

Interconnectors, the EU Internal Electricity Market and Brexit

A discussion paper

April 2017

Grantham Institute discussion papers use evidence to present thought-provoking reflections on topical issues.

Our students work with our academics to form these opinion pieces.

How will leaving the EU affect interconnectors?

Interconnections linking between national electricity grids provides a cost-effective way to deliver a low carbon electricity system. The UK will need to consider how to encourage continued investment in electricity interconnectors between the UK and EU following Brexit for the following reasons:

The internal energy market (IEM): The UK's exclusion from the EU's IEM could mean an increased energy system investment cost of £500 million per year¹.

Existing interconnection: Northern Ireland's (NI) electricity system is highly integrated with that of the Republic of Ireland (ROI). The rest of the UK (GB) is connected to NI via the Moyle (500 MW) interconnection and electricity is traded on the IEM. The ROI will continue to be bound by IEM rules and, therefore, the UK government should carefully consider an appropriate approach for NI and Great Britain (GB) in tandem.

Potential for better use of renewables: In a future UK energy system with higher storage capacity, the UK interconnection capacity should increase to make optimal use of the variable renewable energy supply from other countries, e.g. the ROI².

Non-energy factors: There is a risk that the costs of interconnector development will change after Brexit³ due to loss of access to EU funding. The Weighted Average Capital Costs (WACC) are expected to rise by a perceived increase in investment risk. Brexit might impact factors such as exchange rate fluctuations, import costs, financial regulation, and passporting arrangements.

Political sentiment: The UK is a net importer of electricity⁴. Increased interconnection could lead to increasing import dependency, where the structurally lower prices in mainland Europe force the UK to buy more electricity, potentially creating political resistance to further interconnection⁵.

Why have interconnection?

Increased interconnection allows a more optimal use of surplus electricity generation, helps alleviate the problem of daily and seasonal demand peaks, enhances congestion management and reduces the need for new or contingency capacity⁶.

This increased flexibility can be good or bad for decarbonisation targets, depending on which generation plants are lowest cost at any given time. Therefore, interconnection should be used alongside a strong low-carbon plan such as a carbon price.

The UK National Grid's scenarios for improving future balancing and flexibility include growing shares of interconnection capacity, with interconnector power

demand becoming especially important to support the expected increase in distributed solar capacity⁷, and other variable renewable energy sources.

Interconnection deployment beyond current plans for 2020 could reduce the instances when UK renewable electricity generation would have to be curtailed (turned off) by half. This equates to approximately 15 TWh of lost energy per year².

By completing the European network of system operators for electricity's (ENTSO-E's) planned interconnection projects, the net saving across Europe could be €5 billion per year by 2020, and €15 billion by 2030⁸.

There is also a social benefit – doubling interconnection capacity from current levels by 2020 could lead to savings of £13 per year off household bills (£1 billion per year in reduced wholesale prices).

What is at stake?

The UK has 4,000 MW of interconnection capacity to the EU. This value is set to double by 2021, allowing the UK to reach the European Commission's Energy Security Strategy target (10% of installed electricity capacity by 2020)^{9,10}.

These projects are unlikely to be hindered by the UK leaving the EU. Beyond 2022 there is a further 2,600 MW of interconnector capacity to Norway and Iceland in early development stages, and several gigawatts of connection is planned in the period up to 2030, to reach a target 20,000 MW interconnector capacity¹¹. These investments could be affected by the future role the UK plays in the Internal Energy Market (IEM).

- 1 Vivid Economics (2016) The impact of Brexit on the UK energy sector.
- 2 G. Strbac, M. Aunedi, D. Pudjianto, P. Djapic, F. Teng, A. Sturt, D. Jackravut, R. Sansom, V. Yuffit and N. Brandon, (2012) Strategic assessment of the role and value of energy storage systems in the UK low carbon energy future. Carbon Trust.
- 3 Renewable Energy Association (2015) Written evidence submitted by the Renewable Energy Association. Energy and Climate Change Commons Select Committee.
- 4 Department for Business, Energy & Industrial Strategy (2016) Digest of United Kingdom energy statistics 2016.

