Research Paper

Antony Froggatt, Thomas Raines and Shane Tomlinson
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UK Unplugged?
The Impacts of Brexit on Energy and Climate Policy

CHATHAM HOUSE
The Royal Institute of International Affairs

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Summary

- Over the last 30 years the EU has played a central role in addressing the competitiveness, security and climate dimensions of energy policy among its member states. The UK has been critical in driving forward integration of the European energy market, and has been a strong advocate of liberalized energy markets and some climate change mitigation policies.
- If, at the June 2016 referendum, the UK does vote to leave the EU, energy and climate policy will be part of the overall package of issues to be negotiated, as it is unlikely that each sector will be treated separately. The model of relations for energy and climate may well be determined by political and public sentiment on higher-profile issues such as freedom of movement, rather than by what is best for the UK in these policy areas.
- The UK is increasingly reliant on imports, including from and through continental Europe, and its energy market is deeply integrated with that of its European neighbours. As a growing share of the UK's electricity is exchanged with EU partners, it would be neither possible nor desirable to 'unplug' the UK from Europe's energy networks. A degree of continued adherence to EU market, environmental and governance rules would be inevitable.
- This paper reviews the risks and trade-offs associated with five possible options for a post-exit relationship. Of these, the Norway or the Energy Community models would be the least disruptive, enabling continuity in energy market access, regulatory frameworks and investment; however, both would come at the cost of accepting the vast majority of legislation while relinquishing any say in its creation. The UK would thus have less, rather than more, sovereignty over energy policy.
- The Switzerland, the Canada and the WTO models offer the possibility of greater sovereignty in a number of areas, such as buildings and infrastructure standards as well as state aid. None the less, each would entail higher risks, with greater uncertainty over market access, investment and electricity prices. These models would reduce or even eliminate the UK's contribution to the EU budget, but would also limit or cut off access to EU funding mechanisms.
- All five Brexit models would undermine the UK's influence in international energy and climate diplomacy. The UK would no longer play any direct role in shaping the climate and energy policies of its EU neighbours, at a time when the EU's proposed Energy Union initiatives offer the prospect of a more integrated and effective European energy sector. A decision to leave the EU would make it easier for a future UK government to change direction on climate policy, since only a change in domestic legislation would be required.
- 'Brexit' could affect the balance of energy policy among the remaining member states. In its absence, the centre of gravity for EU energy policy might shift away from market mechanisms and result in weaker collective action on greenhouse gas reduction targets.
- In the field of energy and climate change policy, remaining in the EU offers the best balance of policy options for Britain's national interests: the UK would continue to benefit from the integrated energy market, while maintaining influence over its direction and minimizing uncertainty for crucial investment.

Introduction

Access to reliable, clean and affordable energy is a fundamental need of any modern society. Energy therefore lies at the heart of a country's economic welfare and political and environmental security. It has also always been at the heart of European integration. The European Coal and Steel Community, formed by a treaty signed in Paris in April 1951 (effective from July 1952) was in effect Europe's first supranational organization – where member states pool sovereign powers in order to ensure effective cooperation and a level playing field. The European Atomic Energy Community (Euratom) was established by treaty in 1957 alongside the European Economic Community, the forerunner of the European Union (EU).[1] Energy should be natural territory for cooperation among European countries, given the geographic and economic interdependence that characterizes its supply and distribution. Despite moves in this direction, energy remains a politically sensitive issue, with domestic differences in policy priorities and industry approaches visible across the EU. Meanwhile, the EU has been successful in building a collective approach to tackling climate change, including setting targets for reducing greenhouse gas emissions, promoting renewable energy and energy efficiency, and helping to drive forward international agreements.

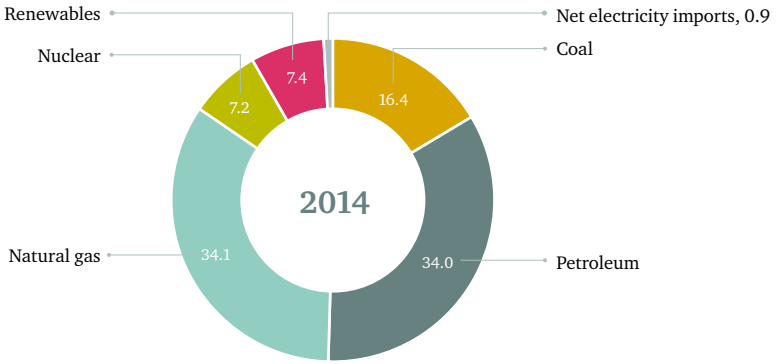
The United Kingdom's energy and climate change policies have evolved together with the EU's, particularly over the past decade, and have often shaped each other. This paper examines how these policies could be affected by a vote to leave the EU in the referendum scheduled for 23 June 2016. The paper addresses the likely impacts on the longer-term cost, sustainability and security of the UK's energy sector, as well as the wider regulatory and investment effects, and on the government's aim to limit the harmful effects of human-induced climate change. It also highlights the possible near-term disruptive effects and transition costs of leaving, and some of the potential impacts on future EU policy.

[1] Both treaties were signed in March 1957, effective from 1 January 1958.

UK Energy and Climate Policies

The energy mix in most countries, not only in the EU but globally, remains dominated by fossil fuels. In the UK these provide some 85 per cent of total energy consumption. As shown in Figure 1, natural gas and oil each accounted for roughly 34 per cent of this share in 2014. However, the rise in the production of renewables (up to 7 per cent of UK consumption, with nuclear power accounting for the remainder) means that the percentage of fossil fuels in the energy mix is at a record low. Domestic fossil fuel production continues to fall, and consequently the UK imports 45 per cent of energy. By far the largest supplier of energy overall is Norway (over 30 per cent), followed by Russia (12 per cent) and the United States (7 per cent).

Figure 1: UK inland energy consumption, 2014 (% share)



Source: DECC (2015), 'DUKES 2015: Digest of United Kingdom Energy Statistics, Chapter 1'.

The UK's energy policy is evolving to reflect changes in domestic supply, price competitiveness, the commitment to reduce carbon emissions and wider patterns in global energy markets. The Conservative government elected in 2015 has made significant policy changes, bringing a greater focus on energy security and the costs to consumers.[2] It intends to introduce policies leading to the phasing-out of coal in power generation that does not use carbon capture and storage (CCS) technology by 2025,[3] while proposed financial support for CCS has been withdrawn.[4]

The controversial commitment to build a new nuclear power plant at Hinkley Point, supported by French and Chinese investment, remains in place despite concerns about the overall cost of the project both to UK consumers and to the supplier, EDF Energy, and a challenge by the Austrian and Luxembourg governments under EU state aid rules.[5] The government also supports further expansion of Britain's nuclear sector, beyond the Hinkley plant.

[2] Department of Energy and Climate Change (DECC) (2015), 'Amber Rudd's speech on a new direction for UK energy policy', speech delivered at the Institution of Civil Engineers, London, 18 November 2015, https://www.gov.uk/government/speeches/amber-rudds-speech-on-a-new-direction-for-uk-energy-policy (accessed 4 Feb. 2016).
[3] Ibid.
[4] Carrington, D. (2015), 'UK cancels pioneering £1bn carbon capture and storage competition', *Guardian,* 25 November 2015, http://www.theguardian.com/environment/2015/nov/25/uk-cancels-pioneering-1bn-carbon-capture-and-storage-competition (accessed 4 Feb. 2016).
[5] Buckworth, N., Borovas, G., and Webber, J. (2015), 'Austria and Luxembourg will challenge Hinkley Point C State Aid', Global Nuclear Group, London: Sherman & Sterling LLP, 25 June 2015, http://bit.ly/1X6raTC (accessed 12 May 2016).

The UK has a significant domestic oil and gas industry based around extraction from its continental shelf reserves in the North Sea (see Box 1). In addition, the government has placed a strong emphasis on developing domestic shale gas reserves, although this has been subject to considerable local opposition. Meanwhile, subsidies for solar power and onshore wind generation have been reduced significantly, complicating the UK's path to meeting its renewables obligations.[6] Offshore wind generation is still likely to attract government support, provided there are further reductions in the global price, with new auctions likely over the course of the current parliament. Taken together, this package of developments has raised concerns about the UK's capacity to meet both its future electricity demand[7] and its climate commitments.[8]

Despite all these changes, the government remains committed to the 2008 Climate Change Act and meeting the UK's 2050 carbon reduction target.

Some of the support schemes and targets for energy efficiency have also been cut. Most significantly, the government abandoned the target that from 2016 onwards all new homes must be 'zero carbon';[9] and it has announced that the Energy Company Obligation (ECO) scheme will be replaced by a cheaper domestic energy efficiency scheme.[10] However, these changes will reduce the level of funding that utilities are required to spend on energy efficiency for the poorest in society.[11] The government has in addition removed the vehicle excise duty differentials for car emissions levels, so that charges will be the same regardless of engine size.[12]

Despite all these changes, the government remains committed to the 2008 Climate Change Act and meeting the UK's 2050 carbon reduction target. However, the Secretary of State for Energy and Climate Change, Amber Rudd, acknowledged in November 2015 that meeting the fourth carbon budget would be tough: 'We do need to meet that challenge, but we need to be pragmatic too.'[13] The fifth carbon budget is scheduled to be approved by parliament in 2016.

[6] This has included a cap on feed-in tariffs for renewables to limit total spending under the scheme to a maximum of £100 million by the end of 2018–19, and closure of the Renewable Obligation scheme to all onshore wind and new solar capacity below 5 MW from 1 April 2016. See DECC (2015), 'Changes to renewables subsidies', Press Release, 17 September 2015, https://www.gov.uk/government/news/changes-to-renewables-subsidies (accessed 5 Mar. 2016).
[7] Institute of Mechanical Engineers (2016), 'Engineering the UK Electricity Gap', January 2016, https://www.imeche.org/docs/default-source/position-statements-energy/imeche-ps-electricity-gap.pdf?sfvrsn=0 (accessed 5 Mar. 2016).
[8] See for example Murray, J. (2015), '10 unanswered questions for Amber Rudd and the UK energy policy 'reset'', Business Green, 18 November 2015, http://www.businessgreen.com/bg/blog-post/2435179/10-unanswered-questions-for-amber-rudd-and-the-uk-energy-policy-reset (accessed 25 Jan. 2016); Science Media Centre (2015), 'expert comment on Amber Rudd's speech today on UK energy', 18 November 2015, http://www.sciencemediacentre.org/expert-comment-on-amber-rudds-speech-today-on-uk-energy/ (accessed 25 Jan. 2016).
[9] HM Treasury (2015), *Fixing the foundations: Creating a more prosperous nation*, Cm 9098, July 2015, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/443898/Productivity_Plan_web.pdf (accessed 25 Jan. 2016).
[10] Osborne, G. (2015), 'Chancellor George Osborne's Spending Review and Autumn Statement 2015 speech', 25 November 2015, https://www.gov.uk/government/speeches/chancellor-george-osbornes-spending-review-and-autumn-statement-2015-speech (accessed 6 May 2016).
[11] Murray, J. (2015), 'Energy efficiency scheme cut as Osborne announces next phase of green policy shake-up', Business Green, 25 November 2015, http://www.businessgreen.com/bg/news/2436536/energy-efficiency-scheme-axed-as-osborne-announces-next-phase-of-green-policy-shake-up (accessed 24 Mar. 2016).
[12] HM Treasury (2015), 'Summer Budget 2015', HC 264, 8 July 2015, http://bit.ly/1fnbY2Y (accessed 2 May 2016).
[13] DECC (2015), 'Amber Rudd's speech on a new direction for UK energy policy'.

