stages. We have managed the connection application process through regulatory changes including GB Queue Management, Interim Connect and Manage, the Statement of Works process for distributed-connected projects and the introduction of the offshore transmission regime. Project circumstances also evolve, which again often necessitates updates to contracts.

In our experience it is important that contractual arrangements with National Grid are:

- Transparent
- Reasonably flexible and pragmatic
- Fair and proportionate
- Provide good visibility of financial liabilities for the life of the project

The current volume of work and the scale of change that National Grid is currently managing are unprecedented in our view. There is also a great deal of historical complexity and opaqueness to the contractual arrangements which compound this situation and sometimes make the process quite difficult for all concerned. Even without the offshore arrangements, the connection application process (and subsequent maintenance and updating of contracts) would very much benefit from some rationalisation and general improvement.

The offshore connection application process adds several more layers of complexity for projects of an unprecedented size being built in phases over long timeframes. We feel that there is room for some improvements to the current process which would benefit offshore projects, as well as some careful thought about the details of a two-stage offshore connection application process. In particular, it is important to:

- Agree and set out clearly generator liabilities at each stage of the process
- Ensure that these liabilities are reasonably predictable
- Build in some flexibility for projects that will inevitably evolve over time
- Provide generators with a clear indication of operational TNUoS costs

The addition of one or more OFTO contractual interfaces further complicates an already convoluted process. The interfaces between National Grid and the Scottish TOs have had knock-on implications for generators where incentives are not aligned. We can see the potential for similar and more difficult issues arising offshore.

For instance, until the OFTO is appointed, who is responsible for facilitatory works for the OFTO connection? National Grid will not undertake the work and is only incentivised to meet connection dates to its system. The generator is incentivised by the ROC mechanism to seek early connection but there is no guarantee that any work it does on the connection pre-OFTO appointment will be adopted. We see this as a lost opportunity to make good time on projects and as a damaging misalignment of incentives between generators and National Grid.

Vattenfall hopes that it can work with Ofgem, National Grid and others in order to find the right balance in the connection application process.

**The OFTO tender process**

Vattenfall already has some valuable experience of the tender process through our ongoing involvement in the transitional tenders for Ormonde and Thanet. This has been an extrememly challenging process for all concerned, and the scale of effort required to meet timescales has been substantial. Vattenfall would like to thank National Grid and Ofgem for the work that has gone into transferring our contracts, to-date.

There are a number of observations that we feel could be usefully carried through as lessons learned for the enduring regime:

- The timescales have been exceptionally challenging. We believe Ofgem should consider the extent to which this reflects first-time effects, and whether there is a need for extra resources. The administrative burden of the regime – on National Grid, developers and possibly Ofgem – we feel has been very much underestimated.

- Generators have no control over the process, which is a long way from both our expectation and our normal way of doing business. Typically we would have ongoing dialogue with parties responsible for our grid connection, especially in the context of us taking commercial risk on grid availability. However we have been disappointed that Ofgem has been rather inflexible in areas such as freezing the data room at a certain point in time, even if there are valuable updates to be made for projects that are continuing to evolve.

- Similarly the generator's lack of influence over the OFTO appointment and our inability to liaise with the preferred bidder is very difficult to comprehend and to work with. Earlier on in the process Ofgem had indicated that the process would be generator-lead, but we just cannot see any evidence of this in the regime. This has introduced regulatory risk that we had not expected.

Ultimately it is important that we have confidence that the tender process will procure a suitable and competent OFTO. Where we have very little if any involvement in that appointment, it suggests the need for us to place a great deal of trust in Ofgem to make good choices which value technical competence and experience as much as cost. This is even more so for the enduring regime than for the transitional regime.

The more generators are excluded from the process, the more we are asked to trust Ofgem. But that exclusion does not help forge a relationship based on trust if we feel our concerns are not being taken on board. Ultimately any breakdown in trust will be reflected in the cost of capital; essentially "pricing in" the regulatory uncertainty around Ofgem running tenders for the first time, and potentially appointing new entrants using new technology, the risks of which are being passed on to the generator.

