



E3G

---

**BRIEFING PAPER** January 2019

## UK-EU ELECTRICITY INTERCONNECTION: THE UK'S LOW CARBON FUTURE AND REGIONAL COOPERATION AFTER BREXIT

**JOSEPH DUTTON**

The electricity interconnectors that physically link the UK to the EU are increasingly important for its climate and energy policies, with more interconnection needed to ensure the UK takes the least-cost pathway to decarbonisation. Though leaving the EU makes interconnector development and operation more difficult, the rationale for building them remains the same. The UK should therefore continue to expand regional electricity interconnection and prioritise interconnector development in the future relationship negotiations with the EU.

### Key points

- > Interconnectors can play a crucial role in the UK's climate and energy policies, helping to ensure it takes the least-cost pathway to decarbonisation while meeting its climate change targets
- > The UK should prioritise interconnectors in the future relationship negotiations with the EU, including them within a climate and energy cooperation track for the UK's engagement with the EU after Brexit
- > Irrespective of the outcome of Brexit, the UK should build more interconnection as it is a 'no-regrets' option for helping achieve the transition to a low carbon energy system
- > Interconnector development and operation will become more difficult because of Brexit, at a time when the UK is set to increase its levels interconnection and become more reliant on them
- > The UK should use existing proposals for developing regional electricity grids and renewables in the North Sea to engage with the EU and maintain a positive role in shaping regional ambition on decarbonisation

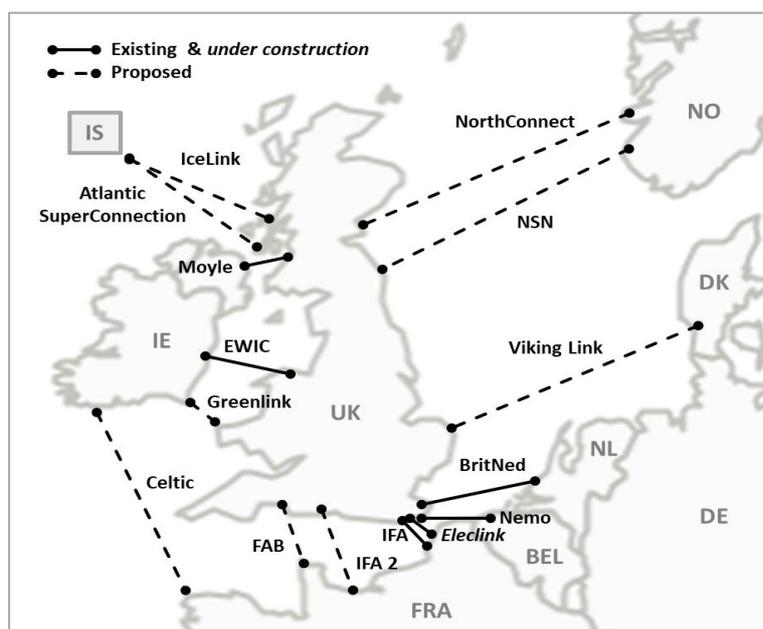


## UK electricity interconnector development

Interconnectors are cross-border high voltage cables that link the separate electricity systems, allowing the transmission and trade of electricity between them. There are currently four high voltage direct current (HVDC) interconnectors that link the GB electricity system to EU markets, totalling 4GW of capacity: BritNed to the Netherlands, IFA to France, and two connecting to the island of Ireland (Moyle to Northern Ireland and EWIC to Ireland). The new Nemo interconnector to Belgium is also expected to be operational in the first quarter of 2019.

