

Energy toolkit



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Fun facts: did you know?

- The UK is the **windiest country in Europe** with about 40% of the total wind that blows across Europe
- **Renewable energy sources** generated **38% of global electricity** in 2021¹
- The electricity pylon was designed by British architect Sir Reginald Bloomfield. The first to be erected was at Bonnyfield in Scotland in 1928
- One rotation of GE's Haliade-X turbine at Dogger Bank can power a UK household for two days
- May 25, 2022 holds the record for the **maximum amount of wind power generation**, at 19.9GW² (to date)
- In 2020 the UK saw its **longest run of coal-free power** – a total of 68 days – and since the industrial revolution³
- If 2030 hydrogen targets are met, as set out in the 10-point plan, the level of hydrogen production could be equivalent to the amount of gas consumed by over 3 million households in the UK each year⁴

¹Earth.org

²National Grid

³National Grid

⁴Leicester & Leicestershire Enterprise Partnership (LLEP)

⁵Sustainable Gas Institute, Imperial College London

⁶North Sea Transition Deal, gov.uk (Mar 2022)



Introduction



The **future of energy** has never been as hotly debated as it is now, and it has become a global concern. Climate change and the need to remove harmful emissions from the earth’s atmosphere, along with extreme weather events, diminishing resources, and volatile global gas prices have created a perfect storm.

With its track record in research, manufacturing and innovation the UK is ready to meet future energy needs and challenges. Two centuries ago the UK led the **world’s first Industrial Revolution** (powered by coal), which gave birth to many of our great cities. In 1935 we launched the **National Grid** – the first of its type in the world – and in 2001 we established the world’s first offshore floating wind farm, the 30MW Hywind Scotland Pilot Park.

From cotton looms and the steam engine to the early adoption of wind technology, and research into fusion energy, the UK has been at the vanguard, and enters the next chapter on a firm footing.

Over the last three decades we have shown that **economic success and environmental responsibility** go hand in hand. Our low-carbon industries already support over 460,000 jobs – from electric vehicle manufacturing in the Midlands and the North East, to our thriving offshore wind industry centred on the Humber and the Tees. Engineers, fitters and construction workers are engaged in harnessing British science and technology to create and use clean energy and forge new industries that export to upcoming markets around the world.

A global reputation for innovation is strengthened by partnerships with educational institutions. The UK is home to **three of the world’s top universities for**

engineering and has a variety of organisations, such as the Institution of Civil Engineers, that facilitate networking and help to stimulate both technical and practical knowledge. Through research and development UK universities, in partnership with industry, are pioneering the transformation of the energy sector towards net zero.

Led by professor Adam Hawkes, the **Sustainable Gas Institute (SGI)** was created in 2014 by Imperial College London, to provide leadership and interdisciplinary analysis on the role of natural gas, hydrogen and biogas in future low-carbon energy systems.⁵ In 2019, the UK became the first major economy to adopt a legally binding obligation to **reach net-zero greenhouse gas emissions by 2050**. By harnessing our natural assets and investing in clean technologies such as wind and wave energy, and carbon capture, the country will develop resilient supply chains, support thousands of jobs and lead the world into a new “green” Industrial Revolution.

The **North Sea Transition Deal (NSTD)**, which will see investment in new energy technologies of between £14bn and £16bn, is an indication of how the UK government is helping the oil and gas industry explore opportunities in cleaner energy. By 2030, supported by business models, the NSTD this will enable Carbon Capture, Utilisation and Storage (CCUS) and the production of hydrogen at a large scale.⁶

Driving the **growth of low-carbon hydrogen** is paramount to the UK’s future energy policies. The government will support the commercial deployment of new low-carbon hydrogen production projects. The **Net Zero Hydrogen Fund (NZHF)** launched in

2022 is worth up to £240m. £7.5m has been awarded to **Gigastack** - the UK’s flagship renewable energy project - and up to £100m of revenue is being allocated to support initial electrolytic projects.⁷

Ambitious targets and the deployment of new technologies will continue to drive investment and innovation. By 2030 it is expected that wind will be the UK’s second largest sub-sector after **turbine supply**, presenting investors with a £1.3bn per year opportunity. Opportunities for investment abound off the coast, where shallow sea beds and high average wind speeds have helped make the UK a leader in the offshore wind field and a pioneer in the development of floating offshore wind structures. It is estimated that wave and tidal stream energy combined has the potential to deliver around 20% of the UK’s current electricity needs. This equates to an installed capacity of between 30 – 50GW.⁸

According to the technology, innovation and research centre the Offshore Renewable Energy Catapult, the UK **offshore wind operations and maintenance (O&M)** market will grow faster in relative terms than any other offshore wind sub-sector market over the next decade. In fact, by 2030 it is expected that O&M will be the UK’s second largest sub-sector after turbine supply, with the potential to generate £1.3bn annually.⁹

Nuclear power, which is a key part of the UK’s energy mix, provides a reliable source of low-carbon electricity. Drawing on 60 years’ experience power companies have extensive knowledge of the full nuclear life cycle, from front-end design through to decommissioning. Advanced nuclear technologies could also have a role in “beyond the grid” applications such as low carbon hydrogen, synthetic

fuel production and heat for industrial or domestic uses and will help deliver “deep decarbonisation” of the UK’s energy system.