- 5 M. v. Werven and F. v. Oostvoorn (2006), Barriers and drivers of new interconnections between EU and non-EU electricity systems, ECN.
- 6 IRENA (2015) Renewable energy integration in power grids. IEA-ETSAP and IRENA.
- 7 National Grid (2016), System Operatbility Framework 2016.
- 8 R. Green, D. Pudjianto, I. Staffell and G. Strbac (2016) Market Design for long-distance trade in renewable electricity. The Energy Journal, vol. 37, 2016.
- 9 DECC (2015) Electricity: Chapter 5 (DUKES), Department for Business, Energy & Industrial Strategy.

In addition to these concerns, ENTSO-E plays a crucial role in the future development of European electricity networks through its Ten-Year Network Development Plan, in which the UK currently plays a large role¹².

What do investors need?

Interconnector investors require assurance that their significant upfront costs can be recuperated via an appropriate price model for the operation of the interconnector, and that demand for electricity will facilitate maximum utilisation of that interconnector. The cap and floor regime, operated by the UK electricity market regulator, Ofgem, factors investment burden in the price floor, while protecting consumers with the price cap.

Interconnector costs are favourable compared with new power plants and other storage options¹³. The UK has been the fourth highest recipient of funds for infrastructure projects benefiting at least two member states. These Projects of Common Interest (PCIs) have facilitated investment on internal lines and interconnection with Belgium, France, ROI and Norway, helping the UK in achieving the Energy Security Strategy target. The European Energy Programme for Recovery (EEPR) has awarded over €100 million to support GB interconnection with ROI (12% of all EEPR funding awarded)¹⁴.

The impact on social welfare created by different interconnector projects are driven by the capacity of the interconnector, the length of the interconnector (cost increases with length), and the scale of the average price differences between markets.

Policy Recommendations

UK policymakers should provide a clear long-term energy strategy and commit to interconnector mechanisms currently in place.

To this end, the UK should pursue barrier-free access to the IEM and preserve the benefits of harmonisation with the European energy market, including an ongoing implementation of EU energy packages, network codes and market design. Industry stakeholders favour this approach¹⁵.

Supply security, flexibility, price competition, renewables integration and decarbonisation will all benefit from the continued free trade of energy in the IEM¹⁶.

The UK has to ensure that Ofgem and the National Grid remain contributing members of the Agency for the Cooperation of Energy Regulators (ACER) and ENTSO-E, respectively. Otherwise the UK risks losing its role as a rule-maker and becoming a rule-follower.

UK policymakers will need to consider replacing the comprehensive financing options currently available at the EU level (EEPR, PCIs, European Investment Bank loans, etc.) if it is doubtful that they will still be available after Brexit.

10 European Commission (2014) Communication from the commission to the european parliament and the council: European Energy Security.
11 National Grid (2016) Written evidence submitted by the National Grid (EuE0079), Energy and Climate Change Commons Select Committee.
12 ENTSO-E (2016) Ten-Year Network Development Plan 2016.
13 Poyry (2014) Near-term interconnector cost-benefit analysis: Independent report. Ofgem.
14 European Commission (2012) Electricity interconnection. Available at http://ec.europa.eu/energy/eepr/projects/files/electricity-interconnectors/uk-ie_en.pdf. [Accessed 28 03 2017].

15 Committee on Climate Change (2015) The fifth carbon budget.
16 Energy and Climate Change Select Committee (2015) Leaving the EU: implications for UK energy and climate change policy.

Grantham Institute, Imperial College London

Grantham Institute discussion papers use evidence to present thought-provoking reflections on a topical issue. This paper and other Grantham Institute publications are available from www.imperial.ac.uk/grantham/publications

Authors

Jonathan Bosch is a PhD researcher in the Department of Chemical Engineering at Imperial College London and his research focusses on global renewable energy potentials.

For more information, please contact Alyssa Gilbert: a.gilbert@imperial.ac.uk