nationalgrid

National Grid House
Warwick Technology Park
Gallows Hill,
Warwick
CV34 6DA

By email – matthew.grant@ofgem.gov.uk
Mr Matthew Grant
European Electricity Transmission
9 Millbank
London
SW1P 3GE

CC. ITPRMailbox@ofgem.gov.uk

Mike Calviou
Director, TNS
Transmission Network Services
Direct tel: +44(0)1926 655873
Mobile : +44(0)7979 708422

www.nationalgrid.com

Date: 17th January 2014

Dear Matthew,

Consultation on Regulation of transmission connecting non-GB generation to the GB Electricity transmission system

Connecting non- GB generation to the GB electricity transmission system provides opportunities for alternative sources of renewable energy to meet the 2020 targets. The regulation of such projects will need to be given careful consideration. We consider the timing of this consultation is significant and timely if the Irish wind export projects are to be developed in time to contribute to the delivery of the 2020 targets.

Design

The design of the infrastructure required to support the connection of generation is a key element in facilitating the delivery of renewable energy from Ireland to the GB market. The regulatory arrangements developed to support Irish renewable generation need to ensure and incentivise an approach to infrastructure delivery that provides:

- the best outcome for GB consumers;
- the most efficient use and potential enhancement of the existing GB transmission network:
- the least impact upon the environment;
- the maximum benefits of Irish wind generation for consumers; and
- flexibility to meet changing future needs.

The most likely place for connection of renewable generation from Ireland is Wales. However, against the current contracted position, the transmission capacity within north and south Wales (and between those areas) is limited without significant transmission reinforcement of the onshore transmission network.

For a simple radial network, the maximum generation that could be accommodated into the Welsh part of the transmission network is around 1.5 GW with a further 1 GW of generation to the English south west peninsula against the existing contracted background. This would require at least three independent HVDC links to be developed in parallel with delivery required by circa 2019. It would be possible to connect more generation via this approach but would require major transmission reinforcements onshore at significantly greater cost and could not be delivered in the timescales to meet the 2020 targets[1].

[1] Also as interconnectors do not benefit from the "Connect and Manage" regime all onshore transmission works would be required to be completed ahead of any additional generation above 1.5 GW.

nationalgrid

National Grid House
Warwick Technology Park
Gallows Hill,
Warwick
CV34 6DA

The diagrams below provide an illustrative example of the possible transmission network configurations discussed within our response.

Diagram A below represents a 'direct and exclusive' approach and is limited to 1.5 GW. Anything greater would require reinforcement of the transmission system onshore.

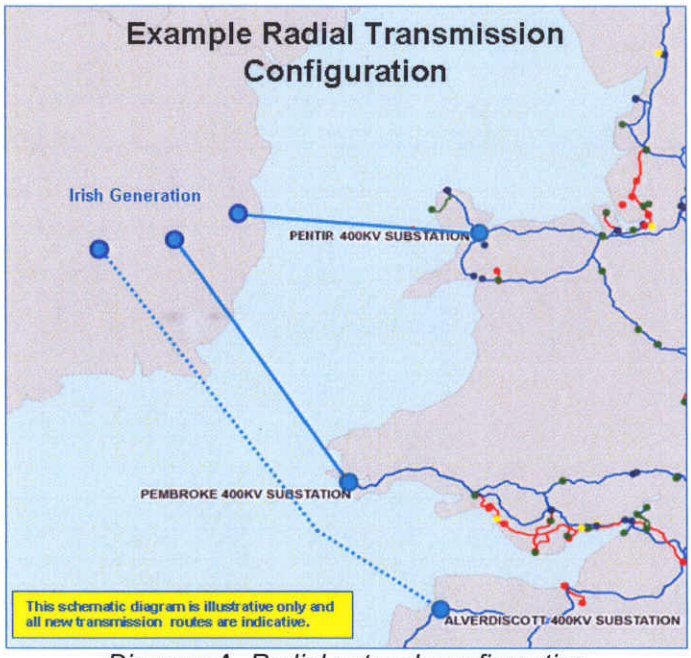


Diagram A- Radial network configuration

Diagram B represents an intergrated approach, which includes the possible onward interconnection to the Irish transmission system.

