

ENERGY POLICIES OF IEA COUNTRIES

United Kingdom

2019 Review

Executive
Summary



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Energy Agency
Secure
Sustainable
Together

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INTERNATIONAL ENERGY AGENCY

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1. Executive summary

The energy policy of the United Kingdom has undergone a major transformation during the seven years since the International Energy Agency (IEA) presented its previous in-depth review (IDR) in 2012. The government has continued its leadership on climate action, implemented the Electricity Market Reform (EMR), and strengthened policies for security of supply. The Industrial Strategy and Clean Growth Strategy, presented by the new Department for Business, Energy and Industrial Strategy (BEIS) progress the energy policy ambitions of the UK towards decarbonising heat and electrifying transport, while delivering both growth in technology development and innovation and improvements in domestic energy efficiency across the economy.

This IDR illustrates the lessons learned from the United Kingdom's energy transition, which can be instructive for many countries' low-carbon transitions. For this review, the government asked the IEA to assess the framework for climate action and the cost-effectiveness of climate measures, notably in the transport and heat sectors, as well as the experience from the EMR in the context of the fast transformation of the energy system and the need to ensure clean, affordable, and secure energy.

Energy system transformation

The United Kingdom has led the way in the transition to a low-carbon economy by taking ambitious climate action at international and national levels. These efforts are consistent with its goal to reduce greenhouse gas (GHG) emissions by at least 80% by 2050 from 1990 levels, as defined under the 2008 Climate Change Act. In 2016, the government adopted the fifth carbon budget (for the period 2028-32), which targets a 57% reduction in GHG emissions relative to 1990 levels. To move the energy system towards this goal, the United Kingdom's Clean Growth Strategy, of 2017 sets out policies and government funding of British pounds (GBP) 2.5 billion for innovation and low-carbon investment up to 2021. Together with Canada, the United Kingdom launched the Powering Past Coal Alliance: to date a total of 30 countries, 22 subnational states and 28 businesses have joined the Alliance, which commits them to the rapid phase out of unabated coal.

The country's energy system has seen a very rapid growth in the share of low-carbon energy, which accounted for over 50% of the electricity mix in 2017: natural gas (41%), nuclear (21%), wind (15%, up from 3% in 2010), solar (3%), bioenergy and waste (11%), coal with 7% (down from 29% in 2010) and hydro (2%). The United Kingdom has committed to phasing out all remaining unabated coal-fired power generation by 2025. UK energy-related CO₂ emissions have declined by 35% on 1990 levels, and total GHGs are down by 40%, reaching some of the lowest levels recorded since 1888. Power and heat, which were once the number one source of energy-related CO₂ emissions in the United Kingdom, have declined significantly (to 25% of the total) and are now far below those of transport (34%).

As the United Kingdom has set the power sector well on the path to decarbonisation, the government is focusing on transport, buildings, industry, and heat. The Carbon Price Support (CPS) policy demonstrates how suitable price signals can help accelerate the transition towards a lower carbon intensive energy use. Carbon pricing applies to electricity (with the Carbon Price Floor (CPF)), industry is exempt if they implement energy efficiency agreements).

The Clean Growth Strategy does not set quantitative emissions targets for the sectors under the fifth carbon budget, but it sets a comprehensive list of policy actions and funding programmes. The United Kingdom met the first and second carbon budgets with headroom and is projected to meet the third one. In its 2018 review of the Strategy, the independent Climate Change Commission, however, warns of a delivery risk for the fourth carbon budget and a policy gap between the current policies and the ambitions under the fifth carbon budget.

Special focus 1: The cost-effectiveness of climate measures

In common with many countries, the decarbonisation of transport and heat brings with it questions as to the potential for energy efficiency, electrification, the direct use of renewables, a change in consumer behaviour, and the relative cost-effectiveness of different measures. As the power sector continues to decarbonise with growing shares of wind and solar, opportunities to electrify heat and transport are expected to increase.