The UK has also negotiated association with the **European Atomic Energy Community**, for the trade in nuclear materials, and continued participation in the International Thermonuclear Experimental Reactor (ITER) project. These signify potential global collaborative opportunities for companies in Oxfordshire and around the UK.

Investment opportunities are also available in UK **fusion energy** R&D. The government has already committed more than £400m towards new fusion programmes and aims to build a prototype commercial fusion power plant by 2040. The goal is to develop a concept design for the **Spherical Tokamak for Energy Production (STEP)** – expected to be the world’s first compact fusion power plant. In 2019, after years of relying on coal for energy, for the first time, more energy was generated from zero carbon sources than fossil fuels. The UK government’s commitment to build a strong, home-grown renewable energy sector means we are well on our way to meeting our 2050 zero-carbon target.¹⁰

⁷Net Zero Hydrogen Fund, gov.uk / Investment for energy technologies of the future, gov.uk

⁸Renewable UK

⁹Catapult

¹⁰National Grid

¹¹National Grid

¹²Tidal Energy and Wind Power in the UK, Green Match



Sector in Stats



- The UK is one of the world's **largest markets for offshore wind**, with more than 10GW of cumulative installed capacity across 38 sites
- The UK has seen up to **£320m in government support** for fixed bottom and floating **wind ports and infrastructure**
- Zero-carbon power in Britain's electricity mix grew from less than 20% in 2010 to nearly 50% in 2021¹¹
- A staggering **£4bn of investment** has flowed into the **UK zero-emission vehicle sector**.
- There are **30,425 public charge-points** in the UK with 100 new rapid chargers added to the UK network every month in 2021.
- Renewable UK has one thousand business working in wind, wave and tidal energy
- The **10 Point Plan for a Green Industrial Revolution** has generated 68,000 green jobs and £22bn in private investment
- The **UK's tidal power resource** is estimated to be more than **10 gigawatts (GW)**, representing about 50% of Europe's tidal energy capacity .centre outside the US¹²





Sub-sectors



Hydrogen

The UK has set a target of 10GW of **low-carbon hydrogen production** capacity countrywide, by 2030. A pioneering hydrogen heating trial, starting with a “Hydrogen Neighbourhood” and scaling up to a potential “Hydrogen Town” is expected by the end of the decade. Net-zero carbon industrial clusters will form green energy “Super Places,” helping to put the UK at the forefront of technological development.¹³

Low-carbon technologies could yield around 8,000 jobs across the country’s industrial heartlands and beyond. The sector will be supported by a range of measures, including the £240m Net Zero Hydrogen Fund.

Hydrogen is critical to decarbonising the UK, and its demand is estimated to reach 80 to 140 terawatt-hours in 2035.¹⁴ Investment in hydrogen could unlock significant benefits, such as meeting up to **50% of our energy demand by 2050**.¹⁵

Gigastack, the UK’s flagship industrial-scale renewable hydrogen project, will demonstrate that renewable hydrogen is essential to the decarbonisation of large industrial clusters. Accelerating the uptake of renewable hydrogen through Gigastack is vital and will facilitate the development of a UK renewable hydrogen technology hub as well as the creation of a world-leading supply chain and highly skilled jobs across the sector.

ZeroAvia are also true innovators in their field. Their hydrogen-electric powertrain will use renewably produced hydrogen and is being developed in the Cotswolds. This technology is zero-emission and will launch for 19-seat aircraft in 2024. By 2030, it could power 100-seat aircraft to fly 2,000 nautical miles.¹⁶

Home to some of the most ambitious and exciting projects and companies in the world, the increase in UK hydrogen production ambition has opened potential opportunities to export hydrogen from the UK at scale.

Offshore wind

Global offshore wind capital expenditure is estimated to be **worth £130bn by 2034** and the UK’s wind sector is growing exponentially as it seeks to meet future energy needs. With more than 10GW of cumulative installed capacity across 38 sites the UK is already one of the world’s largest markets for offshore wind. A further 5GW is in pre-construction stage, with plans for additional 11GW.

By 2030, the UK government plans to quadruple offshore wind capacity, which could help bring £20bn of private investment into renewable energy, bringing jobs and growth to the nation’s ports and coastal regions. The **British Energy Security Strategy (BESS)**, published in April 2022, targets 40GW of additional offshore wind by 2030 (bringing the UK total to 50GW). 5GW will be generated by floating wind technologies.