Box 1: The UK oil and gas industry

In 2014 the UK oil and gas industry produced an average of 1.42 million barrels of oil per day, making the UK the second largest producer of oil in Europe. It is also the third largest producer of gas. About 68 per cent of its primary energy consumption comes from oil and gas. Yet, at present, slightly less than half comes from domestic production in the North Sea.[a] There has been a steady decline for the last 15 years, with production of oil falling by 68 per cent and that of gas by 66 per cent from volumes in 2000.[b]

There are a number of significant challenges to the UK oil and gas industry that place the future of North Sea production in jeopardy. Particularly notable is the damaging effect of low oil prices on the industry, which in recent years has been a major source of tax revenue. Higher operating and recovery costs in the North Sea mean lower margins, or fields producing at a loss at current prices. The present price environment acts as a deterrent to investment, particularly as international investment alternatives are numerous. The industry body Oil & Gas UK expects record low investment of only £1 billion in 2016, after recent averages of around £8 billion.[c] In the long term, a decline in demand for oil and gas and the effects of divestment from fossil fuels could also hamper the industry.

The UK oil and gas industry is also a major employer. It was estimated in late 2014 that some 50,000 people were directly employed in the sector, the majority in Scotland. Industry bodies estimate that the number is much higher once supply chains, consultants and jobs connected to the export of goods and services are taken into account. Oil & Gas UK put this figure at around 375,000 in 2015, although it has estimated that about 60,000 jobs have been lost because of the fall in the oil price.[d]

The importance of the industry as an employer, as well as the complicated politics around devolution and the independence debate in Scotland, mean that the future of the industry will be driven by politics as well as market forces. The March 2016 budget included significant tax breaks for the industry, reducing the supplementary charge and abolishing the Petroleum Revenue Tax.[e]

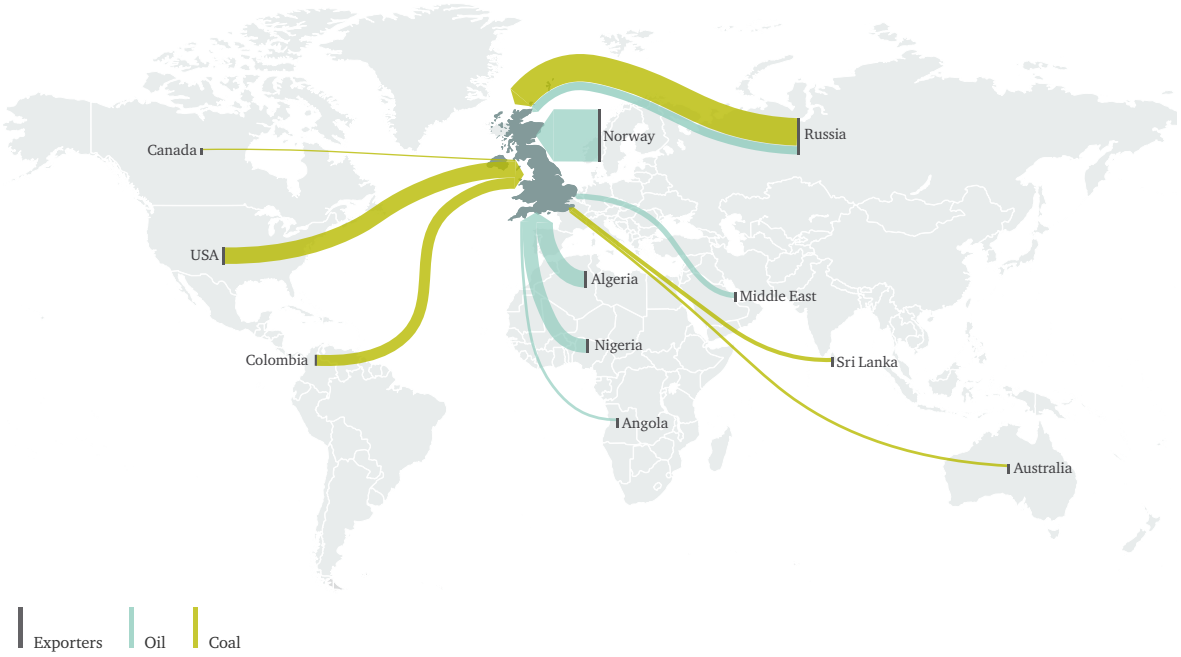
Considerable attention has also been paid to the potential for unconventional fossil fuels to boost domestic output. However, there are good reasons to be cautious about the prospect of a 'shale gas revolution' in the UK, given geological, regulatory and industrial issues.[f]

[a] Hough, D. (2016), 'UK Offshore Oil and Gas Industry', Briefing Paper, CBP 07268, London: House of Commons Library, 22 March 2016, http://researchbriefings.parliament.uk/ResearchBriefing/Summary/CBP-7268#fullreport (accessed 4 Apr. 2016).
[b] BP (2015), *BP Statistical Review of World Energy 2015*, London: BP, http://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2015/bp-statistical-review-of-world-energy-2015-full-report.pdf.
[c] BBC (2016), 'Oil and gas investment 'collapsing' despite cost-cutting', 23 February 2016, http://www.bbc.co.uk/news/uk-scotland-scotland-business-35630242 (accessed 20 Mar. 2016).
[d] Hough (2016), 'UK Offshore Oil and Gas Industry'.
[e] BBC (2016), 'Budget 2016: Chancellor George Osborne cuts North Sea taxes', 16 March 2016, http://www.bbc.co.uk/news/uk-scotland-scotland-politics-35817176 (accessed 20 Mar. 2016).
[f] Stevens, P. (2013), *Shale Gas in the United Kingdom*, Chatham House Briefing Paper, London: Royal Institute of International Affairs, Chatham House, December 2013, https://www.chathamhouse.org/sites/files/chathamhouse/public/Research/Energy,%20Environment%20and%20Development/131213shalegas.pdf (accessed 20 Mar. 2016).

The UK and Europe: Interdependence and Moves Towards an 'Energy Union'

The UK energy market is deeply integrated with that of continental Europe, with a dependence on fossil fuel imports and direct electricity supply (see Figures 2 and 3). Over the past decade, the UK has significantly increased its dependency on imported fossil fuels – as a result of the depletion of oil and gas reserves and now the total cessation of domestic coal mining – to the extent that UK import dependency is now approaching average EU levels (see Figure 4). As a consequence, the UK has gone from being a net exporter of energy at the turn of the century to reliance on imports for 45 per cent of total consumption.

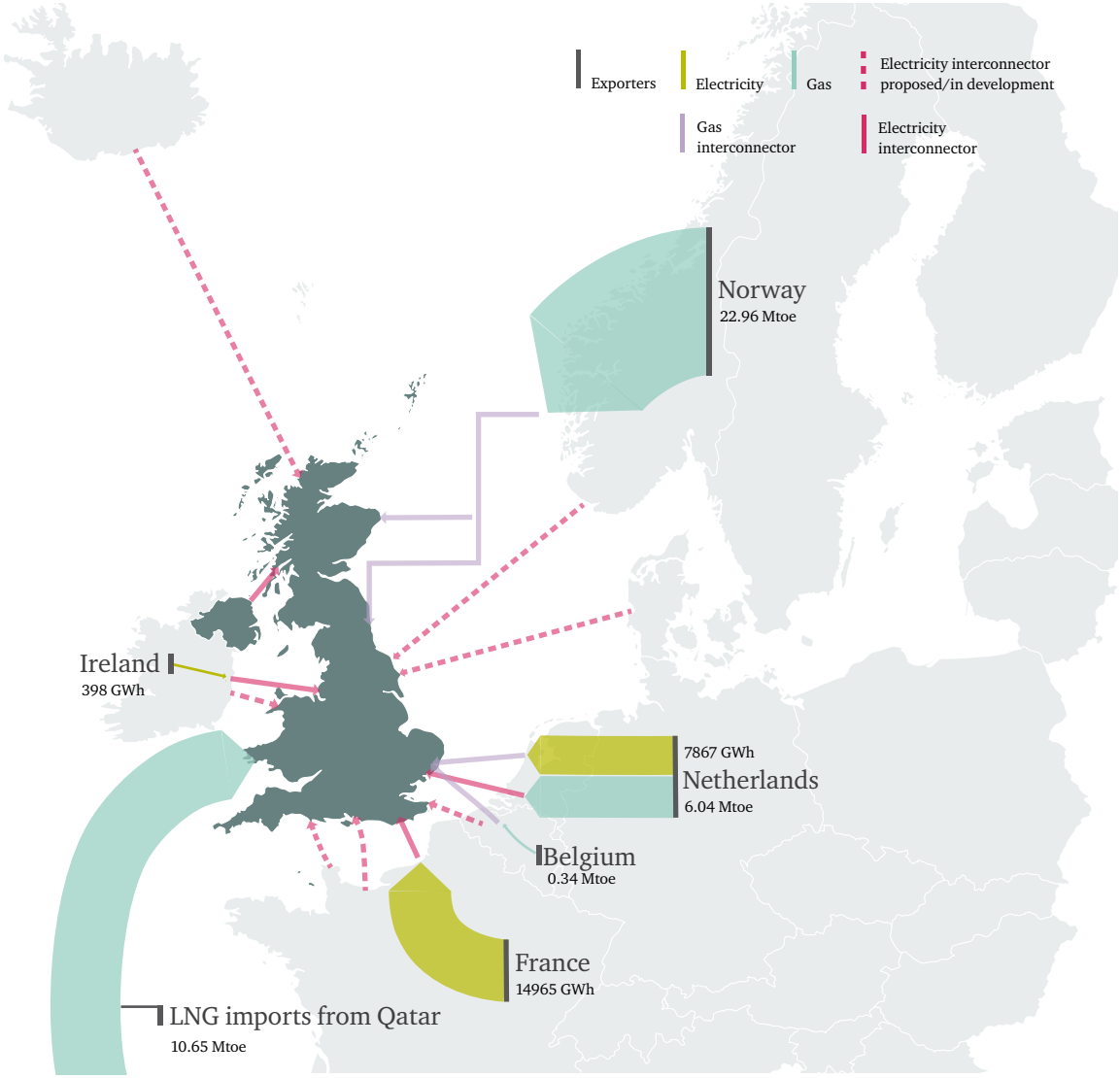
Figure 2: UK oil and coal imports, 2014



Source: DECC (2015), 'DUKES: foreign trade statistics'.[14]

[14] DECC (2015), 'DUKES: foreign trade statistics', National Statistics, 30 July 2015 (first published 28 March 2015), https://www.gov.uk/government/statistics/dukes-foreign-trade-statistics (accessed 2 May 2016). Note that these data differ from those provided in DECC (2015), 'Digest of United Kingdom Energy Statistics 2015', National Statistics Publication, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/450302/DUKES_2015.pdf (accessed 10 May 2016).

Figure 3: Major UK imports of gas and electricity, 2014; UK–Europe gas/electricity interconnection

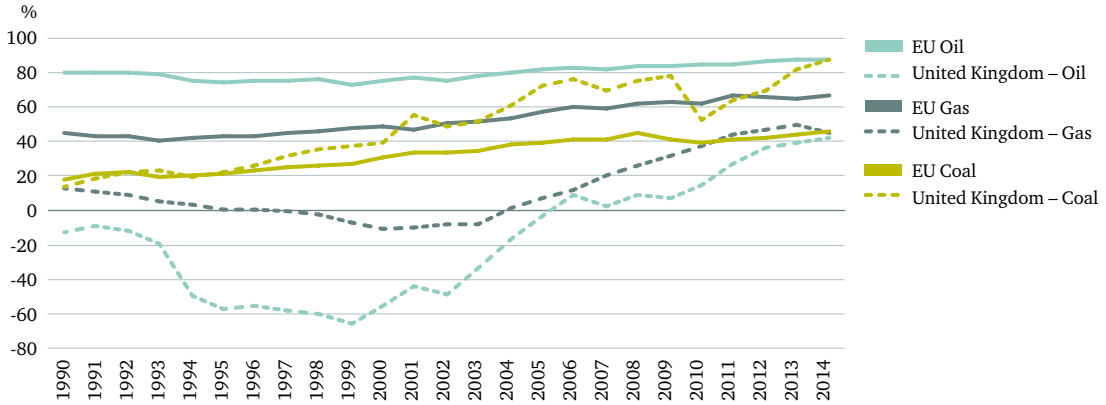


Source: DECC (2015), 'DUKES: foreign trade statistics'.[15]

Given the long construction time and uncertainty for major projects such as new nuclear build (which is not expected before 2025 at the earliest), development of shale gas and the reduction in support for renewables, the UK is likely to become more, not less, reliant on European energy sources over the coming decade.