In 2016, 85% of UK dwellings had gas central heating, 6% of heat demand was met from renewables, and less than 2% from district heating. The UK Boiler Plus policy has increased the energy efficiency of existing gas heaters and the Renewable Heat Incentive promoted a range of alternative technologies with 65 000 residential renewable heat installations. However, the rate of adoption to date suggests that barriers remain. The new government mission to “at least halve the energy use of new buildings by 2030” sets out policies and funding programmes aimed to improve the energy efficiency of existing buildings. Improved energy performance in buildings may benefit from making more explicit linkages and synergies between energy efficiency, electrification, and renewable heat deployment.

Transport is the second-largest energy-consuming sector and, as in all countries, still holds significant potential for GHG emission reductions (shipping, rail, and aviation) and energy efficiency gains. The United Kingdom plans to end the sale of new conventional petrol and diesel cars and vans by 2040, which would facilitate an accelerated roll-out of low-emission vehicles, such as electric vehicles (EVs). In 2017, EVs accounted for around 2% of new car sales in the United Kingdom. The government has created the Office for Low Emission Vehicles, an excellent opportunity to bring together the efforts of BEIS and the Department for Transport.

The energy intensity of the UK economy has dropped significantly over time (it has the third-lowest total final energy consumption (TFC) per GDP among IEA countries) as has its actual final energy use (TFC has declined by 10% over the past decade). The United Kingdom has led the design of energy efficiency policies through energy supplier obligations and voluntary agreements with industry, which have been upgraded over time. The United Kingdom now has 12 million smart and advanced meters, which are expected to take GBP 300 million off domestic consumer bills by 2020. The wide range of UK energy efficiency policies and programmes are evidently yielding results, and may

yield yet more if pulled together into a unifying, coordinated framework for energy efficiency policies and programmes.

The government seeks to increase general research and development (R&D) spending to 2.4% of the gross domestic product (GDP) by 2027, with public R&D investment to reach GBP 12.5 billion in 2021-22, and a cumulative total of up to GBP 80 billion over the next ten years. Programmes for nuclear power and carbon capture and storage, both essential for long-term global decarbonisation, continue to be progressed in the United Kingdom, despite earlier setbacks. The government established a carbon capture, usage, and storage (CCUS) Cost Challenge Taskforce to provide advice on the steps needed to reduce the cost of deploying CCUS in the United Kingdom, and its leadership in this area could prove to be a valuable input to global efforts in CCUS cost reductions and commercialisation. In November 2018, the government published its CCUS Action Plan, which set out a new approach for industry and government to enable the development of the first CCUS facility in the UK, commissioning from the mid-2020s, to achieve the government's ambition to have the option to deploy CCUS at scale during the 2030s, subject to costs coming down sufficiently. The government has stepped up the coordination and funding under the new Energy Innovation Board, in line with its commitments under Mission Innovation (MI) and the Clean Energy Ministerial. The United Kingdom's leadership of global innovation efforts, such as MI, is commendable. At home, the Clean Growth Grand Challenge of the Industrial Strategy is an opportunity to deliver concrete missions in areas where the United Kingdom faces the most acute decarbonisation challenges – the mission on energy use in buildings is a welcome recognition of this.

Special focus 2: The Electricity Market Reform

The EMR of 2013 was conceived as a series of targeted interventions to manage the transition to a decarbonised electricity market. The EMR supplemented the energy-only market with a new design that included the Great Britain capacity market (GB CM), contracts for difference (CFD) for low-carbon electricity, a carbon price floor (CPF) of GBP 18.08 per tonne of carbon dioxide, and an emissions performance standard (EPS) of 450 g/tCO₂. By 2018, BEIS and the Office of Gas and Electricity Markets (Ofgem) had further adapted and improved these policies.

The EMR started out as a supply-side reform, but brought about encouraging lessons for the power sector transition – the benefit of market approaches and competition (competitive auctions) and the need for flexible regulations that can be adapted to fast technology developments, which include the benefits of taxation to drive the decarbonisation.