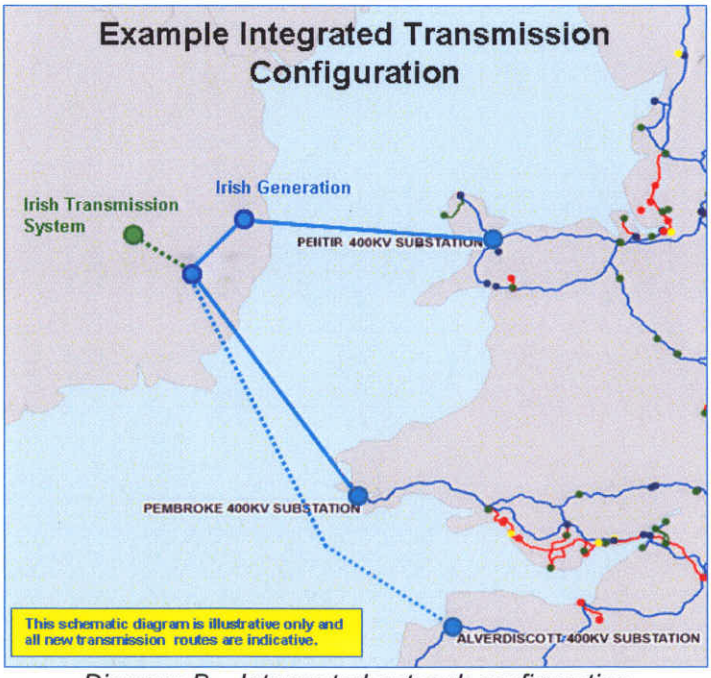


Diagram B – Intergrated network configuration

National Grid House
Warwick Technology Park
Gallows Hill,
Warwick
CV34 6DA

A (lower cost) alternative would be to develop an integrated network solution, which could be developed incrementally to accommodate requirements of all existing contracted users (both GB and Ireland). This could:

- facilitate connection of up to 5 GW of Irish Wind by 2020 to both the GB and Irish networks;
- provide the opportunity to connect further renewable generation in the future;
- facilitate the staged approach to development of the transmission network;
- significantly reduce capital investment requirements (hence reducing the asset stranding risk);
- provide redundancy to reduce generation congestion under transmission outage conditions;
- represent the most efficient and economic solution at this stage and facilitate higher volumes of connection; and

However, this assumes that all developers from across the different renewable projects work together at all stages.

The benefit this provides to the consumer are described in a joint published report with EirGrid (Connecting Wind Generation in Ireland to the transmission systems of Great Britain and Ireland)[2] and is discussed further in question 6 and 11 in Appendix 1.

Interconnector regime

The projects under discussion as part of this consultation do not naturally appear to fit into any of the established patterns of regulation for the existing GB frameworks. However, recognising the timeframe constraints associated with developing new frameworks "bottom up", the interconnector framework appears to be a pragmatic approach. It does however raise a number of issues and challenges for consideration, which will need to be addressed in a timely manner.

Achieving exemption

The first challenge relates to the applicability of EC legislative requirements and the ability to obtain the necessary exemptions outlined in the consultation document. Without the required exemptions the interconnector approach may no longer be viable. It will be vital to ensure the difference between a traditional market to market interconnector and the Irish wind projects is made clear to the Commission and the rationale behind using the interconnector model within GB. In particular that the links, if not connected to the Irish transmission system, do not connect two markets but connects renewable generation to the GB market.

It is possible to overcome a number of challenges associated with the Congestion Allocation Congestion Management (CACM) and Forward Capacity Allocation (FCA) codes by making the network developed for the Irish wind projects form part of the GB bidding zone. Please refer to question 6 for further details in appendix 1.

Practical operation of an interconnector

Secondly, there are a number practicalities and challenges which need to be considered when operating an interconnector. Typically, balancing across an interconnector for onshore network purposes is achieved through the undertaking of SO-SO trades to facilitate the re-direction of flows as necessary for fault conditions.

In the case of Irish wind, given it is not connected to the Irish transmission network in the first instance, the new network (both the AC and HVDC links) will require a System Operator (SO), (to avoid confusion we shall define this as the Irish Wind SO or IWSO). The IWSO will need to undertake

[2] http://www.nationalgrid.com/uk/Electricity/OffshoreTransmission/Joint+Study+with+EirGrid/

nationalgrid

National Grid House
Warwick Technology Park
Gallows Hill,
Warwick
CV34 6DA

actions associated with network security, outage planning, and system balancing to reflect real time physical output of the generation. In addition, a settlement and a cashout process will be required to manage imbalances. This could be undertaken by a number of existing parties or the creation of a new party but under EU unbundling law could not be undertaken by the generators. However, given the challenges and time pressures of this project we would be willing to undertake this role as an extension of the current SO role, if it formed part of the GB bidding zone and until the onward interconnection to the Irish transmission system. At this point it would seem sensible to consider and review the arrangements taking into account the development of any regime being developed beyond 2020. This would provide a number of benefits in the short term in relation to the CACM and FCA codes, practical implementation, and ability to meet the timescales and cost avoidance of setting up a new IWSO.