[15] DECC (2015), 'DUKES: foreign trade statistics'. These data differ from those provided in DECC (2015), 'Digest of United Kingdom Energy Statistics 2015'.

Figure 4: Import dependency of the UK and the EU



Source: Eurostat 2016, 'Energy production and imports'.

In the EU as a whole, imported energy rose consistently in the three decades preceding the 2008 financial crisis, as a result of increasing demand and diminishing production from domestic fossil fuels; but in terms of both actual volumes (million tonnes of oil equivalent – Mtoe) and the percentage of total consumption, this dependency has plateaued and since 2008 has started to decline. This is as a result of decreasing energy consumption (EU 28 consumption in 2014 was slightly lower than aggregate consumption by the same countries in 1990[16]) and the growth in the production of renewable energy (which has doubled since 1995 and is now the largest source of domestic energy in the EU).[17] In combination, these factors have offset the depletion of domestic fossil fuels.[18]

Over the last 30 years, the EU has played a central role in addressing the competitiveness, security and climate dimensions of energy policy among its member states. It shares legal competence with its members in the fields of energy[19] and environment, which means that both the EU and its member states may adopt legally binding acts in the area concerned as long as national laws do not contravene EU rules. They legislate jointly in these fields.[20] The EU has exclusive competence in the field of the internal market.[21]

Russia is the EU's largest supplier of oil (45 per cent), gas (39 per cent) and coal (28 per cent).[22] In 2013 energy imports cost the EU approximately €400 billion, of which Russian imports accounted

[16] Eurostat (2016), 'Simplified energy balances annual data. Gross inland consumption', http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do (accessed 12 May 2016).
[17] Eurostat (2016), 'Energy production and imports', http://ec.europa.eu/eurostat/statistics-explained/index.php/Energy_production_and_imports (accessed 25 Jan. 2016).
[18] In 2014 the EU imported 53 per cent of the energy that it consumed.
[19] European Union (2007), 'Article 4 (2) e & i', Treaty of Lisbon Amending the Treaty on European Union and the Treaty Establishing the European Community, OJ C 306, 13 December 2007.
[20] Measures are adopted by ordinary legislative procedure, which means that both the European Parliament and the Council must adopt these measures with a majority of votes. In some cases, unanimity is required.
[21] Some fiscal measures, namely 'those affecting member states' choice between energy sources and the general structure of its energy supply', are adopted by unanimity in the Council, in consultation with the European Parliament, Economic and Social Committee and the Committee of the Regions. See European Union (2007), 'Articles 3 and 192 (2)', 'Treaty of Lisbon Amending the Treaty on European Union and the Treaty Establishing the European Community'.
[22] Eurostat (2016), 'Main origin of primary energy imports, EU-28, 2003–13', http://ec.europa.eu/eurostat/statistics- explained/index.php/File:Main_origin_of_primary_energy_imports,_EU-28,_2003%E2%80%9313_(%25_of_extra_EU-28_imports)_YB15.png (accessed 6 May 2016).

for €140 billion.[23] But the dependency is mutual. In 2014 Russia's total exports were worth $449 billion (€393 billion).[24] Therefore, while the EU depended on Russia for around one-third of its energy, around one-third of Russia's export revenues depended on the EU's demand for energy.

The Russian intervention in Ukraine in 2014 brought energy security to the top of the EU agenda and gave the impetus for a collection of major EU initiatives around energy, termed the Energy Union. This is centred around five key 'dimensions': energy security, solidarity and trust; a fully integrated European energy market; energy efficiency contributing to a moderation of demand; decarbonizing the economy; and research, innovation and competitiveness.[25] The Energy Union is intended to complement the other major plank of EU policy, the 2030 Climate and Energy Framework, which established an emissions reduction target of at least 40 per cent and a renewable energy target of at least 27 per cent by 2030 from a 1990 baseline. (This formed the basis of the EU's contribution to the global climate change agreement in Paris at the end of 2015.)

> The UK has been a strong advocate of ambitious EU action on climate change, and has been central to driving collective efforts to set binding targets.

The UK has been a powerful voice in support of the Energy Union agenda, and in particular in the second dimension of securing a fully integrated European energy market (see below). It was one of the first countries in the world to liberalize energy markets, and successive UK governments have viewed the construction of liberalized integrated markets across the EU as a key component of the country's continued energy security and price competitiveness. Similarly, the UK has been a strong advocate of ambitious EU action on climate change, and has been central to driving collective efforts to set binding targets.[26] For example, the European Emissions Trading System was in part modelled on the experience of the UK Emissions Trading Scheme.[27]

Over the next two years, including the UK's scheduled presidency of the EU during the second half of 2017, the Energy Union will also establish a new energy governance mechanism that will test the balance of responsibilities between member states and central EU institutions. The target of at least 27 per cent of the EU's energy coming from renewable sources by 2030 is a unique compromise in that it is binding on the EU as a whole but not on individual member states. The UK, along with Poland and some other member states, objected strongly to specific targets for each member state, arguing for flexibility in meeting overall emission reduction goals, and also opposed binding energy efficiency targets for 2030. Thus, from a sustainability perspective, a number of member states, as well as environmental and industry groups, are critical of the UK's energy policy.

The EU's energy policies and energy market, and the ways in which they affect the UK's economic welfare and security, are evolving rather than static. EU energy policy is moving towards market deepening, a goal long supported by UK governments. This will include greater interconnection

[23] Eurostat (2016), 'Share of Russia in extra-EU28 imports and exports of energy products, 2013, trade in value.png', http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Share_of_Russia_in_extra-EU28_imports_and_exports_of_energy_products,_2013,_trade_in_value.png (accessed 6 May 2016).
[24] MIT, The Observatory of Economic Complexity (2016), 'Russia', http://atlas.media.mit.edu/en/profile/country/rus/ (accessed 6 May 2016).
[25] European Commission (2015), *A Framework Strategy For a Resilient Energy Union with a Forward-Looking Climate Change Policy,* COM/2015/080 Final, http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2015%3A80%3AFIN (accessed 26 Apr. 2016).
[26] See stakeholder evidence from HM Government (2014), *Review of the Balance of Competences between the United Kingdom and the European Union: Environment and Climate Change*, London: HM Government, Chapter 2, February 2014, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/284500/environment-climate-change-documents-final-report.pdf (accessed 20 Jan. 2016).
[27] Comptroller and Auditor General (2004), *The UK Emissions Trading Scheme: A New Way to Combat Climate Change*, London: National Audit Office, 21 April 2004, p. 11, https://www.nao.org.uk/wp-content/uploads/2004/04/0304517.pdf (accessed 25 Mar. 2016).

and interdependence of energy infrastructure across the continent, greater collaboration to ensure potential access to international energy resources, collective action on research and development of new technologies and systems, a deep and rapid programme of decarbonization, and the development of a new governance mechanism. The UK has had a demonstrable impact in shaping EU climate and energy legislation to date. In the context of the referendum debate, it is therefore important to consider the potential impacts of different models of 'Brexit'.

Models of Brexit

The effects of a vote to leave the EU would depend heavily on the sort of relationship that would follow. No full member state has left the EU, and so there is no precedent for the UK to follow. Several models of 'out' have been discussed in the run-up to the referendum. Some draw on the experiences of European states such as Norway and Switzerland that have different levels of political and economic integration with the EU but are not members. The unique nature of a decision to withdraw could mean that the UK would negotiate its own *sui generis* relationship with the EU.

In the event of a vote to leave, it is unlikely that energy and climate would be treated as a separate category for negotiation. It would more probably fall within the overall package of issues to be negotiated between the EU and the UK, meaning that the model of relations for energy and climate may well be determined by political and public sentiment on higher-profile issues such as freedom of movement, rather than by what is best for the UK in these policy areas.

Each option for a post-Brexit relationship presents difficult choices and trade-offs that would affect energy and climate policy. These include:

- The degree of access to the European gas and electricity markets;
- The extent to which the UK would lose the capacity to influence EU decision-making on energy policies, relative to what it would gain in terms of sovereign power to design distinct national energy policies;
- The ease with which a deal might be negotiated with other EU states and institutions.

Models that offer the greatest level of continuity and market access are generally not the most politically appealing for opponents of Britain's continued EU membership, since they do not address some of the key criticisms of the status quo, including issues of democratic sovereignty, political legitimacy and the free movement of people. But these models are likely to attract the most support from those seeking continuity in market rules and conditions and limited business uncertainty.

Norway model

This involves membership of the European Free Trade Association (EFTA) and the European Economic Area (EEA). The EEA agreement fully integrates Norway, Liechtenstein and Iceland into the EU Single Market based on the 'four freedoms': goods, services, capital and people. Non-EU EEA countries adopt legislation in these areas, as well as on 'flanking and horizontal' policies – including consumer protection and the environment. The vast majority of energy-related legislation is regarded as EEA-relevant. Following a process of consultation, a Joint Committee composed of representatives of the EEA and the EU then takes a formal decision incorporating legislation into the EEA agreement.

The process leads in practice to the EEA states adopting the vast majority of EU legislation in the field of energy, from the Renewable Energy Directive and 2020 Climate and Energy Package to motor vehicle standards and the Emissions Trading System. As of May 2016, a further 21 energy-related directives and regulations have been marked as EEA-relevant, but have not yet been incorporated into the EEA

agreement.[28] The influence of EEA states in drafting EU legislation is limited since they have no role or formal representation in the institutions of the EU. However, their state representatives are involved in preparatory work and consultation and have the right to submit comments on proposed legislation.

Energy Community model

Established by treaty in 2005, the Energy Community is an international organization that seeks to create an integrated energy market between the 28 member states and (currently) eight neighbouring territories.[29] Countries ratifying the Energy Community Treaty are required to adopt the EU's *acquis communautaire* (its body of laws and rules) relating to energy. By joining the Energy Community, the UK would retain access to the EU's internal energy market. However, this would require adoption of the energy-relevant parts of the *acquis* without the ability to help shape or design the rules. The timelines for transposition and implementation of EU legislation are laid down by the treaty or by a decision of the Ministerial Council.[30] However, it should be noted that the Energy Community was set up to assist countries whose energy sectors were making the transition towards greater market orientation. Membership may therefore not be open to, or appropriate for, a highly developed economy and energy sector such as the UK's.

Switzerland model

Switzerland is a member of EFTA but not the EEA, and negotiates bilateral treaties with the EU for access to the single market on a sector-by-sector basis. This has been an extensive and ongoing process, the main outcome of which is a series of bilateral agreements negotiated between 1992 and 2004. Switzerland is central to European energy markets, given its position and role in transmitting electricity and its reliance on imports of fossil fuels. It also has significant capacity for electricity storage in its hydropower resource. But as a non-member, Switzerland is not automatically bound by the EU's energy and climate policies. It has been negotiating an electricity agreement with the EU since 2007. The ambition of the Swiss government is to agree a more comprehensive treaty on energy which would also cover gas, regulate trade in electricity, improve Switzerland's market access and harmonize standards. However, these negotiations have been suspended while bilateral talks on free movement are held and negotiations on institutional issues are resolved. After five years of negotiations, the EU and Switzerland have reached an agreement to link their respective carbon emissions trading schemes; this is currently awaiting ratification.