The CFDs provided revenue certainty and led to a boom in renewable investment through competitive allocation. Although the government initially set an administered strike price, competitive auctions have since become the standard approach and are an important mechanism to ensure competitive pricing (which has brought significant cost reductions) and benefit from lower costs of capital and risk to investors. The government announced that auctions will be run every two years after Auction Round 3. □ Depending on auction prices and eligibility criteria, BEIS expects the delivery of between 1 and 2 gigawatts (GW) of new offshore wind capacity every year in the 2020s, provided costs continue to fall, which will result in 10 GW of new offshore wind capacity built in the 2020s. To maintain the attractiveness for renewable investment in the United Kingdom,

the government needs to adopt a timetable for the auctions for established and non-established technologies.

CPF underpinned the value of carbon in the power sector to supplement the EU Emissions Trading System (and protect against its volatility) and was able to drive coal-to-gas switching, whereas the EPS constrained the prospects for new coal power plants. The government recently confirmed that the CPF will stay at its current level until 2021. However, there is a lack of visibility about the future level and scope of the UK carbon pricing beyond this date and, as the power sector becomes decarbonised, the role of carbon pricing should be reviewed.

The Great Britain CM places a value on security of supply through a market-wide auction process, which has brought down prices. Contrary to initial expectations, the CM encouraged mainly capacity remunerations for existing plants, smaller-scale new-build plants and often flexibility sources and innovative technologies. Lessons have been learned from the early CM auctions which have been an effective discovery tool for the cost of energy storage, demand-side response, and new interconnectors. In fact, the latter dominate the new capacity committed under the CM.

Investment in new nuclear power is currently below the United Kingdom's target of 16 GW of new nuclear capacity by 2030, with only one project, Hinkley Point C (HPC), of 3.2 GW underway as several other projects were put on hold. Based on a CFD with an administered price of GBP 92 per megawatt hour (MWh), HPC is a welcome step but it is not sufficient to carry the momentum of the UK nuclear development towards an internationally competitive UK supply chain or to achieve cost reductions. The Nuclear Sector Strategy and the Nuclear Sector Deal are positive efforts made by the government in 2018 to build a stronger case for new nuclear development.

The EMR “legacy costs” of the support for low-carbon deployment that arise from administratively set prices for the Renewable Obligation and early CFDs were judged to be high, according to the independent cost of energy review led by Professor Dieter Helm. In his review, Helm called for a simplification of the EMR towards one firm power auction, an economy-wide carbon price, and competition in the networks. The inquiry of the Competition and Markets Authority of 2014-16 also found that the retail market was not delivering efficient outcomes for consumers.

To remedy rising electricity prices, in 2018, the government introduced a temporary retail price cap on default tariffs that entered into force on 1 January 2019, brining the total amount of consumers under regulated price caps up to 11 million in 2019. However, the IEA finds that price caps can risk distorting in the market, with business charging up to the cap and consumers becoming less active. Even if a temporary measure, a clear exit strategy is important, based on a solid and regular assessment of the retail and wholesale market performance. The government is aware of these issues and a major review by BEIS and Ofgem is going to look at options to make the retail market fit for the future. Equally, Ofgem's standards and code review will be an opportunity to ensure a level playing field for all the market participants, incumbents, and new entrants.

Special focus 3: Maintaining energy security

The United Kingdom has a strong focus on energy security and continues to maintain robust policies and market-based approaches, based on collaboration with industry. The government created the independent Oil and Gas Authority, charged with the

implementation of a strategy for the maximisation of the economic recovery (MER). UK continental shelf production increased by 16% from 2014 with the unit operating costs halved because of the new fiscal regime and a tax relief for decommissioning. Although domestic oil and gas production has fallen since the last IDR in 2010, thanks to the MER strategy and major cost-cutting efforts by industry, a reversal and increase in production was achieved in recent years.