The UK is a net importer of electricity across interconnectors, and in 2018 they provided 6% of electricity supply (though it was as high as 9% in 2014 and 2015). The government supports the development of at least 9GW of additional capacity as part of its broader strategy to decarbonise the UK's energy mix.<sup>1</sup> A total of 4.4GW is already under development and expected to be ready by 2020, with a further 5.5GW proposed for development by the mid-2020s.<sup>2</sup> Imports are expected to more than triple by 2025, with interconnectors supplying nearly a third of UK power demand.<sup>3</sup>

Figure 1: Existing and selected proposed interconnectors between the UK, Ireland, and other EU/EEA countries



<sup>1</sup> HM Treasury (2016)

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/508193/HMT\\_Budget\\_2016\\_Web\\_Accessible.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/508193/HMT_Budget_2016_Web_Accessible.pdf)

<sup>2</sup> See appendix 1

<sup>3</sup> Department for business, energy and industrial strategy [BEIS] (2018)

<https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2017>



E3G

---

## The UK needs more interconnection to ensure it takes the lowest cost pathway to decarbonisation

The UK should prioritise interconnectors in the future relationship negotiations with the EU because they can help ensure a least-cost pathway to decarbonisation, and help the UK reduce carbon emissions by 80% by 2050 (under the Climate Change Act<sup>4</sup>), as well as meeting the EU target of 15% of energy from renewable sources by 2020.<sup>5</sup> Interconnectors can contribute to the UK having a low carbon, low cost, and secure electricity system in four principle ways:

- > **Increased electricity system flexibility:** interconnectors provide an alternative route to market for excess electricity during periods of low demand, which helps balance the system and make it easier to manage intermittent renewables. These system balancing services help better manage supply and demand fluctuations, allowing more renewables to be added to the network.<sup>6</sup> This will also help manage the future growth of electric vehicles (EVs) and electrification of heating.
- > **Decarbonisation of electricity supply:** as well as allowing for more renewables, importing electricity from countries with lower power sector emissions reduces the carbon intensity of UK electricity consumption. Imports from France are less carbon intensive than the UK because of its nuclear power, while future links to Norway and Iceland would supply the UK with zero-carbon electricity generated from hydro or geothermal.<sup>7,8</sup>
- > **Increased security of supply:** interconnection can add to the overall balance of electricity supply, as imports can complement domestic generation. Interconnectors are also more flexible than other forms of electricity generation and can change the direction of electricity flow (from export to import) near-instantaneously. By contrast, typical UK coal or gas (CCGT) power stations have a restart time of 2-3 hours.<sup>9</sup> Interconnector operating life of up to 40 years also means they can contribute low carbon electricity for a longer-term compared to other forms of low carbon generation infrastructure.<sup>10</sup>
- > **Reduction in electricity prices:** electricity flows across interconnectors are determined by price differentials between the two connected markets. Higher wholesale prices in the UK mean electricity typically flows to it from other EU countries – or vice versa, at times, if prices are higher in EU countries. Importing

---

<sup>4</sup> <https://www.theccc.org.uk/tackling-climate-change/the-legal-landscape/the-climate-change-act/>

<sup>5</sup> HM Government (2009) [https://www.iea.org/media/pams/uk/PAMs\\_UK\\_NREAP.pdf](https://www.iea.org/media/pams/uk/PAMs_UK_NREAP.pdf)

<sup>6</sup> National Grid (2014) <https://www.ofgem.gov.uk/ofgem-publications/93802/ngetreporttoofgem-qualitativeinterconnectorbenefits-pdf>

<sup>7</sup> Statkraft: <https://www.statkraft.com/energy-sources/hydropower/>

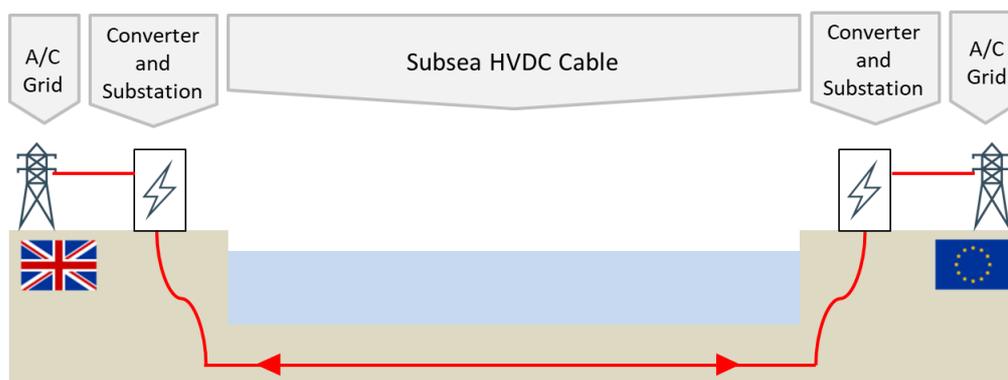
<sup>8</sup> Orkustofnun: <https://nea.is/the-national-energy-authority/energy-statistics/generation-of-electricity/>