Free trade agreement/Canada model

The UK could negotiate a deep and comprehensive free trade agreement with the EU which would allow for extensive access to the internal market for goods, services and capital, but without the need to accept free movement of labour. However, the UK would no longer be able to participate in the

[28] European Free Trade Association (2016), 'Adopted EU acts marked EEA relevant or considered EEA relevant by EEA EFTA experts', 29 March 2016, http://www.efta.int/media/documents/legal-texts/eea/other-legal-documents/list-eu-acquis-marked-or-considered-eea-relevant/weekly_list.pdf (accessed 6 May 2016).
[29] The contracting parties to the Energy Community are the EU, Albania, Bosnia and Herzegovina, Kosovo, FYR Macedonia, Moldova, Montenegro, Serbia and Ukraine. Armenia, Georgia, Norway and Turkey participate as observers.
[30] Energy Community (2016), 'Legal Framework', https://www.energy-community.org/portal/page/portal/ENC_HOME/ENERGY_COMMUNITY/Legal (accessed 12 Apr. 2016).

creation of EU policies, rules or standards, including those governing the energy market. One model for this could be the recently signed (though not yet ratified) EU–Canada Comprehensive Economic and Trade Agreement (CETA), which will eliminate 99 per cent of tariffs on goods (97 per cent of them at the point when the agreement comes into force, with the remainder phased in). There is some limited coverage of trade in services in CETA, although this is subject to a number of exemptions.[31] CETA will allow access to procurement in utilities markets where these are not public monopolies, although aspects of this remain protected and thresholds apply. There is a specific clause calling for both parties to 'pay special attention' to the removal of barriers to trade in support of renewable energy and climate mitigation, and cooperation in environmental protection.[32]

No deal/WTO model

Under this option, the UK and the EU would have no specific bilateral agreement, and trade would be regulated only by existing WTO rules. The production of energy goods comes under the scope of the General Agreement on Tariffs and Trade (GATT), while energy-related services, including transmission and distribution, fall under the scope of the General Agreement on Trade in Services (GATS).[33] This model is likely to be adopted in the event of a failure to negotiate a bespoke agreement, or during a transition period between withdrawal and the signing of a new agreement.

Table 1: Summary of Brexit vs Remain models

Model	Key elements
Norway	• Membership of EFTA and EEA • Fully integrated in EU single market • Adopts vast majority of EU energy legislation, but with significantly less influence over its contents and with no formal voting power • Contributor to EU budget
Energy Community	• Adopts the *acquis communautaire* relating to energy • Access to single energy market • No formal or limited opportunity to shape EU energy and climate legislation • No contribution to EU budget
Switzerland	• Membership of EFTA, but not of EEA • Sector-specific bilateral agreements with the EU • Small contribution to EU budget • Participant in EU energy market; some harmonization of rules and standards required
Free trade agreement/ Canada	• Comprehensive free trade agreement with the EU allowing access to internal market for goods, and to a lesser extent services • Conditional market access • No access to EU energy-related finance programmes • No contribution to EU budget

[31] Erixon, F. (2016), 'The Canada-EU trade deal is no model for Brexit', CapX, http://capx.co/the-canada-eu-trade-deal-is-no-model-for-brexit/ (accessed 19 Apr. 2016).
[32] European Commission, Directorate General for Trade (2014), 'Comprehensive Economic and Trade Agreement (CETA) between Canada, of the one part, and the European Union and its Member States', http://trade.ec.europa.eu/doclib/docs/2014/september/tradoc_152806.pdf (accessed 6 Apr. 2016).
[33] Cottier, T. et al. (2010), *Energy in WTO law and policy*, https://www.wto.org/english/res_e/publications_e/wtr10_forum_e/wtr10_7may10_e.pdf (accessed 11 Apr. 2016).

Model	Key elements
No deal/WTO 	• No agreement; trade regulated under WTO rules • Conditional market access • No access to EU energy-related finance programmes • No contribution to EU budget
Remain in the EU 	• Fully integrated in EU single market • Bound by EU energy and climate legislation • Directly involved in EU energy and climate policy-making with full voting rights • Eligible for all EU and EIB funding mechanisms • Net contributor to EU budget

Unavoidable uncertainty

The legal mechanism for withdrawing from the EU (Article 50 of the Lisbon Treaty) mandates a process of negotiation lasting up to two years between the withdrawing state and the remaining member states. (This negotiation period can be extended by unanimous agreement.) The final agreement must also be approved by the European Parliament. It is in this negotiation that the future shape of UK–EU relations would be determined. During this time, the UK would still be a member of the EU and would continue to be bound by all treaty commitments and EU legislation, but the vote to leave would affect its influence in decision-making, and other member states might seek to exclude it from participating in decisions that would affect the EU after Britain has withdrawn.[34]

Many doubt whether some of the models of Brexit outlined above could be negotiated within a two-year time frame (although it is not a requirement that the British government trigger Article 50 immediately after the result of the vote, this may in practice be necessary in order to begin negotiations). It took Switzerland 12 years to negotiate the bulk of its bilateral agreements with the EU, while CETA has taken seven years to agree and has yet to be ratified. A vote on the part of the UK to leave the EU would generate significant baseline uncertainty – even if any final model involved retaining close market integration and regulatory continuity. In addition, if a vote to leave triggered changes in domestic legislation around energy and climate change policies, the period of uncertainty for the energy sector would be even more protracted, since these would also take time to be agreed and enacted through parliament, most likely after the withdrawal process had been concluded.

As already noted, the UK is scheduled to assume the six-month rotating presidency of the Council of the European Union from July 2017. Yet it remains unclear whether a member state could still hold the presidency while negotiating its withdrawal. The presidency will come at a time when important changes affecting EU energy markets, renewables, energy efficiency and climate change regulation are being discussed, a legislative process that would undoubtedly be disrupted by the UK's departure negotiations.

[34] HM Government (2016), *The process of withdrawing from the European Union*, Cm 9216, February 2016, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/504216/The_process_for_withdrawing_from_the_EU_print_ready.pdf (accessed 12 Apr. 2016).

The Implications of a Vote to Leave

This section considers six major areas of energy and climate policy – market access and integration; energy investment and price security; funding mechanisms and collaboration; standards for goods and services; domestic climate change and pollution targets; and diplomatic engagement on energy and climate security – and sets out the implications for each should the June 2016 referendum result in a vote to leave the EU.

The figures in this section illustrate, with reference to the models described in the previous section, the potential benefits and opportunities versus the costs and risks for each of these policy areas. See Table 1 for legend.

Market access and integration

The UK was at the forefront of the drive towards greater energy market liberalization – notably with the UK Electricity Act of 1989[35] – and in many ways remains so; and the EU as a whole has drawn on its experiences during the various stages of liberalizing European energy markets.[36]

The importance of existing energy market integration is strongly demonstrated between Northern Ireland and the Republic of Ireland, with the operation of a synchronized electricity system and an all-island Single Electricity Market.[37] In addition, there are two interconnectors between the UK and the island of Ireland, both capable of carrying 500 MW, one from Scotland to Northern Ireland and the other from Ireland to Wales. Greater use of renewables is increasing the need for more interconnections. The gas grids of the Republic of Ireland and the UK are also connected, with the UK supplying the majority of Ireland's gas. Indeed, the Irish market has been described as 'in effect a regional extension to the British energy market.[38]

Over the last two decades there have been, at EU level, three sets of electricity and gas liberalization directives aimed at progressively unbundling hitherto vertically integrated electricity and gas companies, enabling greater consumer choice and moving regulatory control away from governments towards independent national and EU bodies. Further market liberalization measures are due to be introduced at the EU level during 2016, and are expected to include legislation on a new market design to encourage greater regional cooperation, new market measures (to support new infrastructure, investment and the effective integration of higher percentages of renewables) and internal energy security elements. Also under discussion are measures to involve consumers more actively in the market through the use of smart grids, data protection and new opportunities to save energy.

[35] Heddenhausen, M. (2007), 'Privatisation in Europe's liberalised electricity markets – the cases of the United Kingdom, Sweden, Germany and France', Berlin: Stiftung Wissenschaft und Politik [German Institute for International and Security Affairs], December 2007, http://swp-berlin.org/fileadmin/contents/products/projekt_papiere/Electricity_paper_KS_IIformatiert.pdf (accessed 8 Apr. 2016).
[36] HM Government (2014), *Review of the Balance of Competences between the United Kingdom and the European Union: Environment and Climate Change*.
[37] CER (2011), 'CER Factsheet on the Single Electricity Market', Irish Commission for Energy Regulation, April 2011, http://www.cer.ie/docs/000262/cer11075.pdf.
[38] Purdue, D. and Huang, H. (2015), *Brexit and its Impact on the Irish Economy*, National Treasury Management Agency, NTMA Economics, June 2015.

Given the perceived economic benefits and the multinational structure of energy markets and companies, it is unlikely that the UK's current government would wish, or be able, to reverse significantly the trend of domestic energy market liberalization in the event of Brexit.[39]

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In practice, remaining in the EU, or, should the vote be to leave, the Norway model and the Energy Community model would all provide long-term continuity in market access. The Switzerland, the FTA/Canada and the no deal/WTO models would all create market uncertainty over the short to medium term. This uncertainty could be mitigated on successful conclusion of an agreement along the lines of the Switzerland or the FTA/Canada models, but this is by no means guaranteed.

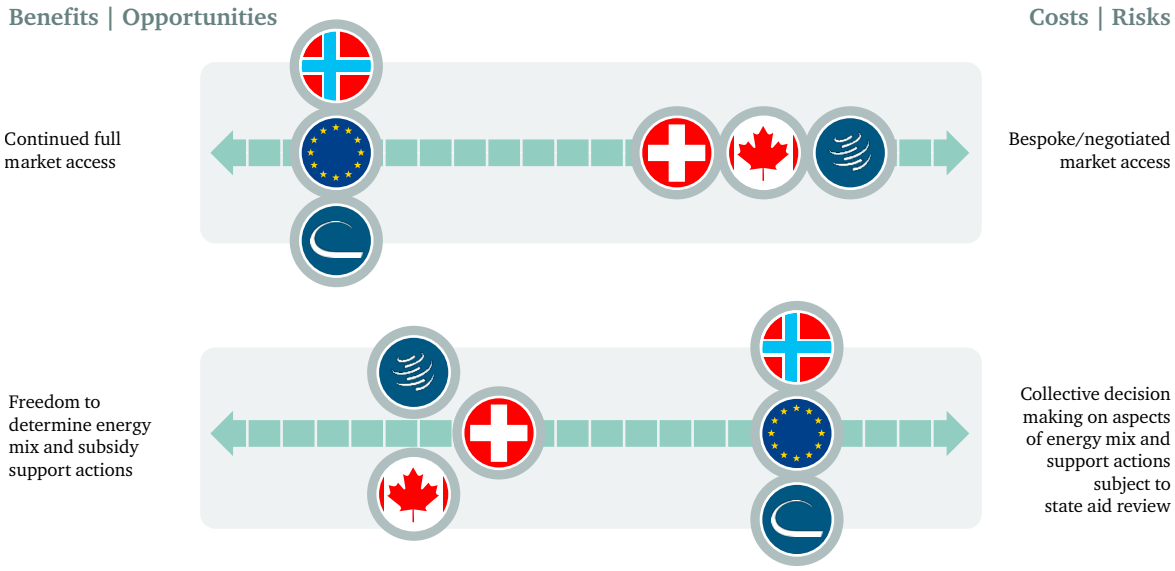
Given the extent of interconnectivity for both gas and electricity, physical disconnection seems unrealistic under any scenario. Furthermore, there is no reason why National Grid or other UK transmission system operators would not remain part of the respective European Network of Transmission Operators for electricity and gas, which develop network codes including for energy exchange between countries inside and outside the EU.