Coordinated offshore wind connections could help deliver up to **£6bn in consumer savings by 2050**.

Nuclear power

According to the Department for Business, Energy and Industrial Strategy (BEIS), nuclear power plants generate **18.3% of the UK’s electricity**.¹⁷ Fusion could be the ultimate clean-power solution, representing a low-carbon, safe, continuous and sustainable source of energy.

The UK’s electricity system could double in size by 2050, as **demand for low-carbon electricity** in sectors like heat, and transport rises. **Nuclear power** provides a reliable source of low-carbon electricity and with the advent of advanced nuclear technologies and nuclear power could also have a role in ‘beyond the grid’ applications such as low carbon hydrogen, synthetic fuel production and heat for industrial or domestic uses.¹⁸

The UK government has also recently committed £220m to develop the world-leading STEP (spherical tokamak for energy production) programme, in order to build a **prototype fusion power plant in the UK by 2040**.

Transition fuels

From clean growth to technological development, the UK provides a range of market opportunities for international business.

The Department for Business, Energy and Industrial Strategy (BEIS) awarded £49.4m of funding with the aim of reducing the UK’s reliance on fossil fuels and drive economic growth.¹⁹ Feasibility studies into **fuel switching solutions** are also being conducted, with the focus on switching from high carbon fuels to hydrogen, electrification, biomass and wastes.

By 2045, global demand for oil is also expected to rise to 108.2 million barrels per day (bpd). From the extraction in oil and gas to innovations in **cleaner energy** and production there are a wide range of opportunities in the Transitions sector. Oil and gas companies can capitalise on the UK’s resource endowment, and expertise, to take advantage of anticipated global demand. Leading French energy company Engie, Texas-based Exxon Mobil and Saudi Aramco have already benefited from UK expertise, business and government support.²⁰

There are emerging opportunities in the delivery of **green gases**, such as biogas, biomethane and renewable hydrogen. The government supports these through the Green Gas Support Scheme (GGSS). The scheme provides financial incentives for new anaerobic digestion biomethane plants for the purpose of increasing the proportion of green gas in the gas grid.

¹³Hydrogen strategy, gov.uk (Dec 2022)

¹⁴Hydrogen, great.gov.uk

¹⁵Hydrogen UK

¹⁶Hydrogen UK

¹⁷Civil nuclear, great.gov.uk

¹⁸Industrial decarbonisation strategy, gov.uk

¹⁹Energy Transition, Osborne Clarke

²⁰Transition fuels, great.gov.uk



Sub-sectors



Tidal energy

Another powerful and renewable source of energy with great potential is **tidal energy**. Given the predictability of tides, it has the potential to be a very reliable source of power generation. The Government estimates that wave and tidal stream energy combined has the potential to deliver around **20% of the UK's current electricity needs**, which equates to an installed capacity of around 30 – 50GW²¹. In November 2021 it announced a cash injection of £20m per year in Tidal Stream electricity as part of its flagship renewable energy auction scheme.²²

The [Hendry Review](#) also sets out a compelling case for ground-breaking tidal lagoon technology to harness the UK's tidal range resource and the opportunity for investment in domestic tidal lagoon infrastructure.²³

Solar

Solar photovoltaic energy (PV) is an abundant and free resource. There is currently 14GW of solar capacity in the UK split between large scale projects and smaller-scale rooftop solar. A five-fold increase in deployment (70GW) is expected by 2035,²⁴ enabling a bigger and better solar industry.

Electricity produced from renewable sources – such as solar power – varies with the time of day, and the weather. When surplus electricity is produced, it is stored in order to keep costs low, reduce carbon emissions, and maintain a steady supply of electricity. This capacity to store and release heat

and power when it is needed is what will help the UK deliver **carbon-free energy** for all.

For ground-mounted solar, the government will consult on amending planning rules to strengthen policy in favour of development on non-protected land, while ensuring communities continue to have a say.

Solar parks can also help produce the power needed to support the UK's electricity system. In May 2020, along with other forms of solar power, solar parks helped the UK meet more than 11% of its entire electricity demand, and contributed to a record period of coal-free generation.²⁵

As well as helping to reduce the UK's carbon emissions, solar power can deliver local environmental benefits. The work carried out as part of the installation and management of a solar park can increase biodiversity on site, support water management and flood prevention, and regulate soil quality.

New performance standards under development will make the installation of renewables, including solar PV, the presumption in new homes and buildings.²⁶

²¹Wave and tidal Energy, gov.uk
²²UK government announces biggest investment into Britain's tidal power, gov.uk
²³Tidal Energy and Wind Power in the UK, Green Match



**Any
questions?**

Visit our corporate website at www.visitbritain.org
Or contact VisitBritain Business Events team at
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