Vattenfall therefore feels that there is some work to build trust, and to look at the way risks are being allocated in the regime. Vattenfall cannot think of any existing regulatory regime that asks players to take on these kinds of risks, where the player has no role in risk control or mitigation.

**OFTO appointment through to construction / energisation**

The period for enduring projects between OFTO appointment and construction / energisation contains a new and as yet unexplored relationship – i.e. a competitively appointed TO working with National Grid, a Scottish TO(s) in Scotland, and the generator. There are three and four-way relationships in Scotland but the added complexity for offshore is the need for the OFTO to remain within the parameters of its bid, despite circumstances evolving with the generator, other generators and other TOs.

Vattenfall notes Ofgem's suggestion to use contingencies. We feel that this should be developed on a case-by-case basis and that negotiations should include the developer pre-appointment. It is unlikely that the generator's plans will not change in some shape or form during the OFTO's design process. This could be especially problematic for an early OFTO appointment. The same can probably be said of the OFTO's plans as its designs and ideas continually progress. There will be some key milestones which will crystallise decisions, and Vattenfall sees no reason why there should be any arbitrary regime-enforced point which forces decisions to be made too early. Therefore, it seems rational to make an OFTO appointment based on competency and a willingness to negotiate regulated settlements as plans evolve.

**Energisation and operation**

The most significant risk we are being asked to take at this stage is the financial consequences of network failure. This is because the OFTO is only exposed to up to 10% of its total revenue.

Whilst we acknowledge that generators are not normally fully compensated onshore for network failure, the risk profile is completely different onshore. For instance there is technology risk for the farther distance offshore projects, which we have summarised here:

*Direct current technology (voltage source converter)*

HVDC technology has been used for more than a half century, although it has been evolving. A new HVDC classification has emerged, which is based on semiconductor technology rather than conventional thyristor valves. It is a technology which is often discussed as a possible offshore transmission medium for the next generation of wind farms in development which are formidably large and far from shore.

Only two European manufacturers offer Voltage Source Converter (VSC) High Voltage Direct Current (HVDC) products: ABB and Siemens. Areva has announced active development of its own VSC HVDC system but this is not near production yet.

ABB has VSC HVDC systems either in operation or under development across Europe, in the form of four interconnectors, two oil & gas projects, and one which is

wind farm related ("Borwin1"). Siemens is completing its first VSC HVDC interconnector which is located in the United States. Siemens does not have any similar projects in Europe.

The reliability of VSC HVDC is still in question because all of the installations have been relatively recent. The earliest of these projects, Troll A (84MW, 70km, operational in 2005), has not reported any failures but has needed some replacement for faulty power electronic components. Reliability information for other projects is still pending.

Furthermore, the VSC HVDC offerings from each manufacturer differ operationally from one another. This means that maintenance, repairs, and replacement parts can only be sourced from the original manufacturer. This is a significant problem if demand exceeds manufacturer resources. Thus there are concerns over timeframes and resources associated with maintenance, troubleshooting, and repairs.

VSC HVDC links have not yet been built to higher voltage specifications such as ±300kV which may enable power transfers up to 1200MW, though manufacturers claim the capability exists. It is likely that Round 3 will drive the technology to be built to this specification for the first time. This raises uncertainty for Round 3 generators over the reliability and performance of this next generation of VSC HVDC systems.

*Alternating current technology*
Alternating current (AC) technology as applied to offshore is proven and well understood, but only at voltages under 150kV. Even so, AC voltages above 150kV have been reported as a possibility for the grid connection of Round 3 sites.

This includes operational voltages of 220kV, 275kV, and even 400kV, with 220kV being the most likely. 220kV AC cables are anticipated for Round 3 use despite having no track record with offshore use. Construction of a 220kV subsea link will not be without challenges with respect to offshore substation design, reactive compensation design, transformation equipment, and cable installations.

All of which reinforces our earlier points that generators need to be heavily involved in any OFTO process.

We trust that these comments are helpful and please do not hesitate to contact us if you require any further information.

Yours sincerely

David Hodkinson

For and on behalf of
Vattenfall Wind Power Ltd