Another key issue for EU markets is state aid, which regulates the use of public resources to support entities in order to prevent distortion of existing market rules. Under some models of the future relationship, the UK outside the EU would be able to operate a more active industrial policy unconstrained by EU state aid rules; however, this would be affected by the type of overarching relationship that might exist between the UK and the EU, and whether or not current EU state aid rules would still apply. In the case of the Norway model, the EEA agreement contains a prohibition on state aid that is broadly equivalent to those in the EC Treaty,[40] and there is a similar requirement under the Energy Community model.[41] Under the Switzerland, FTA/Canada and no deal/WTO models, it is likely that there would be no definite stipulations on state aid rules, or that these would be significantly weaker than current EU ones. However, even in the event that a no deal/WTO or FTA/Canada model was adopted and there was limited participation by the UK in the European market, international trade rules such as the GATS would continue to apply.

If the UK was to leave the EU, a powerful pro-market voice would be lost at the negotiating table, potentially shifting the balance within Europe towards greater state intervention. Remaining in the EU would mean for the UK that it was still subject to collective decisions across a range of market and investment issues, although past experience suggests that it is effective at influencing such decisions in line with its own interests. Exiting the EU could, depending on the future relationship, create market uncertainty and change the access rules for continental energy resources, but would potentially give the UK greater freedom to support its energy sector in line with government priorities.

[39] Miller, V. (ed.) (2015), 'Exiting the EU: impact in key UK policy areas', Briefing Paper, 07213, London: House of Commons Library, 3 June 2015, researchbriefings.files.parliament.uk/documents/CBP-7213/CBP-7213.pdf (accessed 29 Jan. 2016).
[40] EFTA Surveillance Authority (2016), 'The EEA state aid rules and the role of the Authority', http://www.eftasurv.int/state-aid/state-aid-in-the-eea/ (accessed 18 Apr. 2016).
[41] Energy Community Secretariat (2015), *Policy Guidelines on the Applicability of the Guidelines on State Aid for Environmental Protection and Energy 2014–2020*, PG 04/2015, Vienna: Energy Community, 24 November 2015, https://www.energy-community.org/portal/page/portal/ENC_HOME/DOCS/3892323/256E442005065CB8E053C92FA8C02D35.PDF (accessed 8 Jan. 2016).

Figure 5: Market access scenarios



Energy investment and price security

Importantly, within the energy sector there is significant global competition for investment; and the International Energy Agency (IEA) estimates that nearly $70 trillion will be needed by 2040.[42] Furthermore, significant investment is needed across Europe's energy sector, including that of the UK, both to replace ageing infrastructure and to transform the system to enable decarbonization – according to IEA estimates, over the next decade this equates to approximately $1 trillion (£700 billion) in the power sector alone in the EU, under current policy scenarios.[43] In the case of the UK, the government estimates that for the period 2014/15–2020/21 the total energy infrastructure requirement will be £274.9 billion.[44] Foreign direct investment (FDI) will be crucial to achieving this objective; and indeed, overseas investors have since 2010 provided around 40 per cent of the necessary finance for energy and infrastructure projects.[45] The UK is therefore competing for foreign investment with investors on the European and global scale.

The UK has in recent years been a major recipient of inward FDI; in 2013 it had the second highest stock in the world, behind only the United States. EU countries accounted for over half of this inflow – £566 billion of a total of £975 billion.[46] A report for the UK parliament reviewing the possible impact of withdrawal from the EU concluded that it would not be possible to calculate the impact on FDI, but did state that:

> On the whole, it is reasonable to conclude that membership of the single market is one of a number of important determinants of FDI; but outside the EU, the UK may be able to establish a regulatory regime more favourable to overseas investors that could offset the effect of its departure.[47]

[42] International Energy Agency (2015), *World Energy Outlook 2015*, Paris: IEA, 10 November 2015.
[43] Ibid.
[44] HM Treasury (2014), *National Infrastructure Plan 2014*, December 2014, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/381884/2902895_NationalInfrastructurePlan2014_acc.pdf (accessed 8 Jan 2016).
[45] UK Trade and Investment (UKTI) (2015), *Inward Investment Report 2014/15*, UKTI/15/43, 17 June 2015, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/435646/UKTI-Inward-Investment-Report-2014-to-2015.pdf (accessed 8 Jan. 2016).
[46] UKTI (2014), *Inward Investment Report 2013/14*, UKTI/14/125, 18 July 2014, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/341601/UKTI_Inward_Investment_Report_2013-2014.pdf (accessed 8 Jan. 2016).
[47] Miller (ed.) (2015), 'Exiting the EU: impact in key UK policy areas'.

However, according to Ernst &Young's November 2015 *Capital Confidence Barometer* for power and utilities, when companies were asked what issues had risen up the boardroom agenda over the last six months, volatility of commodities and currencies were cited more than any other issues.[48] The concern appears to be that a vote to leave the EU could make access to capital more difficult, or that it would at least be accompanied by a risk premium, reflecting possible fluctuations in currency, impeded credit ratings, and reduced and/or restricted access to EU funds.

The price paid by consumers for their energy depends on a number of factors: the market price of the product, the network (distribution) charges, environmental and social charges, and taxes. For electricity, UK market prices are above the EU average,[49] in part owing to the lack of interconnectors with the continent. With interconnections able to supply only the equivalent of six per cent of peak electricity demand, the UK lags behind other member states. HSBC estimates that additional interconnectors to both the continent and Ireland by the end of 2021, providing more than 10 GW of power capacity – more than three times the current level – could lower the wholesale market price for baseload electricity by 7 per cent.[50] Energy and climate secretary Amber Rudd has suggested that greater interconnectivity could save British households £12 billion over the next two decades.[51] Such an expansion in infrastructure would be in the UK's own interest, and would also help to meet the EU's objective of ensuring greater interconnection between member states.[52]

The development and deployment of the EU's network plans are part-funded by the Connecting Europe Facility (CEF) a funding instrument to promote growth, jobs and competitiveness through targeted infrastructure investment at European level in the fields of transport, energy and digital services.[53]. While non-EU member states participate in the CEF, projects must be able to show that they have a significant impact on the energy market and the market integration of at least two EU countries. Potentially, therefore, the focus of future projects involving the UK under the CEF would change in the event of Brexit.

One criticism often made of the EU's energy policies is that their environmental requirements entail increased prices paid by consumers.[54] However, most of the social and environmental costs included in consumer bills are not determined by EU legislation. Rather, prices in the UK are driven predominantly by international markets along with domestic legislation, such as the Climate Change Act and the Fuel Poverty (England) Regulations. This is unlikely to change, as least in the short term, under exit scenarios.

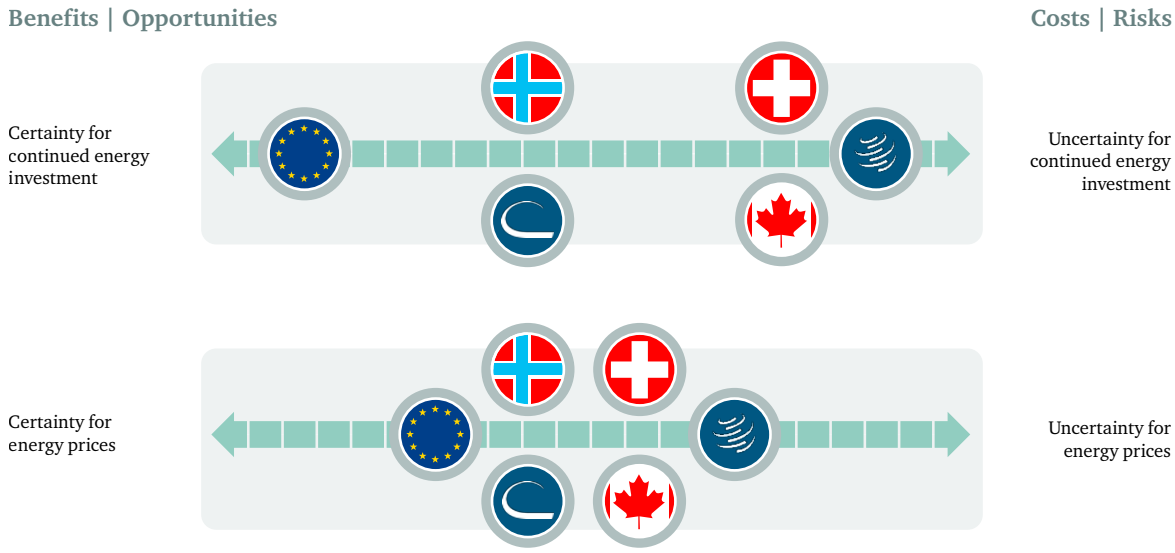
[48] Ernst & Young (2015), *Power & Utilities: Capital Confidence Barometer*, 13th Edition, DX0358, November 2015, http://www.ey.com/Publication/vwLUAssets/ey-ccb13-global-power-and-utlilities-nov2015/$FILE/ey-ccb13-global-power-and-utlilities-nov2015.pdf (accessed 7 Feb. 2016).
[49] In early 2016, the month ahead base-load market price for power in the UK was around €40/MWh in the UK, €22/MWh in Germany, and €25/MWh in France. Platts, 'Power in Europe', 11 April 2016.
[50] HSBC (2015), UK Electricity, Britain to Join the (Electricity) Eurozone, June 2015.
[51] DECC (2016), 'Amber Rudd's speech on the energy benefits of staying in the EU', 24 March 2016, https://www.gov.uk/government/speeches/amber-rudds-speech-on-energy-benefits-of-staying-in-eu (accessed 12 Apr. 2016).
[52] The European Council of October 2014 called for all member states to achieve interconnection of at least 10 per cent of their installed electricity production capacity by 2020. See General Secretariat of the Council (2014), 'European Council (23 and 24 October 2014) Conclusions', EUCO 169/14, Brussels, 24 October 2014, http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/145397.pdf (accessed 15 Apr. 2016).
[53] European Commission (2016), 'Connecting Europe Facility', Innovation and Networks Executive Agency web site, see https://ec.europa.eu/inea/en/connecting-europe-facility, (accessed 16 May 2016).
[54] Elliot, M. and Lewis, O. (2014), 'Energy policy and the EU, How a better deal could bring down the cost of energy and save jobs', Business for Britain, http://businessforbritain.org/BFBEnergyPaper.pdf (August 2014).

Brexit is unlikely to affect significantly the short-term price the UK receives or pays for oil and gas, given its relatively small size in comparison with the global oil and regional gas markets.[55] However, higher investment costs, if a political risk premium were added following a decision to leave the EU, would increase exploration and development costs at a time when lower world prices are already threatening the economic viability of UK production. Heads of some of the UK's largest oil and gas producers, among them BP[56] and Shell,[57] have stated that leaving the EU would have a negative impact on their companies and the sector in general. This could leave the UK more dependent on imported oil and gas if importing energy became a cheaper option.

While the UK government is actively promoting the development of shale gas, local and national environmental concerns, along with the low global gas price, are likely to delay, if not curtail, its production, at least in the short term. Even allowing for a longer time frame, domestic shale gas production is unlikely to replace conventional gas production from the North Sea.

Overall, the option of remaining in the EU provides the highest levels of certainty for continued energy investment. The Norway and the Energy Community models incur less uncertainty, would most likely be quicker to negotiate and would provide a degree of continuity; all of the other Brexit models would introduce a high level of uncertainty that could affect energy investment decisions over the medium term.