<sup>9</sup> Gonzalez-Salazar, M, et al., (2018) Review of the operational flexibility and emissions of gas- and coal-fired power plants in a future with growing renewables, *Renewable and Sustainable Energy Reviews*, 82 (1) 1497-1513

<sup>10</sup> EirGrid: <http://www.eirgridgroup.com/site-files/library/EirGrid/EWICTradingBrochure.pdf>

electricity from a cheaper market lowers wholesale prices, and system operator National Grid estimates each additional GW of interconnector capacity reduces UK wholesale prices by 1-2%, saving consumers £1bn per year.<sup>11, 12</sup>

Figure 2: Subsea HVDC interconnector overview (illustrative)



## Interconnection with Europe should be part of the UK's future energy system, irrespective of Brexit outcomes

The UK is at a crucial stage in determining the structure of its future of energy system and making the energy transition to a low carbon economy. The government will need to make key decisions in the short-term to ensure the UK meets its carbon budgets in the coming decades, and it has asked the Committee on Climate Change (CCC) to investigate setting carbon emissions reductions targets to 2050 and beyond.<sup>13</sup>

The contribution interconnectors can make to this and the UK's future relationship with the EU was reiterated by the secretary of state for energy Greg Clark at the commissioning of the new Nemo interconnector to Belgium in December 2018:

“Not only will [new interconnection] help us to accommodate more renewable energy on our grid and provide cheaper, greener energy for consumers as part of our modern Industrial Strategy, it will also see continued and close cooperation on energy across borders with our European partners.”<sup>14</sup>

<sup>11</sup> National Grid Interconnector Holdings (2014) <http://viking-link.com/media/1037/getting-more-connected-march-2014.pdf>

<sup>12</sup> Wholesale prices make up 33% of a standard electricity bill and 36% of a dual fuel bill: Ofgem (2018) <https://www.ofgem.gov.uk/publications-and-updates/infographic-bills-prices-and-profits>

<sup>13</sup> Committee on Climate Change (2018) <https://www.theccc.org.uk/2018/10/15/ccc-to-advise-government-on-uks-long-term-emissions-targets/>

<sup>14</sup> National Grid, 5 December 2018, 'Launching Nemo – National Grid launch £600 million subsea cable between the UK and Belgium'



E3G

---

UK emissions have fallen by third since 1990 because of lower coal use and more renewables in power generation – as well as energy efficiency – with renewables supplying a record 33.3% of electricity in 2018.<sup>15</sup> Central to this is the UK’s world leading offshore wind sector, which saw a record 2.1GW installed in 2018 – more than double the previous annual record.<sup>16</sup> The UK has 7.8GW of operational capacity, and expansion of the sector could see a further 2GW of capacity added every year in the 2020s.<sup>17</sup>

But despite the growth in the offshore wind sector, low carbon investment has slumped because of policy changes made by the government in 2015, including removing support for solar and effectively banning onshore windfarms.<sup>18</sup> In 2017 clean energy investment fell by 57% from the previous year, slumping to a decade-low. The government has committed funding for 45 TWh of additional low carbon power generation<sup>19</sup> but a further 50-70 TWh will be needed if the UK is to meet its 2030 carbon emissions reduction target.