Timing

Whilst it is possible to develop and deliver Irish wind export projects in time to meet the 2020 targets, (Appendix 2 provides a generic timetable), the timescales are extremely challenging and decisions are required sooner rather than later. There are a number of key milestones that impact on the ability to deliver such as pre-construction engineering and the achievement of regulatory certainty. In particular to deliver the design described within our response there is a requirement for technology push and development, but given the evidence within the market and industry this technology advancement should be achievable in the timescales. Please refer to our response to question 10 for further details.

Answers to the specific questions raised within the consultation document can be found in Appendix 1 of this document.

We are happy to discuss our views contained within this letter further should that be helpful. For further details, please contact Emma Carr (emma.j.carr@nationalgrid.com). Our response is not considered confidential and is provided on behalf of National Grid Electricity Transmission (NGET). We are therefore happy for it to be placed on the Ofgem website and shared wider for the purposes of this project and the ITPR project.

Yours sincerely

Mike Calviou
Director, Transmission Network Service

nationalgrid

National Grid House
Warwick Technology Park
Gallows Hill,
Warwick
CV34 6DA

Appendix 1 – Questions raised within the consultation on Regulation of transmission connecting non-GB generation to the GB electricity transmission system

Question 1: *What are the key milestones for the delivery of non-GB generation and connections pre-2020? How does the decision on the regulation and licensing of non-GB connection fit into this timeline?*

The timing of this consultation is significant and we consider obtaining governmental and regulatory certainty within 2014 will be crucial for the Irish onshore and offshore wind developer projects to meet the GB 2020 targets. From a technical transmission perspective, Appendix 2 provides a generic timetable for the delivery of a single VSC HVDC link, which such projects within Ireland would need to use to connect to the GB Transmission System. The timetable highlights the significant challenge in meeting the 2020 deadline. However, it should be noted that whichever transmission network design solution is adopted, it will be necessary to take forward multiple HVDC links. A key decision will be the volumes of non-GB generation to be connected by 2020 and hence the network design solutions required to meet it.

In summary, based on our experience, the key milestones in reaching 2020 are:

- Volumes of non GB renewables to be accommodated pre 2020 – mid 2014;
- Initial detailed transmission design agreed by all parties – by the end of 2014;
- Governmental and regulatory certainty[3] – by the end 2014;
- Detailed pre-construction engineering to commence - spring 2014 (including seabed surveys). – it should be noted that the timing of commencement of pre-construction engineering is on the critical path;
- Consenting for preferred transmission network solution - 2014/15;
- Commencement of production of ITT for initial stages - autumn 2014;
- Award of HVDC VSC contracts – autumn 2015;
- Cable manufacturing and installation to commence – 2016;
- Commence the construction of the turbines and collector network – 2016;
- Commence the construction of the VSC HVDC converter – late 2016; and
- Commence commissioning and connection – late 2019.

Question 2:- *From the perspective of a non GB developer, how does the decision on the regulatory arrangements interact with Government decisions on renewable support (such as the ward of a Contract for Difference (CfD)?*

We are not in a position to answer this question as we are not a developer.

Question 3: *Are there other factors that Ofgem should be aware of relating to the timing and development of non-GB connections?*

The global supply chain for HVDC cable and converters has a limited capacity and consideration should to be given as to whether there are sufficient capacity and factory time slots to complete such orders prior to 2020. Developers will be unwilling to commit to such significant financial liabilities in booking a factory time slot without greater certainty as to the regulatory regime.

To ensure sufficient capacity is reserved and the programme completion date is met, early commitment may be required by the developer ahead of project financial close. The developer may

[3] If the Inter-Governmental Agreement (IGA) provides a clear picture of the target volumes for delivery of Irish Wind to the GB market then this will facilitate more economic, efficient, and coordinated design. If there is no visibility beyond 2020 then this makes an integrated approach more problematic and risks increasing bills to GB consumers more than necessary

National Grid House
Warwick Technology Park
Gallows Hill,
Warwick
CV34 6DA

seek to have the risks associated with this significant investment to be underwritten by consumers. As a result, the development of a regulatory structure for these projects is also on the critical path.

Question 4: *Do you agree these are appropriate principles to take into account in relation to non-GB connections?*

The principles outlined within the document seem appropriate:

- Consumers should be protected from undue risk and costs, with the projects providing demonstrable benefits to GB consumers as a whole;
- ensures that only efficient capital and operational costs are incurred and recovered from consumers;
- complements efficient network development and does not drive system operational costs onto consumers through creating difficulties and costs in wider system operation; and
- (provided that they do so in accordance with the above) supports low carbon generation.