Figure 6: Investment and price security scenarios



[55] The UK's oil production is less than 1 per cent of the world total, while its consumption is 1.6 per cent; gas production is about 1 per cent and consumption 2 per cent. *BP Statistical Review of World Energy 2015*.
[56] Ahmed, K. (2016), 'BP boss: Threat to investment if UK leaves EU', BBC news, 20 January 2016, http://www.bbc.co.uk/news/business-35365701 (accessed 12 Feb. 2016).
[57] Costas, P. and Hardcastle, E. (eds) (2016), 'Shell CEO says oil giant would be hit by Brexit', Reuters, 17 January 2016, http://www.reuters.com/article/us-britain-eu-business-idUSKCN0UV0H3 (accessed 12 Feb. 2016).

Funding mechanisms and collaboration

The EU is a significant funder of energy-related projects in the UK. At the same time, the UK is a net contributor to the EU budget, giving more in direct contributions than it receives in allocations of EU expenditure. Therefore, in terms of energy and climate-related funding from the EU, the costs and other implications of Brexit must be weighed against the UK's position as a net contributor and how that contribution could potentially be reallocated in the event of the UK's withdrawal from the EU.

Under the EU's current seven-year budget framework (2014–20), significant levels of energy-related financial support are available for allocation from structural and regional funds. For the UK specifically, this includes €1.9 billion for climate change adaptation and risk prevention, and €1.6 billion to support the transition to a low-carbon economy.[58]

In addition, the EU has supported infrastructure and research investments in energy- and climate- relevant projects. Under the European Energy Programme for Recovery (EEPR), established in 2009, the UK received almost €300 million in allocated funding for a variety of projects including offshore wind and electricity interconnection with the Republic of Ireland.[59] The CEF has awarded the UK £59 million in funding for energy projects under its calls in 2014 and 2015. The UK was the fourth highest recipient of funds among member states under the CEF energy programme, which is based on member states' applications for funds.[60]

> In particular, the UK has been particularly successful in utilizing EIB loans for renewables and energy efficiency projects, securing 24 per cent of funding available from the EIB's Climate Awareness Bonds.

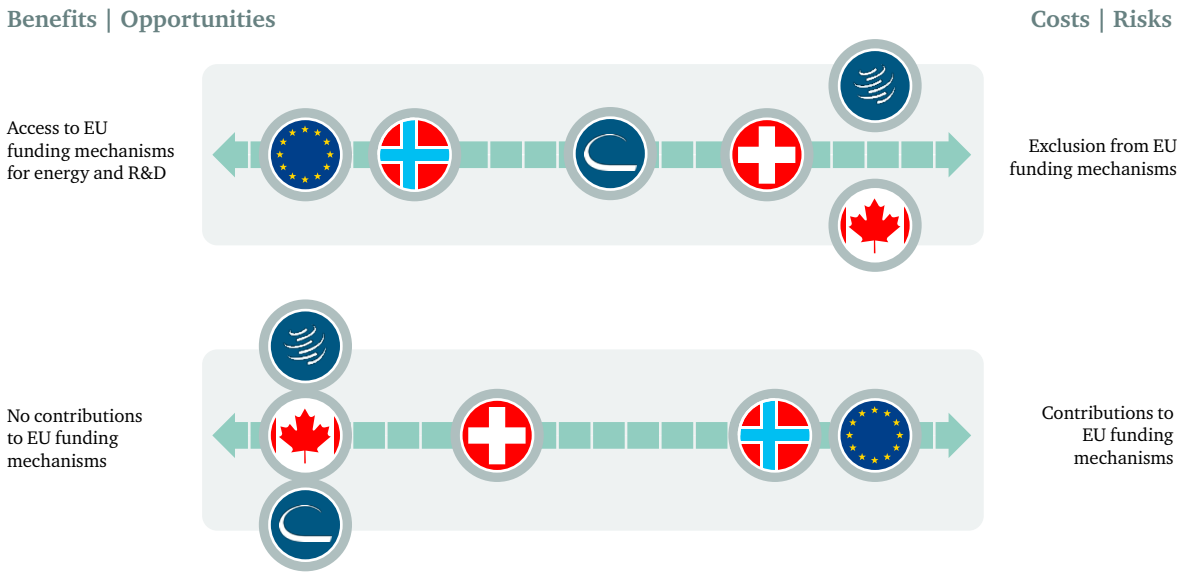
The European Investment Bank (EIB) is also an important financier of energy investment. The UK is one of the bank's largest stakeholders: in the past five years alone, the EIB has provided €31 billion in long-term loans for UK projects, with more than €9 billion going to energy projects.[61] In particular, the UK has been particularly successful in utilizing EIB loans for renewables and energy efficiency projects, securing 24 per cent of funding available from the EIB's Climate Awareness Bonds.[62] Although the EIB does lend to non-EU member states, 90 per cent of its funding is spent within the EU on the basis of the latter's priorities. The UK's position *vis-à-vis* the EIB after leaving the EU would be unclear, as no non-member states are stakeholders in the bank.

Exiting the EU under most models would close off access to most of these funds.[63] Norway and, to a lesser extent, Switzerland, still make a sizeable contribution to the EU budget: indeed, Norway's per capita contribution in 2011, at £106, was not much lower than that of the UK (£128); Switzerland's contribution per head was £53.[64] Under the Canada, the WTO and the Energy Community models,

[58] European Commission, European Structural and Investment Funds Data (2016), 'Country Data: United Kingdom', https://cohesiondata.ec.europa.eu/countries/UK (accessed 6 Apr. 2016).
[59] European Energy Programme for Recovery (EEPR) (2016), 'Projects map', http://ec.europa.eu/energy/eepr/projects/ (accessed 6 Apr. 2016).
[60] Figures provided by European Commission (Directorate General for Energy) in correspondence with Chatham House, February 2016.
[61] Author calculations based on EIB data available at European Investment Bank (2016), 'United Kingdom. European Union', http://www.eib.org/projects/loans/regions/european-union/gb.htm (accessed 6 Apr. 2016).
[62] Shankleman, J. (2016), 'Brexit May Lose U.K. Billions in Funding for Climate, Renewables', Bloomberg News, 2 February 2016, http://www.bloomberg.com/news/articles/2016-02-02/brexit-may-lose-u-k-billions-in-funding-for-climate-renewables (accessed 6 Apr. 2016).
[63] The UK could still benefit from some Projects of Common Interest under the Connecting Europe Facility if they were of benefit to other member states, just as Norway has done.
[64] The figures for contributions per head are taken from Miller, V. (ed.), *Leaving the EU*, Research Paper, 13/42, London: House of Commons Library, 1 July 2013, http://researchbriefings.parliament.uk/ResearchBriefing/Summary/RP13-42#fullreport (accessed 13 May 2016).

the UK would theoretically be left with its previous EU budget contribution to reallocate to domestic projects. (This assumed reallocation notably discounts any potential negative effects on the economy and government revenue caused by a vote to leave.) It would then be up to the UK government of the day to determine whether it would choose to provide a lower, higher or similar level of support to energy- and climate-related projects amid competing priorities.

Figure 7: Funding mechanisms and collaboration scenarios



Standards for goods and services

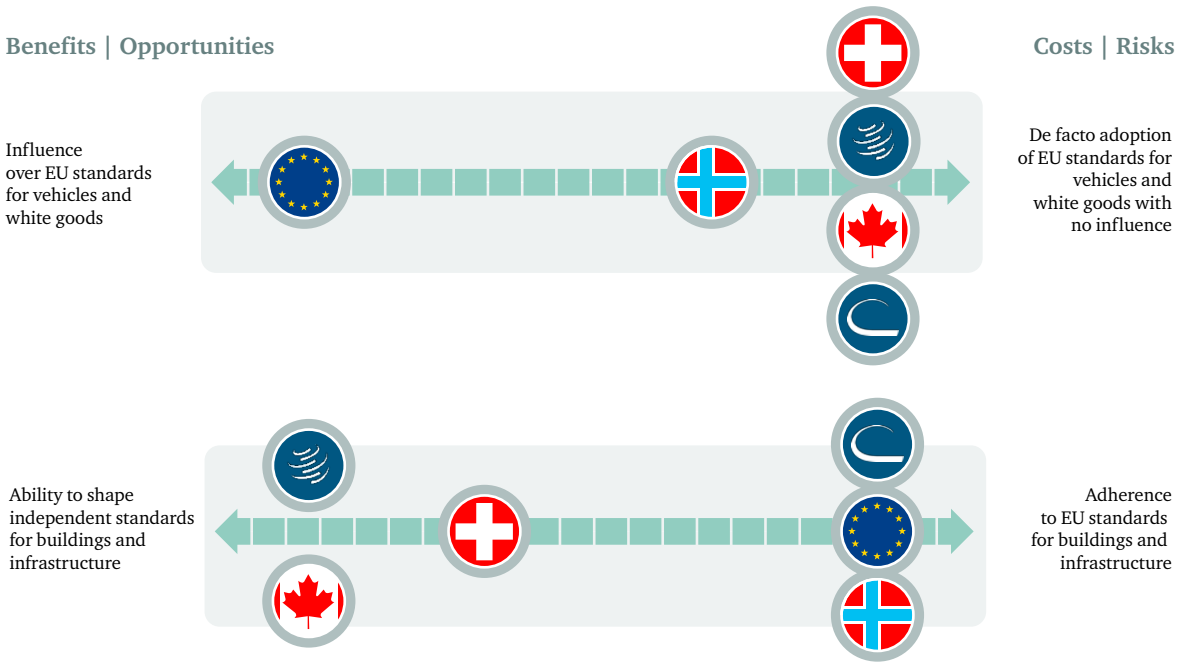
Many of the energy standards for vehicles, consumer goods and buildings are significantly determined at the EU level. This ensures that goods can be traded freely throughout the EU without unfair competitive advantage for one country's products, while at the same time achieving energy efficiency and low-carbon targets shared by all EU members. EU directives make energy labelling obligatory, set vehicle emissions limits and establish eco-design requirements for white goods (which regulate a number of factors such as energy use in vacuum cleaners or washing machines), as well as codes and standards for new buildings. While a decision to leave the EU might be seen to free the UK from this body of regulation, in practice it is likely that much of it would be kept or immediately readopted. To retain access to the single market and continue to trade with EU countries, UK producers would need to meet all future EU minimum standards for their products. Likewise, manufacturers in the EU exporting to the UK would, wherever possible, continue to produce a single product that can be sold across multiple EU markets and so would not specifically produce less energy-efficient goods for the UK. This is currently the case for many goods sold in Norway and Switzerland. The UK would thus de facto remain subject to minimum EU standards, but would have no voice in determining these. It may even establish higher domestic standards than those required by existing EU regulation, as Switzerland has done in some areas,[65] irrespective of whether this would impose additional costs on domestic manufacturers relative to their EU counterparts.

[65] Steinmann, W. (2015), 'Welcome address at 8th International Conference on Energy Efficiency in Domestic Appliances and Lighting – EEDAL'15', Presentation, Lucerne-Horw, 26 August 2015, http://iet.jrc.ec.europa.eu/energyefficiency/sites/energyefficiency/files/events/EEDAL15/Plenary/2_dr_walter_steinmann_referat_engl_eedal_26.08.2015.pdf (accessed 15 Jan. 2016).

The UK outside the EU would potentially have more freedom concerning regulation of its construction sector, given that buildings are not traded in the same way as consumer goods or services. Legislation such as the 2012 Energy Performance of Buildings Regulations would no longer apply, even under the Norway model. None the less, as noted in the discussion on climate change targets below, given the strong domestic commitment to emissions reductions, the UK would still be likely to pursue measures to improve energy efficiency in buildings and construction, and would be unlikely to lower overall building standards from current levels under any exit model. It should be noted the UK had an estimated 2.34 million people living in fuel poverty in 2015,[66] and improvements to buildings efficiency will be important in addressing this issue.