These policy changes, coupled with continued support for fracking and developing shale gas, and a severe lack of ambition on energy efficiency, are not compatible with decarbonisation and reaching net-zero by 2050. As such, the government should reaffirm support for interconnectors and ensure those in development are completed to keep the UK on the path to decarbonisation. Regardless of the eventual outcome of Brexit and the UK’s future relationship with the EU, interconnectors are a ‘regret-free’ option for contributing to decarbonising the energy system and should remain part of future government policy.

## Interconnectors can be a key tool for the UK’s engagement with the EU after Brexit

The UK and EU will need to continue cooperating on climate change and energy issues post Brexit, as the connected physical space between them – both the natural environment and physical infrastructure, such as interconnectors – means that choices made by one will impact the other. As the Brexit negotiations move towards discussions on the future relationship, where the majority of climate and energy issues are contained, establishing a cooperation track would be the best way to maximise synergies between the two sides.<sup>20</sup> Within this space, the UK should prioritise interconnectors because of the array of energy and climate benefits that they provide, as well as technical and political collaboration with other countries.

---

<sup>15</sup> Carbon Brief (2019) <https://www.carbonbrief.org/analysis-uk-electricity-generation-2018-falls-to-lowest-since-1994>

<sup>16</sup> Renewable UK (2018) <https://www.renewableuk.com/news/430793/Record-breaking-amount-of-new-UK-offshore-wind-capacity-installed-in-2018-.htm>

<sup>17</sup> BEIS (2018b) <https://www.gov.uk/government/news/energy-minister-claire-perry-hails-success-story-of-offshore-wind-in-newcastle-today>

<sup>18</sup> Environmental Audit Committee (2018) <https://www.parliament.uk/business/committees/committees-a-z/commons-select/environmental-audit-committee/news-parliament-2017/green-finance-report-published-17-19/>

<sup>19</sup> <https://www.gov.uk/government/news/government-confirms-up-to-557-million-for-new-renewable-energy-projects>

<sup>20</sup> E3G (2017) ‘Brexit: cooperation Track for Climate and Energy’ <https://www.e3g.org/library/brexit-cooperation-track-for-climate-change-and-energy>



E3G

---

Historically, the UK has been a leader in using ‘real economy diplomacy’ to maintain international climate ambition – for example in the EU, the G7, or the Powering Past Coal Alliance. Real economy diplomacy is when countries collectively share ideas and provide mutual support as they redesign their energy sectors, economies and societies away from fossil fuels towards being carbon-zero.<sup>21</sup>

After Brexit the UK will lose its a policy influence and agenda setting role that has historically been via the EU to enhance its own clean energy transition and that of others, in line with UK interests. As it seeks to build international relationships after Brexit, regional integration of electricity markets using interconnectors can be a key focal point around which it can maintain its own climate and energy ambition while cooperating with the EU.

Interconnectors are important in this context as they will be a key vector through which the UK engages with the EU, using its soft power to influence policy as best it can. The UK is likely to have severely reduced influence in European energy policy after it leaves the EU, as it is set to lose its position in the key decision making body Agency for the Cooperation of Energy Regulators (ACER) and have only a role in technical matters in the European Network of Transmission System Operators for Electricity (ENTSO-E).<sup>22</sup>

But the physical links between the UK and EU energy systems could mean the UK has to comply with internal energy market (IEM) rules.<sup>23</sup> Remaining in the IEM without EU membership – like Norway – could mean the UK still be required to conform to existing and future regulation on energy, environment, state aid and competition rules.<sup>24</sup>

### **Spotlight: North Seas Countries’ Offshore Grid Initiative (NSCOGI)**

A key cooperation space for the UK and EU on interconnector and renewables is the North Seas Countries Offshore Grid Initiative (NSCOGI).<sup>25</sup> A political declaration was signed in 2010 by ten northwest European countries on developing a North Sea grid with connected windfarms and interconnectors across the region.<sup>26</sup> Integrating member states’ power markets and building offshore grid infrastructure and windfarms is a cost-effective way ensuring a low carbon future, as well as delivering economic and energy security benefits to participants.<sup>27</sup>