Question 5: *Are there other principles that we should also we consider?*

A further principle of 'extendibility and longevity' should also be considered. All network developments, whether within GB or relating to non GB generation, need to be flexible enough to allow for incremental development in order to meet changing future demands placed upon them.

Transmission network capacity within north and south Wales (and between them) is currently limited and will remain so without significant reinforcement to the "onshore" network. Also there are limited landing points for HVDC cables within GB and Ireland and some network designs (multiple links under a direct and exclusive approach) may limit the potential for further development beyond 2020 and have greater environmental implications in terms of triggering the need for new transmission routes through both north and south Wales.

Question 6: *We invite views on our interpretation of the different asset definitions/boundaries and interpretation of the legislation provided in this chapter. What implications does this have for the regulatory options presented in the next chapter?*

The interpretation contained within the consultation document seems sensible. However, one point that may be drawn out further is that the "collector network" may itself be a transmission network which may have implications for the availability of an exemption under Article 17 of Regulation 714/2009.

We understand the rationale behind the Ofgem proposal to use the current interconnector regime with possibility of an European Commission (EC) exemption under Regulation 714/2009. In terms of the timing and delivery of the 2020 targets, the need to avoid the requirement for new legislation and jurisdictional complexities is clear. However, this approach does not come without challenges especially in relation to the exemption process and compliance with the developing European Codes that will have a direct impact.

The European Commission has increasingly placed tighter conditions upon interconnectors seeking exemptions from Regulation 714. The nature of this project is different to a traditional interconnector (i.e. it does not connect two markets if there is no interconnection with the Irish transmission system) and its purpose is to connect renewable generation to the GB market and is likely to be backed by long term CfD's and an Inter-Governmental Agreement (IGA) . We consider that is unlikely to meet the test in Regulation 714 Article 17.1(b) (level of risk attached to the investment…) and will be unable to obtain an exemption from 16.6 – use of revenues. This raises questions about funding mechanisms and an alternative funding mechanism to that of a 'traditional' point-to-point interconnector between two markets.

In summary, for the interconnector approach to work it will require close collaboration with the EC and any exemption will needs to be clarified before its full impact can be fully assessed.

The applicability of the CACM and FCA codes also raises further challenges for the use of the interconnector regime. The definition of which bidding zone the generation is located could assist in relation to CACM and FCA but raises different challenges around constraint management and operation. For example, if the generation was classified within the GB bidding zone CACM and FCA would no longer be relevant but all constraint would be resolved by the GB SO and if within the Irish bidding zone CACM and FCA would apply and the Irish SO would be responsible for constraint management.

There are also a number of practical issues which will need to be considered further, for example, as previously stated, generation volumes greater than 1.5 GW an integrated design solution will be required to meet the 2020 deadline and it is not connected to the Irish transmission system. For this design to work in operational timescales, an IWSO[4] would be required to undertake SO to SO trading and to allow the redirection flows pre and post faults on the respective interconnector links between Ireland and GB. In this case the IWSO would be required to undertake the normal network operational role in relation to network security, outage planning and system balancing to reflect real time physical output of the generation. In addition, a settlement system and a cashout process will be required to manage imbalances.

This could be undertaken by a number of existing parties or the creation of a new party but under EU unbundling law could not be undertaken by the generators. However, given the challenges and time pressures of this project we would be willing to undertake this role as an extension of current SO role, if it formed part of the GB bidding zone and until the onward interconnection to the Irish transmission system. At this point it would seem sensible to consider and review the arrangements taking into account the development of any regime being developed beyond 2020. This would provide a number of benefits in the short term in relation to the CACM and FCA codes, practical implementation, and ability to meet the timescales and cost avoidance of setting up a new IWSO

We agree with Ofgem that if the UK government decide to explore import of direct generation from outside GB post 2020, that further consideration needs to be given to developing a long term solution, which may require legislative change and is compatible with the future approach Ofgem, is developing under Integrated Transmission Planning and Regulation (ITPR) project. Therefore any arrangements developed within the short term need to be flexible.

We are happy to discuss our thoughts on the challenges and possible solutions further.

Question 7: *We are interested in views from stakeholders on what impact alternative interpretations would have on potential projects? Please provide detail where possible.*

N/A

Question 8: *We seek input from stakeholders on how generation licensing for non-GB generation could ensure appropriate safeguards for the export of renewables to the GB transmission system?*

Licensing needs to be undertaken by the National Regulatory Authority (NRA) in which the generation resides. Any IGA between GB and Ireland should include the necessary high level principles and requirements to ensure appropriate technical and consumer safeguards are catered for in accordance with cooperation requirements for cross border issues under the EU third package.