In sum, remaining in the EU is the only way to ensure continued direct influence over EU standards for manufactures such as vehicles and white goods. All options to leave would require the de facto adoption of these standards in order to retain access to EU markets, with no say in how these are set; and under the Norway and the Energy Community models there would be continued adherence to all EU standards, again with little influence over how such standards are set. For buildings and infrastructure standards, both the FTA/Canada and the no deal/WTO options would allow for full independence, and greater flexibility would be afforded under the Switzerland option, depending on any final negotiation with the EU.

Figure 8: Standards scenarios



[66] Defined as low-income households with high required energy costs such that if they met their requirements their residual income would be below the official poverty line. DECC (2015), *Annual Fuel Poverty Statistics Report,* 15D/165, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/468011/Fuel_Poverty_Report_2015.pdf (accessed 15 Jan. 2016).

Climate change and pollution targets

The implications for climate change and pollution policies should the UK leave the EU are complex. As noted earlier in this paper, the EU's 2030 Climate and Energy Framework has established an overall emissions reduction target of at least 40 per cent by 2030 from a 1990 baseline. It also includes a renewable energy target of at least 27 per cent that is binding on the EU as a whole but not (in part to accommodate UK objections) on individual member states. If the UK were to leave, it would no longer be subject to these EU-level targets. However, the UK already has domestic legislation in place, through the Climate Change Act, that commits it to delivering an 80 per cent reduction in emissions by 2050 from the same baseline. This is already binding for a longer period than current EU level legislation, which remains aspirational beyond 2030. In this context, withdrawing from the EU would not necessarily affect current UK domestic climate goals. However, a decision to leave the EU could make it easier for a future UK government to change policy by weakening or abandoning the current Climate Change Act, since only a change in domestic legislation would be required.

At the international level, the UK is a party to the joint Intended Nationally Determined Contribution (INDC) on emissions reductions submitted on behalf of the EU and its member states in advance of the Paris Climate Change Conference at the end of 2015.[67] It would be required under any exit model to submit a unilateral INDC setting out its 2030 commitment, as Norway and Switzerland have done. Although in theory the UK would be free to determine its own ambition level, it would come under considerable scrutiny from countries such as the United States, China and India, as well as from the EU, to ensure that it was not backtracking on the global ambition levels established in Paris. If it was perceived to be undermining the ambition levels established in Paris, other major economies could respond through actions ranging variously from the use of soft power and public criticism to hard trade sanctions such as border tax adjustments.

As regards renewable energy, the impact of future governance arrangements is unclear. The Energy Union process commits member states to develop national plans for energy policy in consultation with the European Commission. If these plans were to show collectively that delivery of the renewables target was significantly off track, this could lead to proposals for national plans to be revised and/or stronger EU-level governance. However, the precise implications and structure of future EU-level governance are currently uncertain, making it more difficult to assess the implications for the UK outside the EU. Despite this uncertainty, the Energy Community or the Norway models would also involve setting targets for renewable energy and energy efficiency. Under an FTA/Canada or a no deal/WTO model, the UK would not be bound by these EU-level targets.

Much pollution legislation is currently set at the EU level. This includes the EU Air Quality Policy Framework and the Industrial Emissions Directive (IED).[68] The latter, which replaces seven existing EU directives, will affect future coal use in particular. Existing plants may still be exempted from IED compliance, but are limited to no more than 17,500 hours of operation over the period 2016–23.[69] If the UK left the EU, it would no longer be subject to the IED. However, local air pollution levels are likely to remain a political priority, and before the 2015 general election there was consensus across

[67] Latvian Presidency of the Council of the European Union (2015), 'Submission by Latvia and the European Commission on Behalf of the European Union and its 28 Member States', 6 March 2015, http://www4.unfccc.int/submissions/INDC/Published%20Documents/Latvia/1/LV-03-06-EU%20INDC.pdf (accessed 16 May 2016).
[68] European Commission (2016), 'The Industrial Emissions Directive', http://ec.europa.eu/environment/industry/stationary/ied/legislation.htm (accessed 16 May 2016).
[69] European Commission, Directorate-General for Energy (2015), 'Environment. Frequently Asked Questions (FAQ)', 19 November 2015, http://ec.europa.eu/environment/industry/stationary/ied/faq.htm (accessed 20 May 2016).

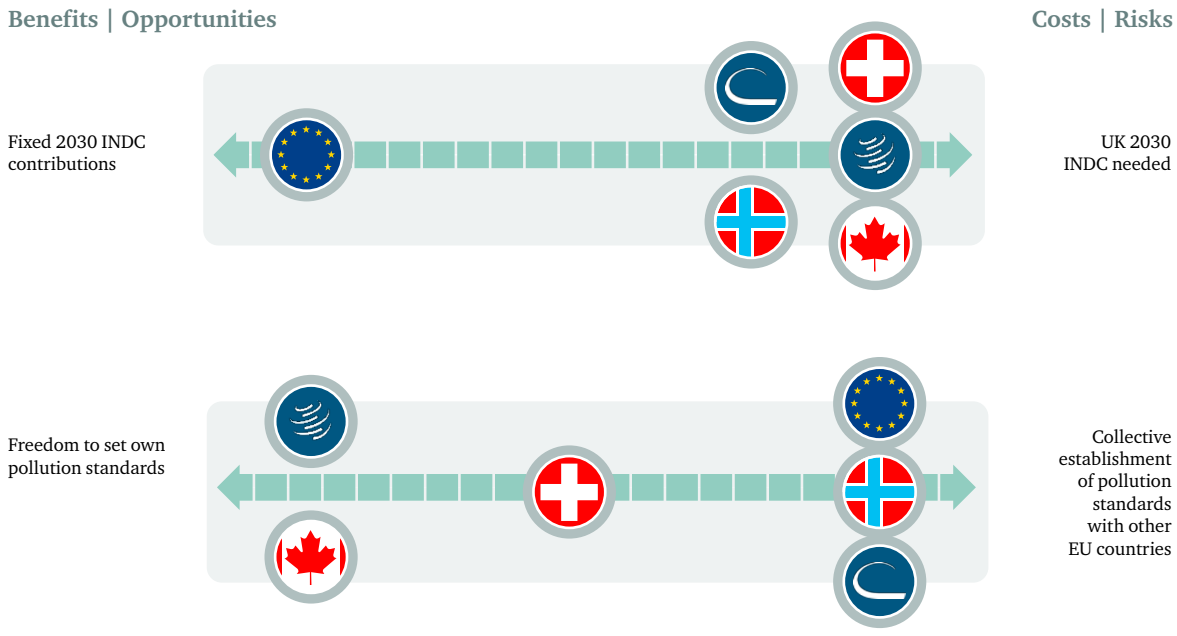
all major British political parties on the phasing-out of unabated (i.e. lacking CCS technology) coal power. The current UK government has announced its intention to close all existing coal-fired power stations by 2025, and to restrict the use of coal in power generation from 2023,[70] which would also assist the UK in meeting its future carbon budgets. In practice, therefore, Brexit would be unlikely to lead to a radical change of policy on measures to reduce pollution.

It is probable that under all models of Brexit the UK would have to leave the EU Emissions Trading System. The UK has been one of the most vociferous supporters of the system, and its own voluntary Emissions Trading Scheme, implemented in 2002, is seen as the forerunner of the EU-wide scheme and has unilaterally introduced a carbon floor price to counteract the low market price of carbon. In the event of Brexit, the UK would be likely to re-establish its own scheme, as Norway and Switzerland have done, with direct links and probably similar overarching reduction targets to those of the EU system.

To sum up, remaining in the EU would imply continued certainty over the UK's contributions to combating climate change. On the other hand, all options to leave would require the EU to submit a new INDC to the United Nations Framework Convention on Climate Change (UNFCCC) as part of the Paris Agreement, creating uncertainty over future climate change action. The FTA/Canada, no deal/WTO and Swiss models, but not the Norway and Energy Community models, would allow the UK to set independent pollution standards, although a radical departure from the UK's current energy policies is unlikely given current legislative commitments.

More generally, Brexit could seriously affect the EU's own internal policies on decarbonization. The UK, alongside countries such as Germany, France and Sweden, has traditionally argued for strong action to address climate change. In the absence of the UK, the centre of gravity in the EU could shift towards those states that have traditionally argued for less stringent policies.

Figure 9: Climate change and pollution scenarios



[70] DECC (2015), 'Amber Rudd's speech on a new direction for UK energy policy'.

Diplomatic engagement on energy and climate security

Leaving the EU would have significant implications for the UK's diplomacy in relation to energy security and climate change. In this context, it is important to consider the benefits and risks to the UK of coordinating diplomatic efforts with fellow EU members to engage other global powers, relative to those of maintaining an independent voice on energy and climate issues.

The EU currently takes a coordinated approach in engaging with major fossil fuel producers such as Russia and countries in the Middle East. This includes formal processes such as the EU–Russia Energy Dialogue, which provides an overall structure for cooperation with Russia on energy issues, including through the Gas Advisory Council and the Early Warning Mechanism.[71] The latter was established following the gas dispute between Russia and Ukraine in 2009, with the aim of helping to prevent interruptions in energy supply into the EU. The EU has also taken coordinated action at the level of heads of state in response to issues that affect the EU's energy security. Following Russia's annexation of Crimea and incursions into eastern Ukraine in 2014, Chancellor Angela Merkel and President François Hollande led negotiations with President Vladimir Putin, coordinating closely with other EU leaders. However, the decision to impose sanctions on Russia was taken collectively.[72] The EU has, moreover, been able to coordinate domestic action across member states. This has helped ensure price stability and security of supply, including by means of infrastructure investment to increase the efficient use of existing pipeline systems, provide reverse flow capacity and ensure replenishment of storage. Cumulatively, these have reduced energy supply pressures both on EU member states and on Energy Community members.[73]

If the UK were to leave the EU, it would cease to be part of these internal coordination mechanisms. Russian gas accounts for about 25 per cent of natural gas in the EU's energy mix,[74] and the UK, while itself importing little from Russia (Russian gas accounts for 16 per cent of all UK imports), is reliant on the continuation of a well-functioning gas market across the EU. It could continue to operate on a bilateral basis with other energy producers and importers, but would carry less diplomatic weight than through joint EU positions.