---

<sup>21</sup> E3G (2018) ‘Real Economy Diplomacy is the Real Story’ <https://www.e3g.org/library/real-economy-diplomacy-real-story>

<sup>22</sup> House of Commons (2017) ‘Leaving the EU: negotiation priorities for energy and climate change policy’ – written evidence from Chatham House

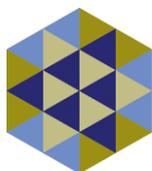
<sup>23</sup> House of Commons (2017) ‘Leaving the EU: negotiation priorities for energy and climate change policy’ – written evidence from Oil & Gas UK

<sup>24</sup> House of Commons (2018) <https://researchbriefings.parliament.uk/ResearchBriefing/Summary/POST-PN-0569>

<sup>25</sup> E3G (2015) ‘Delivering the North Seas Grid: towards a regional free trade zone of electricity’ [https://www.e3g.org/docs/E3G\\_Delivering\\_NS\\_G\\_April\\_2015.pdf](https://www.e3g.org/docs/E3G_Delivering_NS_G_April_2015.pdf)

<sup>26</sup> Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands, Sweden, the UK, and Norway

<sup>27</sup> European Wind Energy Association [http://www.ewea.org/fileadmin/files/library/publications/research-notes/MoU\\_definitief.pdf](http://www.ewea.org/fileadmin/files/library/publications/research-notes/MoU_definitief.pdf)



E3G

---

Despite EU and member state support for the project, progress on advancing NSCOGI beyond high level political agreement has been slow. Delivering the North Sea grid is crucial for UK and EU long-term decarbonisation and reaching net-zero economy by 2050, meaning it is an area with shared interests and scope for widespread cooperation after Brexit.

### **Offshore windfarm and interconnector supply chain**

High voltage direct current (HVDC) connections important for the development of offshore windfarms in the North Sea, as well as cross-border interconnectors. The locating of new, bigger windfarms further out to sea means HDVC connections are used – as well as for interconnectors – because they can carry more electricity efficiently and with fewer transmission losses than alternating (AC) connections.

Currently just three companies in Europe produce the advanced HVDC cabling required for long-distance interconnectors and windfarm connections. While some of the existing UK interconnector projects contained major areas of technical innovation, National Grid identified a lack of a UK HVDC cable manufacturing supply chain as a risk for future projects<sup>28</sup> – an assessment made without reference to future impacts of Brexit on supply chains and capital and resource costs.<sup>29</sup>

The disruption to the UK's access to supply chains because of Brexit comes at a time when it requires greater access to them. Developing domestic manufacturing capacity would help the sector in the long-term, but the current pipeline of interconnector and offshore windfarm development requires the UK to maintain access to the EU supply chain.

The leading offshore wind developer Orsted's newest developments have only 50% of their lifetime value in the UK supply chain.<sup>30</sup> The company's Walney Extension offshore windfarm in the Irish Sea – the largest in the world – for example had a supply chain with 15 from five EU countries alongside 31 UK-based companies.<sup>31</sup>

---

<sup>28</sup> National Grid (2016) <https://www.ofgem.gov.uk/ofgem-publications/108621>

<sup>29</sup> House of Lords EU Committee (2017) <https://publications.parliament.uk/pa/ld201719/ldselect/ldeucom/63/63.pdf>

<sup>30</sup> Westminster Energy Forum (5 October 2018) 'Annual Energy Outlook & Smart Strategies for the PowerGen & Networks Sector'

<sup>31</sup> <https://twitter.com/OrstedUK/status/1038001484397535232>



E3G

---

## Interconnectors and the post Brexit UK-EU relationship

Following the Brexit referendum there was a mixed response from interconnector developers on their future. The French energy regulator withheld planning approval on the new IFA2 interconnector and launched a public consultation on legal issues.<sup>32</sup> Several firms made final investment decisions on new projects and signalled their intention to continue development despite Brexit, particularly having already invested significant amounts of money.<sup>33</sup> However, this reflects the need for their development, rather than whether Brexit will affect their operation.<sup>34</sup> The proposed links to Iceland are expected to be unaffected by Brexit as Iceland is not a member of the IEM.<sup>35</sup>