Any network developments would need to comply with both the respective the GB and the Irish grid codes to avoid operational issues. Risks should be placed with those parties able to manage such

[4] As defined within the covering letter – Irish Wind System Operator

risks and not passed on to the consumer. No one party, including consumers, should be placed in a position of advantage/disadvantage. Consequently, creating a level playing field will be challenging but is necessary if such projects are to be successful and to take full advantage of the future potential of non GB generation for consumers.

Question 9: *Are non-GB connections deliverable by 2020 via direct and exclusive connections?*

Irrespective of whether the design is 'direct and exclusive' or 'multi-purpose', both will be a challenge to deliver by 2020. Although, the design approach taken will impact upon the ability to deliver the volume of non-GB generation up to 2020 and beyond. This is because there is limited transmission capacity within the network in north and south Wales (and between those areas), against the contracted position, anything greater than 1.5 GW[5] in volume connected in a 'direct and exclusive' manner will require major onshore reinforcements (potentially a new transmission route / overhead line) that can take 10 or more years to complete when design, planning and consenting issues are taken into consideration. This would not meet the desired 2020 date and would have significantly higher capital and operational costs ultimately leading to higher bills for consumers.

Alternatively, a coordinated and integrated design approach will lead to significant savings in onshore reinforcements and provide the transmission capacity for higher volumes of wind (greater than 1.5 GW) dependent on the number of links and connection points. This could be achieved through a pragmatic approach of developing 'direct and exclusive' connections[6] initially that could, at a later date, become an integrated and coordinate design solution. It would also be possible to accommodate higher volumes of renewables by 2020 whilst deferring major investment on both HVDC interconnectors and investment in transmission assets in both Ireland and GB in response to change in existing and future User requirements.

We currently have contracted with a number of parties onshore and offshore within Ireland for a connection to the GB transmission system for volume totalling 10.5 GW. We have worked with developers and have developed an integrated design which meets the developers required dates and the 2020 deadline, but does not integrate the individual developer's projects.

To determine the overall optimum network design it will be necessary for these integrated designs to be fully co-ordinated and delivered in an incremental manner. This minimises stranding risk and can ensure the network finally built can be further optimised in response to both the agreed volumes of non-GB renewables which subsequently proceed and continuing development of GB generation developments.

We have developed an optimum overall transmission design that minimises transmission investment in Ireland, from Ireland to GB and on the GB Transmission System. However, it should be noted that the contracts, with the non-GB generators, work on the premise that it is the responsibility of the developers to deliver the necessary infrastructure outside GB, both offshore and in Ireland, in order to facilitate their connection to the GB transmission system[7],

Finally, intergrated solutions provides greater opportunities for onward integration to the Irish transmission system

We are happy to discuss our thoughts on design options and connections further.

---

[5] This could possibly be increased circa of 1 GW, if an addition connection to the south west peninsula was made but at a significant increase in cost.

[6] These connections could utilise a limited window of spare capacity that currently forecast to be available until 2025 from our Future Energy Scenarios.

[7] Noting that the EU 'Third Package' of legislative change will require transmission to be unbundled from generation prior to operation.

nationalgrid

National Grid House
Warwick Technology Park
Gallows Hill,
Warwick
CV34 6DA

Question 10: *What are the technology challenges of delivering direct and exclusive connections? What are the technology challenges of delivering multi-purpose assets*?

The only viable technology to connect non-GB Generation from Ireland to the GB transmission system is the construction of High Voltage Direct Current (HVDC) links coupled with Voltage Source Converters (VSC). The challenges for delivering this technology in either a 'direct or exclusive' or 'multi-purpose' connection are very similar in complexity and will be dependent upon the cable type and size and converter capacity chosen.

Due to the potential volume of renewable generation in Ireland (both existing and to be connected) required to meet their renewable targets, it is not possible, due to technical challenges, to connect this additional generation directly to the Irish Main Interconnected Transmission System. Consequently, it will be necessary to establish a series of independent AC networks in Ireland connected to the GB transmission system via High Voltage Direct Current links (due to restrictions on network technology, it is not possible to connect using AC). An integrated network solution would reduce the number of independent AC networks links, and would facilitate further integration of the GB and Irish transmission systems at a lower cost.