United Kingdom's security of gas supply remains strong – the United Kingdom has a liquid gas market, robust infrastructure, and a diverse supply from domestic production, liquefied natural gas, and pipeline imports. Price signals are used to ensure flexibility, to cover potential shortages, and to allow gas to flow to the United Kingdom. The gas emergency preparedness proved robust at the end of February 2018 during a period of cold weather (referred to as the “Beast from the East”), despite the closure of Rough storage, previously the largest in the country. The first gas deficit warning by National Grid Gas System Operator (NGGSO) since 2012 provoked the appropriate market responses. Amid the expectation that domestic gas production is likely to decline in the North Sea region over the long term, and the high share of natural gas in power generation, the security of gas supply has to be kept under review, with the coordination of gas and power emergencies by NG, as the power mix becomes more variable.

Oil security continues to be robust and the United Kingdom remains well supplied. The United Kingdom became a net importer of refined oil products in 2013. Supply sources are well diversified, which reduces the potential impact of a supply disruption. In 2018, the country held oil stocks at a level of 238 days of net imports (all of which are industry stocks), one-third of its stocks abroad, all much above the IEA's required minimum of 90 days. As North Sea oil production decreases, net imports are set to rise significantly in the short-to-medium term. UK stockholding obligations are expected to rise in step, which will require the monitoring and assessment of the adequacy of storage capacity.

The power system of the United Kingdom will experience a major renewal in the next ten years with the final phase out of remaining coal-fired capacity and the closure of the oldest nuclear reactors (half of the total capacity of 8.9 GW) by 2025, with another six reactors closing by 2030. Electricity security has been a priority for the government, which sets the reliability standard (loss of load expectation of 3 hours per year or a 5% capacity margin), based on the forecasts of NG, to determine the needs in the GB CM. The power system is moving towards high shares of variable renewables and a lower baseload, so interconnections will continue to be an important source of flexibility, encouraged by the CM and Ofgem's cap and trade regime. The government's review of the reliability standard and of the CM should ensure market rules support this energy system transformation, in line with digitalisation of the electricity supply, better energy efficiency, and the BEIS/Ofgem Smart Systems and Flexibility Plan.

The United Kingdom's Energy Resilience work is exemplary, with a National Security Risk Assessment conducted every two years, contingency planning, and exercises, which feed into annual Sector Security and Resilience Plans across the energy sector.

In 2019, uncertainty remains over the timing and format of the UK exit of the European Union (Brexit). Its impact on the energy market and the rules applicable in the UK may undermine investment and open trade. The government is encouraged to ensure that open and efficient trade and their benefits for security of supply of the UK are maintained.

Key recommendations

The UK government should:

- Streamline and adjust the regulatory framework for electricity markets by removing barriers to efficient wholesale and retail market pricing and outcomes, with a view to take full advantage of innovation and competition, while boosting decarbonisation through cost-effective measures.
- Ensure fiscal policies continue to support the achievement of the United Kingdom's decarbonisation targets, particularly as the focus shifts to sectors such as transport and heat.
- Capture the various aspects of energy efficiency policy within a single dedicated energy efficiency strategy to provide for a greater visibility of government action and a more integrated and coordinated framework, aligned with a flexible and smart energy system.
- Continue to lead international energy R&D collaboration and efforts to scale-up energy technology innovation under Mission Innovation and other fora, including nuclear power and CCUS.
- Maintain open, free and efficient energy trade over different timeframes to safeguard the benefits for the flexibility and security of the United Kingdom energy system. Continue efforts to ensure that exiting the European Union and the EURATOM treaty will not impact trade or the supply chain, notably in the United Kingdom nuclear sector.