Balancing the need for new interconnection with a deterioration in operation conditions can be seen with the planned 700MW Greenlink interconnector to Ireland. It has received backing from Irish regulator, the CRU, (and Ofgem in Great Britain) despite Brexit, because of the overwhelming need for new interconnection.<sup>36</sup> Brexit will reduce the benefits from the project for the UK and Ireland because the UK leaving the IEM will make trade less efficient and more expensive.<sup>37</sup> Despite the backing for the project, the political and regulatory drag placed on the Greenlink project could see Ireland push for quicker development of the 700km Celtic Interconnector to France.<sup>38</sup>

Although the outcome of Brexit negotiations is undetermined because of UK domestic politics, clarity has been provided on what would happen in the event of a 'no deal' scenario (with the UK leaving the EU on 29 March 2019) and what a future relationship on electricity could be like as part of the Withdrawal Agreement.

### No Deal: the UK leaves the internal energy market

The UK government confirmed that in event the of 'no deal', after 29 March 2019 "EU energy law will no longer apply to the UK and the UK's electricity markets will be decoupled from the Internal Energy Market" and both the UK and EU will need to develop new rules for electricity trade.<sup>39</sup> This does not mean trading will stop, and contingency arrangements are in place to ensure there is no disruption to electricity

---

<sup>32</sup> Reuters (2018) <https://uk.reuters.com/article/britain-eu-france-power-idUKL5N1E22T4>

<sup>33</sup> Chatham House (14 May 2018) 'Beyond Brexit: Regulatory Alignment with the Continental Market and Ireland'

<sup>34</sup> Chatham House/Herbert Smith Freehills (22 October 2018) 'Deal or No Deal: what next for energy and climate after Brexit?'

<sup>35</sup> Westminster Energy Forum Forum (5 October 2018) 'Annual Energy Outlook & Smart Strategies for the PowerGen & Networks Sector'

<sup>36</sup> Element Power (18 October 2018) <https://www.greenlinkinterconnector.eu/news/greenlink-gets-green-light-irish-regulator-ireland%E2%80%99s-next-interconnector-clears-crucial-hurdle>

<sup>37</sup> Commission for Regulation of Utilities (2018) <https://www.cru.ie/wp-content/uploads/2018/10/CRU18216-Greenlink-determination-paper-1.pdf>

<sup>38</sup> Dutton, J. & Lockwood, M., (2017) Ideas, institutions and interests in the politics of cross-border electricity interconnection: Greenlink, Britain and Ireland, *Energy Policy* 105 (2017) 375-285

<sup>39</sup> BEIS (2018c) <https://www.gov.uk/government/publications/trading-electricity-if-theres-no-brexit-deal/trading-electricity-if-theres-no-brexit-deal>

---

flows via interconnectors immediately after Brexit.<sup>40</sup> However, a hard Brexit with ‘no deal’ and the UK leaving the IEM means that it will fall out of key market trading arrangements.

The UK is expected to be excluded from the trading mechanism that couples together 14 member states’ electricity markets. This will mean that the most efficient form of electricity trade – ‘implicit trading’ – will no longer take place across UK interconnectors.<sup>41</sup> Being excluded from IEM and the new EU-wide trading platform known as XBID<sup>42</sup> will make interconnector operation and electricity trade less efficient, costing consumers as much as £270mn a year.<sup>43</sup>

A ‘no deal’ would also mean that EU rules would cease to apply in Northern Ireland, which is currently part of a single integrated electricity market with Ireland (known as I-SEM<sup>44</sup>) that was created and operates under EU regulation. This would leave key elements of ISEM “without any legal basis”, with a high risk that would it not be able to continue, and Northern Ireland’s market would become separated from Ireland.