Converter technology

The converter technology is driven by the development in Insulated Gate Bipolar Transistors (IGBT) which is currently at 1600 Amps and is expected to reach 2000 Amps by 2016[8] leading to the ability to deliver higher capacity links of 2.2+ GW being available in 2020 timescales. However, this assumption does depend on the developers, pro-actively working with the equipment suppliers to ensure these assets are available to required timescales and that appropriate risk mitigation strategies are developed to ensure effective timely integration into the GB system. With regard to multi-terminal VSC HVDC this is less well established, but this technology has been studied extensively by both industry and academia. A number of schemes are on order and it is envisaged that multi-terminal connection can still be achieved as a means to link into the Irish Transmission System with sufficient coordination with developers and manufacturers; a connection could alternatively be achieved through back-to-back converters.

Cable technology

There are a number of different cable technologies that can successfully applied to this project. The main competing cable types are either Mass Impregnated (MI) or Cross-Linked Polyethylene (XLPE). The former can deliver greater capacity (~2.2 GW at 600 kV) and is a more mature and established technology, whereas the XLPE is still developing with lower capacity (~ 1.0 GW at 320 kV). We have undertaken analysis to determine the lowest risk technology approach, and have concluded this to be circa 2 GW link using MI cable. This analysis is consistent with the report commissioned by Ofgem[9].

However, it is recognised that the rating of MI cable has the potential to increase significantly given close collaboration with the equipment suppliers and targeted R&D. This should lead to HVDC systems with ratings in excess of 2.5 GW being available for the latter stages of this project.

Volume of assets

The optimum link capacity required will be dependent on the volume of non-GB generation, but generally, from an economic and environmental perspective, fewer larger VSC HVDC links are more efficient and cost effective than a higher number of smaller links. Given the current constraints with

[8] https://www.ofgem.gov.uk/publications-and-updates/skm-review-worldwide-voltage-source-converter-vsc-high-voltage-direct-current-hvdc-technology-installations

[9] Please refer to footnote 4 above

National Grid House
Warwick Technology Park
Gallows Hill,
Warwick
CV34 6DA

respect to factory capacity for cable manufacture, a reduction in kW should also result in improved manufacturing capability to deliver cables to required timescales.

Development is required in VSC HVDC link capacities and stretching the boundaries of either cable capacity or IGBT current rating, which, without appropriate asset management risk techniques, could result in increased technology risk. The appropriate risk management techniques for the incorporating of this technology onto the GB transmission system will require any solution to be developed closely with the manufacture and appropriate risk mitigation strategies to be developed during the design, development, commissioning and maintenance of these assets.

Question 11: *What are the potential benefits and challenges of enabling flexibility for a non-GB connection to also be used for a) market-to-market trading; and b) GB network reinforcement? What are the implications for investment certainty?*

As stated above the volume of non-GB generation that can be connected by 'direct and exclusive' connection is limited to 1.5 GW. An integrated network design approach, (which is the same approach adopted when developing onshore transmission networks) will be required in order to allow for flexibility with respect to non GB generation but to also to allow for market to market trading and wider GB network reinforcement,

This would facilitate the connection of higher volumes of non-GB renewables, whilst ensuring we can meet the requirements of contracted GB generation in an economic, secure and deliverable manner. An integrated solution could be taken forward at significant lower capital cost, developed incrementally to significantly reduce asset stranding risk and would facilitate potential for increased interconnector trading at minimum additional cost.

Dependent on the volumes of non-GB generation to be connected to the GB transmission system, the integrated network solution can result in:

- the least risk and lowest cost solution to the end consumer;
- greater utilisation of transmission assets;
- increased boundary capacity;
- additional options for fault management on the GB Transmission System; and
- allow the network solution to be further developed to meet potentially unknown future user requirements.

There are further benefits that would accrue through a 'market-to-market' connection in to the Irish Transmission System. These were identified in a joint study with EirGrid (footnote to the report at Footnote 1) and include increased capacity for cross-border trade, increased sharing of reserve and response and a reduction in the total generation capacity to maintain security of supply; these benefits would be reduced through a direct and exclusive connection approach.

However, to ensure that the full benefits of these designs are fully utilised, an IWSO is required to manage the independent AC networks in Ireland and to agree transfers across the individual HVDC circuits between Ireland to GB, as detailed above in our response to question 6.

The Boundary Transfer Capacity (BTC) between the independent AC networks would have to be designed to ensure that there is sufficient flexibility to allow the SO optimise network performance under the full range of credible operating conditions in order to secure the GB transmission system. Therefore the summation of individual asset capability installed between Ireland and GB will need to be greater than the declared BTC or the total installed non-GB generation in Ireland. This is consistent with the approach taken in mainland Europe.