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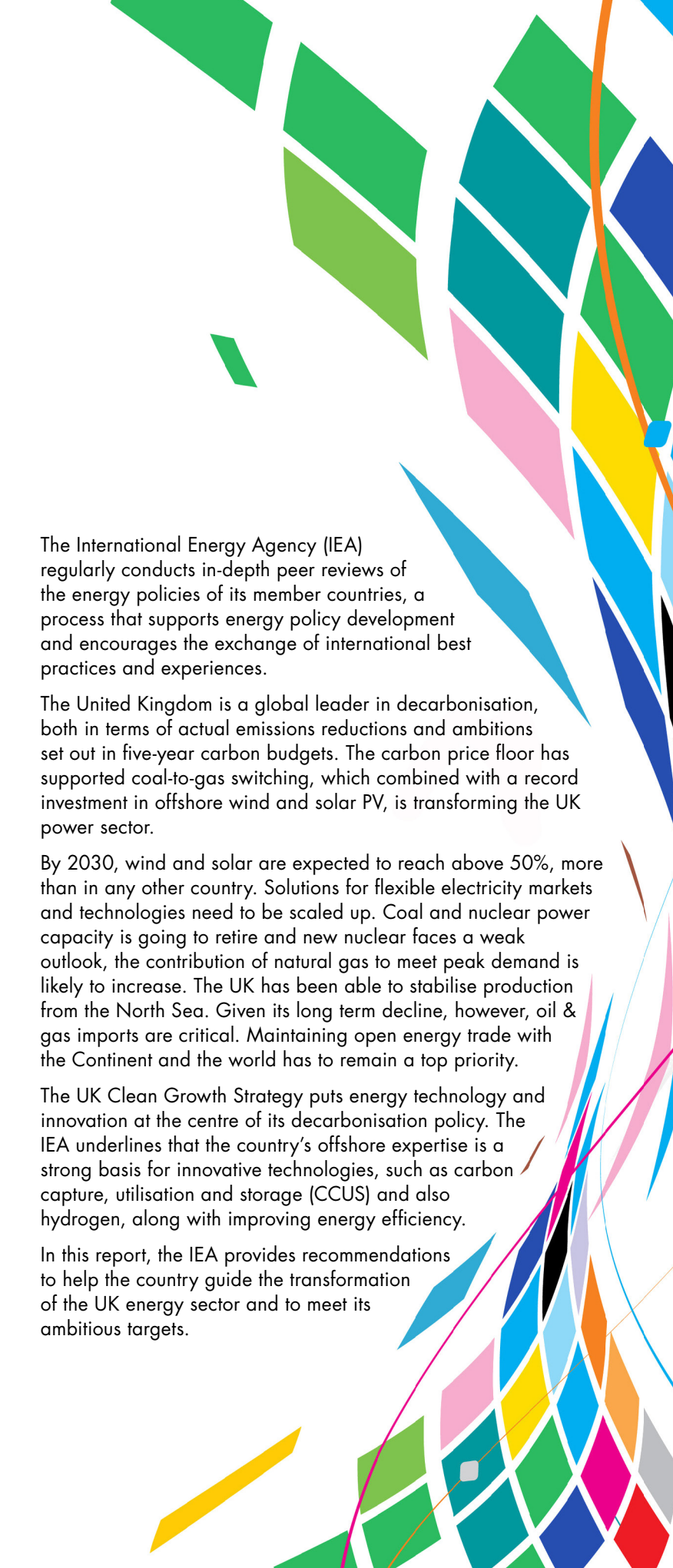
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The International Energy Agency (IEA) regularly conducts in-depth peer reviews of the energy policies of its member countries, a process that supports energy policy development and encourages the exchange of international best practices and experiences.

The United Kingdom is a global leader in decarbonisation, both in terms of actual emissions reductions and ambitions set out in five-year carbon budgets. The carbon price floor has supported coal-to-gas switching, which combined with a record investment in offshore wind and solar PV, is transforming the UK power sector.

By 2030, wind and solar are expected to reach above 50%, more than in any other country. Solutions for flexible electricity markets and technologies need to be scaled up. Coal and nuclear power capacity is going to retire and new nuclear faces a weak outlook, the contribution of natural gas to meet peak demand is likely to increase. The UK has been able to stabilise production from the North Sea. Given its long term decline, however, oil & gas imports are critical. Maintaining open energy trade with the Continent and the world has to remain a top priority.

The UK Clean Growth Strategy puts energy technology and innovation at the centre of its decarbonisation policy. The IEA underlines that the country's offshore expertise is a strong basis for innovative technologies, such as carbon capture, utilisation and storage (CCUS) and also hydrogen, along with improving energy efficiency.

In this report, the IEA provides recommendations to help the country guide the transformation of the UK energy sector and to meet its ambitious targets.