#### UK-EU Withdrawal Agreement and future relationship political declaration

The draft withdrawal agreement was well received by the UK’s energy industry, because it showed progress had been made in ensuring the functioning of cross-border markets and the free flow of energy between the UK and EU after Brexit.<sup>45</sup> To this end, the inclusion of interconnectors in the agreement reinforces the importance of them to the UK. The energy section of the draft withdrawal agreement focused on maintaining access to markets and supporting “the delivery of cost efficient, clean and secure supplies of electricity”. A key part of this would be keeping “mechanisms to ensure as far as possible security of supply and efficient trade over interconnectors over different timeframes” – a reference to the trading and market coupling mechanisms.

There was also a commitment to establish a framework to facilitate technical cooperation between UK and EU energy network operators and organisations in the planning and use of energy infrastructure that connecting their systems.<sup>46</sup> The withdrawal agreement also confirmed that Northern Ireland would remain part of the IEM via ISEM, as EU law governing wholesale electricity markets would still apply.<sup>47</sup>

---

<sup>40</sup> Personal Communication, BEIS

<sup>41</sup> See appendix 2

<sup>42</sup> Argus Media (12 October 2018) <https://www.argusmedia.com/en/news/1772013-uk-power-trade-less-efficient-if-no-brex-it-deal?page=1>

<sup>43</sup> Geske, J, et al. (2018) ‘Elecxit: The Cost of Bilaterally Uncoupling British-EU Electricity Trade’, Imperial College London/UKERC <http://www.ukerc.ac.uk/news/elecxit-could-cost-270-million-a-year.html>

<sup>44</sup> EirGrid <http://www.eirgridgroup.com/customer-and-industry/i-sem/>

<sup>45</sup> Energy UK (2018) <https://www.energy-uk.org.uk/media-and-campaigns/press-releases/412-2018/6885-energy-uk-responds-to-the-publication-of-the-draft-brex-it-withdrawal-agreement.html>

<sup>46</sup> HM Government (2018) Political Declaration Setting Out The Framework For The Future Relationship Between The European Union And The United Kingdom, Section XI ‘Energy’ (a)

<sup>47</sup> European Commission (2018), Draft Agreement on the withdrawal of the United Kingdom of Great Britain and Northern Ireland from the European Union and the European Atomic Energy Community, Article 11: single electricity market



E3G

---

## Loss of EU funding and support for interconnector projects

Interconnectors are fundamental to the pan-EU single electricity market because they connect separate national electricity systems. The EU has promoted developing interconnectors in parallel to market liberalisation policies because they are effectively the ‘hardware’ upon which the ‘software’ of internal market rules and standards operate.<sup>48</sup> The EU plans to expand cross-border interconnector capacity in member states to 10% of their installed electricity generation capacity by 2020, and to 15% by 2030.<sup>49</sup>

The EU’s ‘Projects of Common Interest’ (PCI) process speeds up the planning and permitting process for cross-border infrastructure projects that enhance internal market integration, promote sustainability, and increase security of supply. The PCI process provides funding via the Connecting Europe Facility (CEF) for projects that “fill the missing links in Europe’s energy, transport and digital backbone”.<sup>50</sup> Eleven of the planned electricity interconnectors between GB and European countries are included on the most recent PCI list, and funding between 2014 and 2018 was almost €100mn.<sup>51</sup>

The department for business, energy and industrial strategy (BEIS) and Ofgem encourage interconnector developers to seek PCI status because of the expedited planning process and political support that comes with it, as well as the finance from CEF. Although the finance is not crucial for the overall development case for interconnectors, when combined with the political and regulatory support it reduces project risk and encourages further investment.<sup>52</sup>

Losing the CEF early-stage finance and streamlined planning regime could lead to a fall in private capital for interconnector projects. Ofgem supports merchant interconnector development through its ‘cap and floor’ regulatory regime,<sup>53</sup> but a fall in private investment that CEF funding encourages could lead to a higher burden on transmission system operator National Grid to develop interconnectors.<sup>54</sup>

---

<sup>48</sup> European Commission (2015) ‘A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy’ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0080>