National Grid House
Warwick Technology Park
Gallows Hill,
Warwick
CV34 6DA

Question 12: *Is the interconnector licence with exemptions(s), as currently available, a feasible option for non-GB connections? If not, what are the key challenges of applying this route to non-GB connections? How could these challenges be addressed?*

We consider any exemption in relation to "use of revenues" would be problematic. Partial exemption from Articles 9, 32 and 37 of the Directive might be possible - please refer to our response to question 6 above.

Question 13: *Under this route would an exemption (under Article 17 of the Electricity Regulation) be required? If so, which provisions would you seek exemption from? How would your project be affected if exemptions could not be applied for?*

It is possible that an exemption (for 3rd party access and unbundling of transmission systems) would be required. Without such exemptions, projects would be unable to proceed under a developer led model. However, we note above the challenges facing the grant of any exemption and detailed within our response to question 6.

Question 14: *Given that an application of the regulated Cap and Floor or fixed revenue model would take time to implement for non-GB connections, should these still be explored further?*

We agree that both the Cap and Floor or fixed revenue model would take time to implement but all proposed options within the consultation have their challenges. The time pressure for delivery needs to be balanced with the requirement for a 'fit for purpose' flexible regulatory regime. As previously stated although the Irish wind projects may be categorised by UK legislation as an "interconnector", the assets concerned are connecting generation to the GB market and not necessarily connecting two markets, unless interconnected to the Irish transmission system. Given the differences it is not clear that a Cap and Floor regime offers any benefits as there is no or limited market risk as it is underpinned by a CfD, the IGA and long term agreements. Therefore other options may need to be further considered. Please also refer to our response to question 6 above.

Question 15: *If so, what are the main challenges and benefits of applying a regulated Cap and Floor or fixed revenue model to non-GB connections? How could these be addressed?*

Please refer to our response to question 14 above.

Question 16*: What is the appropriate mechanism for ensuring access to capacity for non-GB generation?*

Capacity reservation will depend upon the network configuration and the connection approach taken. A more radial approach lends itself towards a long term capacity contract. A more integrated design raises interesting challenges for capacity reservation and the potential to develop capacity access rules within the boundaries of EU legislations such as CACM/FCA. Long term contracts could be adopted but the whole market design would need to be considered as well as the ability to undertake SO to SO trades. This becomes more complex if there is subsequent onward connection to the Irish transmission system.

Please refer to our response to questions 6 and 11 above.

Question17*: What are the implications of following the current connections process for non-GB connections? Should non-GB generators be treated differently to GB based generation? Should non-GB generators be treated differently to other interconnector users? If so, please provide your reasoning.*

The creation of level playing field for all generation and interconnectors is of great importance and no one class of connectee should be placed in a position of advantage or disadvantage. Consequently, decisions in relation to renewable support, the regulatory regime and the recovery of network costs

through transmission charges need to be considered together, i.e. CfD would need to take into account generation outside GB would not be exposed to TNUoS or BSUoS charges.

However, the different nature of traditional interconnector projects (i.e. connecting two markets) and the connecting non GB generation using the interconnector regime may mean the associated regulatory frameworks may need to be adapted or differences justified in order to meet the requirements of the project. The most obvious example here is that the "Connect and Manage" regime in GB applies only to GB generation and not to interconnectors. Given that non-GB generation may be in receipt of a CfD issues by DECC, and be participating in the GB market, Ofgem and DECC may wish to revisit the "connect and Management" regime framework.

***Question 18**: How would the role of the interconnector operator need to adapt if a direct-connect asset was used for additional purposes – such as a) market-to-market interconnection; or b) GB network reinforcement? Should the GB or non-GB NETSO have a role in operating these assets? If yes, what role?*

Please refer to our response to question 11 and 17 above.

***Question 19**: Can the existing charging/cost allocation approaches used onshore or for interconnection be applied to non-GB connections? If not why not and what alternatives are available?*

It may be possible to utilise the existing charging / cost allocation approaches used for onshore or interconnection when considering non GB connections. Further more detailed consideration is required however taking into account all aspects including renewable support and the overall regulatory regime. Please refer to our response to question 11 above.

***Question 20**: How can capacity allocation for direct and exclusive connections ensure consistency with European legislation and European Network Codes? How could this be achieved with the introduction of market-to-market connections?*

As stated previously, the adoption of an exempt interconnector approach has challenges regardless of design. Please see the answer to questions 6, 11 and 16 above.