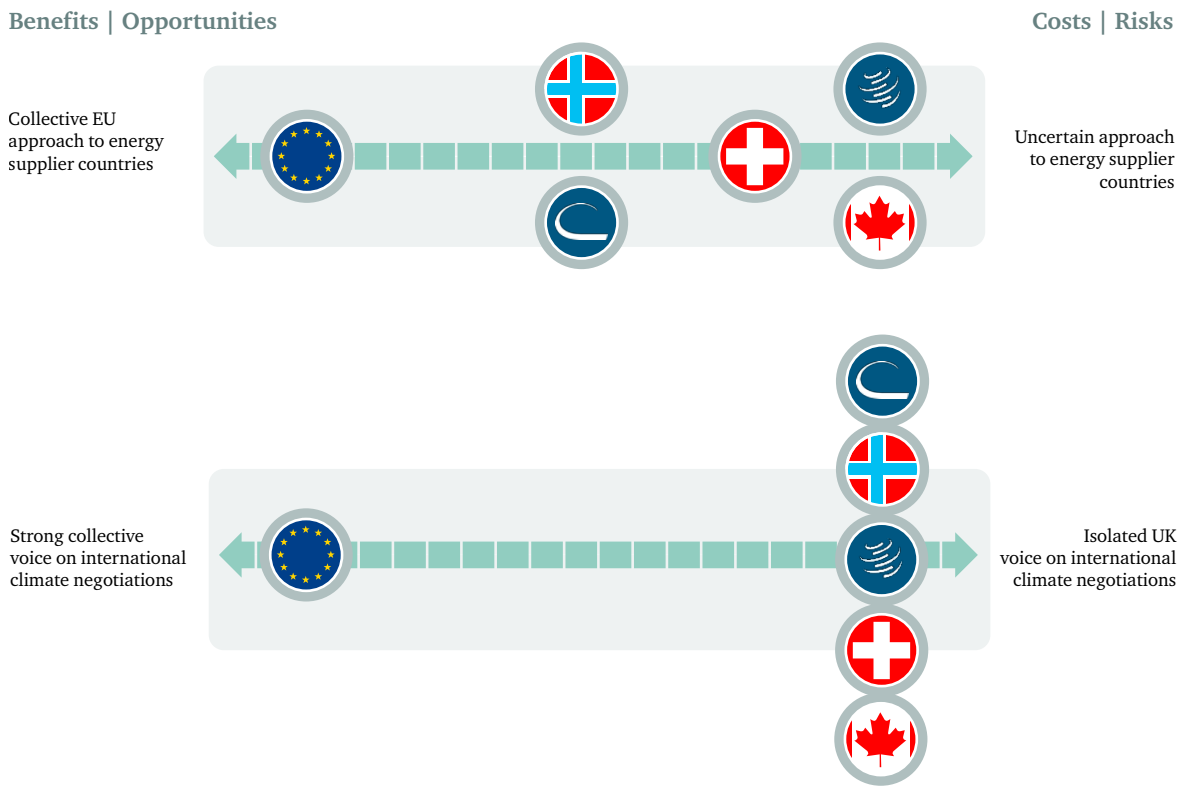
The EU also negotiates collectively in international climate diplomacy. It was a central player in establishing the Paris Agreement at the end of 2015, and, as already mentioned, put forward a joint INDC in preparation for the summit. In climate negotiations, a country's leverage is significantly influenced by the size of its own emissions and hence impact on global climate levels, along with other factors such as provision of finance, technology and vulnerability to climate impacts. Negotiating collectively gives the EU significant political weight, enabling it to operate on the same level as other global powers and major emitters such as the United States and China. Meaningful progress on climate change can only be delivered if all three parties – which jointly account for more than half of all global greenhouse gas emissions[75] – take action. The fact that the US and China did not undertake quantified emissions reduction under the Kyoto Protocol was a key weakness of that agreement. Taking the UK out of the EU would therefore have a significant impact on the latter's diplomatic

[71] European Commission (2016), 'Energy: Russia', https://ec.europa.eu/energy/en/topics/international-cooperation/russia (accessed 16 May 2016).
[72] European Union Newsroom (2016), 'EU sanctions against Russia over Ukraine crisis', https://europa.eu/newsroom/highlights/special-coverage/eu_sanctions_en (accessed 16 May 2016).
[73] IPA Advisory Limited (2015) 'A Quiet Revolution in Central And Eastern Europe' http://ipaadvisory.co.uk/ (accessed 17 May 2016).
[74] Based on data from Eurostat (2013) and Gazprom (2013) in Raines, T. and Tomlinson, S. (2016), *Europe's Energy Union. Foreign Policy Implications for Energy Security, Climate and Competitiveness*, Research Paper, London: Royal Institute of International Affairs, https://www.chathamhouse.org/publication/europes-energy-union-foreign-policy-implications-energy-security-climate (accessed 12 Apr. 2016).
[75] CAIT Climate Data Explorer (2012), http://cait.wri.org/ (accessed 13 Apr. 2016).

influence on this issue *vis-à-vis* the United States and China. The UK has been a strong advocate of international climate leadership within the EU, and by leaving could shift the centre of gravity among the remaining member states towards those that have traditionally argued for less stringent climate measures. The UK would itself wield less influence, moving alongside other second-tier powers such as Australia, Canada and South Korea.

In sum, remaining in the EU provides clear benefits in terms of providing a strong, coordinated approach on both energy security and international climate change issues. All Brexit options would increase uncertainty, lead to greater fragmentation and weaken the EU's position in managing key relationships with countries such as Russia. Over the medium term this could have a significant impact on energy diplomacy and policy responses.

Figure 10: Diplomatic engagement and energy and climate security scenarios



Conclusion: Unplugging from Europe Is Not an Option

A vote to leave the EU would have significant implications for the UK's energy sector and its approach to dealing with climate change. The extent of these implications would depend on the final agreed model of UK–EU relations. Regardless of the model established, the decision to leave would generate significant short- to medium-term uncertainty, potentially affecting investment in the sector.

An 'out' vote could also affect the political direction of some key pillars of EU climate and energy policy, notably on measures to address climate change, create emissions trading schemes and liberalize energy markets – all areas in which the UK has played an influential role in shaping policy. While the immediate consequences may be limited, there are significant EU climate and energy policies due to be finalized in the next few years that will affect the strategic direction of this critical sector for several decades. In the absence of the UK, the balance of power within the EU on energy and climate policy would shift.

The assessment of the impact of different models of Brexit on key energy and climate policy issues highlights the considerable risks associated with all options. Each involves trade-offs. The Norway or the Energy Community options would be the least disruptive, in that they would provide continuity in market access, regulatory frameworks and, probably, investment in the energy sector. However, both would come at the price of passively accepting the vast majority of EU energy policy and legislation while sacrificing any say in their creation. In the case of the Norway model, the UK would also be expected to continue to contribute to the EU budget, while potentially losing some of the benefits of financial support for common infrastructure projects that it currently enjoys. This model could lead to a position where the UK would have less, rather than more, sovereignty over its future energy policy.

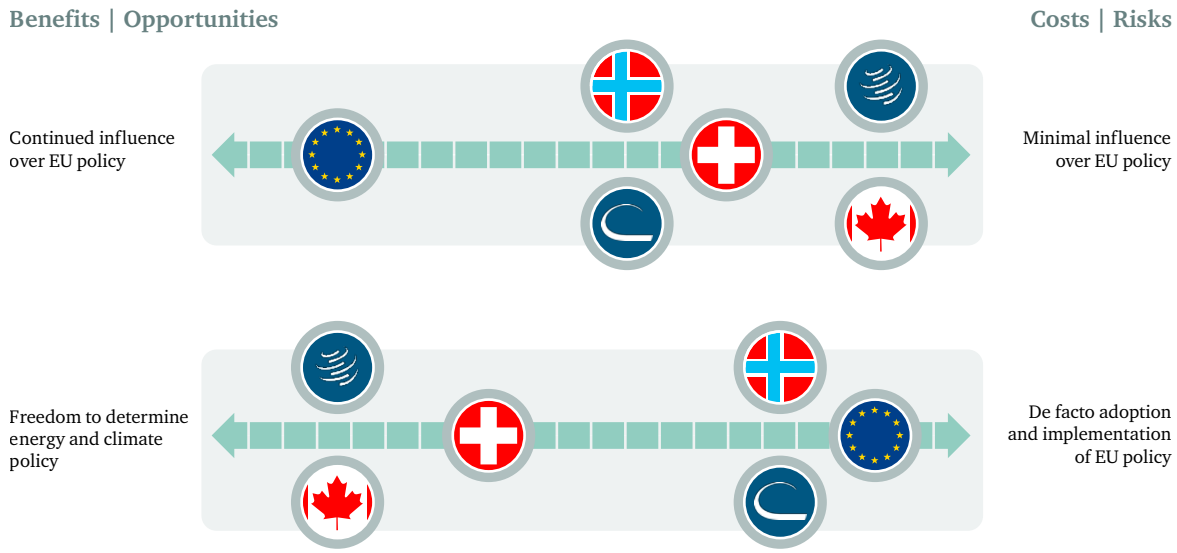
The Switzerland, the FTA/Canada and the no deal/WTO options all offer the possibility of greater sovereignty in a limited number of areas such as buildings and infrastructure standards, and would mean that the UK was no longer subject to EU state aid restrictions. However, all three models would entail higher risks, with greater uncertainty over market access and investment. Given declining North Sea production and the growing integration of gas and electricity markets, the country's high dependency on EU energy markets will continue. Whichever Brexit model is chosen, it will be neither possible nor desirable simply to 'unplug' the UK from Europe's energy markets.

It may be tempting to try to combine the best aspects of both the Norway and the FTA/Canada models, in the interests of achieving the continued certainty and market access afforded by the former along with the greater sovereignty and flexibility of the latter. However, the assessment in this paper shows that this reconciliation is not possible: a country cannot be a full member of the internal energy market yet not be subject to its rules.

Joining the Energy Community would potentially allow for continued market access in the energy sector without requiring EU or EEA membership. This could enable regulatory continuity and more limited disruption to the investment climate without the need for more politically challenging trade-offs over sensitive issues like freedom of movement. In this regard, Energy Community membership

represents a unique post-Brexit compromise for this sector. However, the Energy Community was set up to assist countries whose sectors were making the transition towards greater market orientation, and therefore membership may not be open to, or appropriate for, a highly developed economy and energy sector such as the UK's. This option could severely hamper Britain's ability to influence EU climate and energy policies, and would still be subject to the approval of other member states in the EU and probably the Energy Community.

Figure 11: Summary of Brexit vs Remain models for energy and climate change



All Brexit models would undermine the UK's influence in international energy and climate diplomacy. It would no longer directly shape the policies of its continental neighbours in these areas at a time when the EU's Energy Union initiatives offer the prospect of a deeper and more effective European energy market. The UK could also lose the benefits of being part of key energy security mechanisms such as the gas Early Warning Mechanism and the Gas Advisory Council, although it may be able to renegotiate its role in these agencies. A diminished EU, for its part, would be weaker in managing relationships with Russia, which already seeks to divide it and to negotiate bilateral energy deals with individual member states. The EU would also be less able to influence global climate negotiations alongside other major powers such as China and the United States, as it would represent a much smaller share of the global economy and of global emissions. This would not serve the long-term interests of either the UK or the EU. At a broad level, in the energy and climate sector, leaving the EU presents a choice between continued influence over collective policy on the one hand, and greater freedom to determine an independent policy on the other (see Figure 11).

Energy and climate issues are not among the principal concerns of voters during the referendum campaign, although both areas could acquire greater importance for citizens in the event of either rising energy prices or an increased desire to see the UK respond to the domestic impacts of climate change. The UK has a proven record of success in shaping the EU agenda to suit its own priorities, especially with regard to market liberalization and competition. It is clear from this assessment that a decision in June to remain in the EU would enable the UK to maintain and potentially build on this influence. A vote to remain would also send the strongest signals in terms of investor confidence and market access. A vote to leave the EU could cause the UK to lose rather than gain

influence over its future energy options, and the resulting uncertainty would also have an impact on urgently needed energy investment decisions. All available future models demand trade-offs, but in the field of energy and climate change remaining in the EU offers the best balance of policy options for British national interests.

About the Authors

Antony Froggatt is a senior research fellow at Chatham House, specializing in global energy security and environmental policy. He has worked as an independent consultant for 15 years with environmental groups, academics and public bodies in Europe and Asia, and as a freelance journalist.

Thomas Raines is a research fellow at Chatham House, where he manages the Europe Programme. Previously, he worked as an analyst in the Strategy Unit of the Foreign & Commonwealth Office in London. His research interests lie in the UK's relationship with the EU, British foreign policy, and public attitudes to international affairs.

Shane Tomlinson was a senior research fellow at Chatham House until May 2016, where he worked on energy, climate and resource governance issues. He took up a new role as a senior associate at E3G in May 2016. He has written extensively on innovation and technology transfer, low-carbon development, and EU, US and China relations.

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Cover image: A line of electricity pylons stretches beyond fields of rapeseed near Hutton Rudby, North Yorkshire, on 27 April 2015.

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The Royal Institute of International Affairs
Chatham House
10 St James's Square, London SW1Y 4LE
T +44 (0)20 7957 5700 F +44 (0)20 7957 5710
contact@chathamhouse.org www.chathamhouse.org

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