<sup>49</sup> European Commission (2018b), ‘Electricity interconnection targets’ <https://ec.europa.eu/energy/en/topics/infrastructure/projects-common-interest/electricity-interconnection-targets>

<sup>50</sup> European Commission <https://ec.europa.eu/inea/en/connecting-europe-facility>

<sup>51</sup> Nemo (Belgium), FAB, IFA2, Eleclink, Acquind, Gridlink (France), Greenlink (Ireland), Northconnect, North Sea Link (Norway), Viking Link (Denmark), Icelink (Iceland)

<sup>52</sup> Personal Communication, Ofgem

<sup>53</sup> Ofgem (2016) ‘Cap and floor regime: unlocking investment in electricity interconnectors’ [https://www.ofgem.gov.uk/system/files/docs/2016/05/cap\\_and\\_floor\\_brochure.pdf](https://www.ofgem.gov.uk/system/files/docs/2016/05/cap_and_floor_brochure.pdf)

<sup>54</sup> Chatham House (14 May 2018) ‘Beyond Brexit: Regulatory Alignment with the Continental Market and Ireland’



E3G

---

## Appendices

### Appendix 1: Existing and future UK interconnectors<sup>55,56</sup>

Project Name	Country	Capacity	Delivery date
IFA	France	2000 MW	1986
Moyle	Ireland	500 MW	2002
BritNed	Netherlands	1000 MW	2011
EWIC	Ireland	500 MW	2012
Nemo	Belgium	1000 MW	2019*
Eleclink	France	1000 MW	2019
NSN	Norway	1400 MW	2020
IFA 2	France	1000 MW	2020
FAB Link	France	1400 MW	2022
Viking	Denmark	1400 MW	2022
Greenlink	Ireland	500 MW	2023
Atlantic Super Connection <sup>+</sup>	Iceland	1000 MW	2025
IceLink	Iceland	1200 MW	n/a

#### Notes

\*Construction of Nemo was completed in December 2018, with commercial operations expected in the first quarter of 2019.

<sup>+</sup>Atlantic Super Connection will be a generator-to-market connection (using electricity from hydro or geothermal), not a traditional market-to-market interconnector

### Appendix 2: Interconnector trading

Electricity trade with interconnectors between two coupled markets is split between 'implicit' and 'explicit' trading arrangements. Implicit market coupling is when interconnector capacity and energy are sold as a single product, whereas explicit market coupling occurs when capacity and energy are sold as separate products. If electricity capacity and energy are traded separately and at different times (explicit allocation) trade across interconnectors is inefficient and welfare benefits are lost. The time frames for implicit trading with market coupling are:

**Forward:** Years down to two days ahead of real time

**Day-ahead:** One day ahead of real time

**Intraday:** Within a day to one hour ahead of real time

**Balancing:** From one hour ahead of real time to real time<sup>57</sup>

---

<sup>55</sup> <https://www.ofgem.gov.uk/electricity/transmission-networks/electricity-interconnectors>

<sup>56</sup> <https://www.4coffshore.com/windfarms/interconnector-icelink-icid48.html>



E3G

---

## About E3G

E3G is a European think tank working globally to accelerate the transition to a low carbon economy. We build the broad-based coalitions necessary to deliver a safe climate. We pride ourselves on bringing independence to an extremely polarised discussion and holding policy makers to account on their promises. E3G was ranked the fifth most influential environmental think tank in the world by the University of Pennsylvania's 'Go To Global Think Tank' Index in 2016 and 2017

More information is available at [www.e3g.org](http://www.e3g.org)

## Copyright

This work is licensed under the Creative Commons Attribution-NonCommercial-ShareAlike 2.0 License.

© E3G 2019

---

<sup>57</sup> Froggatt, A, et al. (2017) 'Staying Connected Key Elements for UK–EU27 Energy Cooperation After Brexit' Chatham House/University of Exeter Energy Policy Group research paper  
<https://www.chathamhouse.org/sites/default/files/publications/research/2017-05-10-staying-connected-energy-cooperation-brexit-froggatt-wright-lockwood.pdf>