***Question 21:** Are there other challenges we should be considering when looking at non-GB connections?*

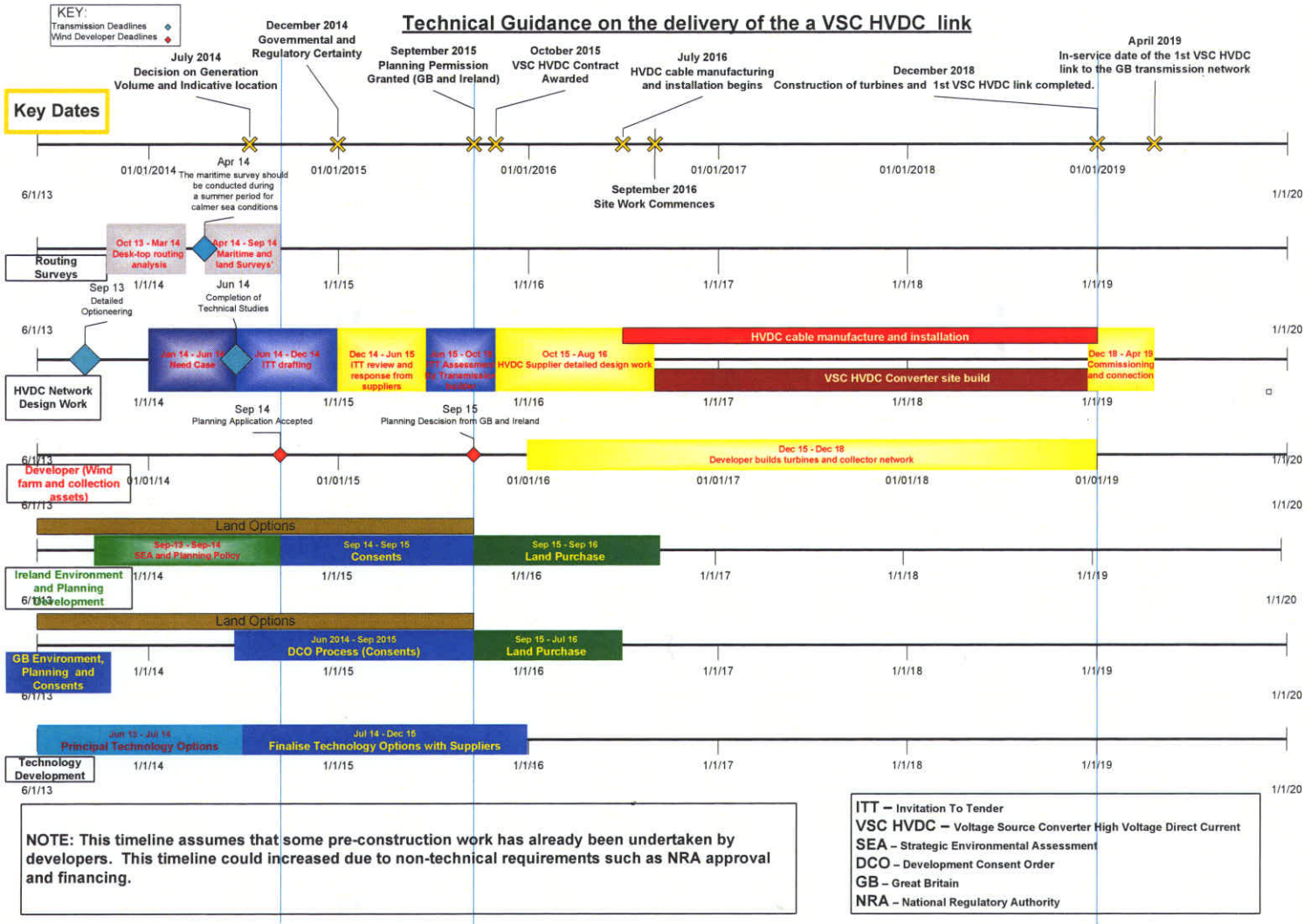
- *Reservation of capacity*
- *Access for renewable*
- *Sharing capacity for other purposes (market to market, network capacity)*
- *Interactions with GB network*
- *Cost allocation*

No, all the main high level challenges (listed above) have either been identified or raised within our responses to the above questions.

nationalgrid

National Grid House
Warwick Technology Park
Gallows Hill,
Warwick
CV34 6DA

Appendix 2 – Generic timeline



NOTE: This timeline assumes that some pre-construction work has already been undertaken by developers. This timeline could increased due to non-technical requirements such as NRA approval and financing.

ITT – Invitation To Tender
VSC HVDC – Voltage Source Converter High Voltage Direct Current
SEA – Strategic Environmental Assessment
DCO – Development Consent Order
GB – Great Britain
NRA – National Regulatory Authority