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Connecting Wind Generation in Ireland to the Transmission Systems of Great Britain and Ireland

nationalgrid

EIRGRID

Introduction

The supply of generation from large-scale renewable energy projects in Ireland and in the Irish Sea to the electricity transmission system of Great Britain (GB) is recognised as having the potential to make an important contribution to European Union (EU) environmental targets. In that context, a formal Memorandum of Understanding on renewable energy trading between Ireland and the United Kingdom was signed early in 2013 by the two Governments with a view to it leading to a full inter-governmental agreement.

Previous studies undertaken by both EU Transmission System Operators (TSOs) and EirGrid have demonstrated the benefits of greater interconnectivity between the GB and Irish transmission systems. Furthermore, studies undertaken by National Grid have shown that there is value in co-ordinating the connection of the Irish renewable energy projects to GB via an integrated network solution, rather than each project connecting individually (and radially).

EirGrid and National Grid Electricity Transmission have completed a study exploring the benefits to GB and Irish consumers that might be achieved by an integrated network solution that includes interconnections to the Irish transmission system, thus increasing power transfer capacity between GB and Ireland. A key finding is that this additional cross-border integrated network capacity would provide similar benefits as another GB - Ireland interconnector, but at a fraction of the cost and without impacting on the development timeframes, costs or the available network capacity for renewable energy export projects.

Background

Several developers have proposed large-scale renewable energy export projects in Ireland that would access the GB market for renewable energy by connecting directly to its transmission system via a number of High Voltage Direct Current (HVDC) links as illustrated in Figure 1.

To maintain network flexibility and keep options open while the necessary regulatory arrangements develop, National Grid Electricity Transmission and EirGrid, the respective TSOs for the GB and Ireland transmission systems, have jointly investigated the benefits of coordinating the infrastructure associated with these renewable energy projects with network development in and between both islands. In particular, this study examines different connection options to the Irish transmission system.

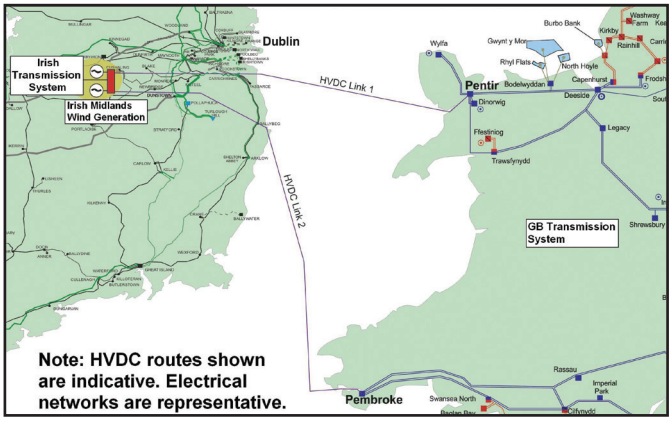

Figure 1: A potential generic connection method for renewable generation in the Irish midlands to the Great Britain and Ireland transmission systems.

The Benefits of Interconnection

The study focussed on the incremental costs and benefits arising from adding one or more new connections of 0.5 to 0.7 GW to the Irish transmission system compared to a scenario with no such connection. Figure 2 shows a schematic representation of this new interconnection.

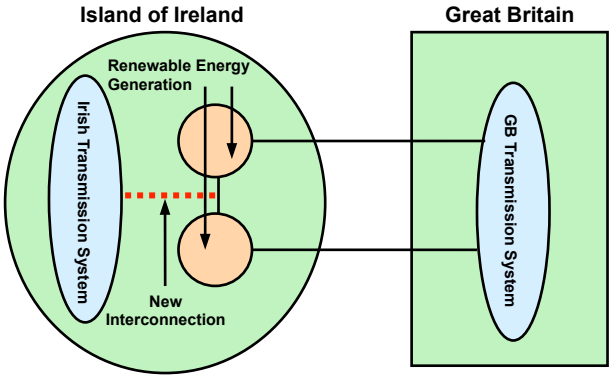

Figure 2: Schematic representation of a generic integrated concept including new interconnection from the Irish transmission system to the renewable generation network connected to the Great Britain transmission system.

The benefits include:

- Increased capacity for cross-border trade;
- Increased sharing of response and reserve;
- Reduction in the total generation capacity required to maintain security of supply;
- Reduction in overall capital costs and environmental impact;
- Future flexibility for network evolution and further integration.

For a single new 0.5 GW connection, the studies estimate the annual benefits to be £60m (€75m) per annum. Of this, approximately 35% arises as a result of trading between the GB and Irish markets; 20% from sharing response/ reserve; 40% from generation capacity savings and 5% from increasing boundary transfer capability on the GB system. The trading benefits accrue to both GB and Ireland, the benefits from boundary transfer capability accrue to GB while the benefits from sharing of response/ reserve and the provision of generation capacity accrue largely to Ireland.

The Cost of Interconnection

The capital cost of the connection to the Irish transmission system depends on the connection technology employed. The preferred technology option has an estimated capital cost of £80m (€100m). By comparison, a stand-alone interconnector would cost in the region of £450m (€550m). In terms of cost-benefit, the preferred option for a single new interconnection has a payback on capital costs of less than two years with the benefits accruing for the remaining asset lifetime.

A second interconnection also appears to provide added benefits. However, further analysis is required to confirm this.

Developing the Interconnection

Based on the studies performed, the appropriate size for initial connections to the Irish transmission system is 0.5 GW. However, the links could be constructed at a higher capacity (e.g. 0.7 GW) for “future-proofing”. The additional cost of constructing a 0.7 GW link relative to a 0.5 GW link has been included in the estimated capital cost. An interconnection sized at 0.5 GW can be accommodated on the Irish transmission system while the additional power flows from Ireland to GB can be accommodated on the GB transmission system without driving a need for new build network reinforcements on either network.

Study Assumptions

The study assumes expected developments in HVDC technology, and early co-ordination with manufacturers is required to ensure these proposed projects can be delivered within acceptable timescales. It also assumes that power flows from the renewable energy export projects are unaffected. Additionally, this type of connection does not fit into the existing regulatory framework for either GB or Ireland. It is clear that developments in the political and regulatory space would therefore be required.

Technical standards, ownership and operating frameworks were outside the scope of this study but they would need to be resolved by the TSOs and other relevant bodies.

Conclusions

The successful development of the proposed renewable energy export projects presents technical, regulatory and political challenges. However, the delivery of an innovative, efficient, and economic design concept would facilitate greater electricity market integration and result in enhanced competition and lower electricity prices benefiting network customers on both islands as well as renewable energy developers.

The analysis undertaken to date forms only a first step of the investigations that the two TSOs would typically go through in transmission planning, although the planning process for such a hybrid network infrastructure has not yet been defined. To take this forward, detailed analysis and cross-industry technology innovation will be necessary while developments are also required in the political and regulatory frameworks to allow these projects to proceed regardless of the design concept chosen.

nationalgrid

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

Please contact Customer Services at:
Tel: +44 (0) 1926 65 3000
Fax: +44 (0) 1926 65 4378
www.nationalgrid.com

EIRGRID

The Oval,
160 Shelbourne Road,
Ballsbridge, Dublin 4,
Ireland.

Please contact Customer Relations at:
Tel: +353 (0)1 702 6642
Fax: +353 (0)1 661 5375
Email: info@eirgrid.com
www.eirgrid.com