

UK Renewable Capabilities

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BRITAIN & NORTHERN IRELAND



Energy Storage

Elevator pitch

With a well-established and highly reliable national grid, coupled with a long-standing commitment to the increased use of renewable energy, the UK has a wealth of expertise and experience in making electrical networks work efficiently and effectively.

In this context, energy storage is a broad descriptor for technologies that can support the management of electrical networks, particularly those with intermittent renewables (think solar / wind). Storage technologies absorb and store energy for release back into the network at a later time (hours / days / weeks).

They can also provide ancillary services (e.g. frequency management), which help with system stability. These technologies can be deployed at different scales on a distributed and/or a centralised basis, in traditional or mini/off-grid setups. Some are mature (think batteries) whilst others are still in development (think fly-wheels). The UK's general electrical network management expertise makes us adept at integrating storage effectively into a system setup. We also have a number of technology providers (hydrogen, liquid air, etc.) and make much of the required supporting equipment, though we don't currently have a world-leading offer in battery manufacture.

Key points / messages:

The UK excels at:

- ✓ Development and delivery of fully integrated, grid scale energy storage systems;
- ✓ Technical Services, with expertise in Energy Storage Solution Analysis;
- ✓ Consultancy - including all aspects of implementation of Storage Solutions into networks with renewable technology content;
- ✓ General design, engineering and construction services applicable to all major types of Energy Storage technologies;
- ✓ Protection and Control System software for Energy Storage systems that interfaces with existing control system protocols and SCADA systems.

The UK can also do:

- ✓ The development and management of 'smart' solutions that can integrate both off grid and mini grid technologies with the design interface to the appropriate energy storage solution(s)
- ✓ Financial support for Energy Storage companies trying to establish themselves into the export market.
- ✓ The capability to deliver fully integrated Grid Scale Energy Storage solutions.

Solar

Elevator Pitch

- Solar is a well-proven and low cost solution to providing clean energy. When coupled with storage, it can remove the need for expensive grid upgrade and infrastructure.
- The UK has a number of experienced developers that can deliver projects at all scales, with expertise in niche panels and the design / installation of off-grid systems
- With the ability to quickly leverage green finance in London and with access to UKEF services, the UK solar proposition is a good one.

Solar is power derived from the sun and now represents the cheapest form of renewable energy generation available. Solar is highly scalable, ranging from a single photovoltaic panel through to fields of panels for grid-scale projects.

The UK has a large installed capacity of solar and is a world leader in the research and development of new and more efficient solar technologies. It's helpful to think of solar projects at three scales: Large, medium and small. UK export value in 'large' (grid) scale projects will be low - margins are tight and developers tend to draw their componentry from outside the UK - but Overseas Direct Investment potential is high, with UK developers owning and operating projects around the world. 'Medium' is about giving businesses cheaper off-grid power, often integrating solar with other generation technologies and storage.



The expertise required to do this successfully is a UK strength; export potential will be higher and the project itself another ODI proposition. Small scale can be thought of as residential rooftop. In developing markets this might be rolled out at village / town scale and would therefore be comparable with medium scale. In developed markets, this is more often done on an individual basis. The main UK value propositions for solar are in ODI for large scale projects and export in medium scale projects.

Key points / messages:



The UK excels at:

- ✓ Designing and implementing the policy and incentive structure required to make Solar facilities economically viable;
- ✓ The development, delivery and ownership / operation of large, grid scale solar projects (ODI proposition);
- ✓ The development, delivery and ownership / operation of medium scale solar projects (ODI proposition), integrated hybrid solutions with energy storage and mini grid management;
- ✓ The development, delivery and ownership / operation of medium scale solar projects (ODI proposition), solutions integrated into construction products and building processes;
- ✓ General design, engineering and construction services applicable to all types of Solar facility

The UK can also do:

- ✓ Balance of plant including Inverters, cables, panel frames and Bespoke BIPV panels (roof tile effect, architectural panels)

The UK doesn't do:

- ✗ Standard solar panels

Geothermal

Sales pitch

- The world continues to search for energy sources that don't pump more greenhouse gases into the atmosphere, and of those that have been found few can offer genuine baseload power at scale. Deep Geothermal can and has much of the flexibility of a gas power plant. Given a good geological resource it is also cost-competitive with fossil fuel power. Geothermal power stations have very long lifetimes.
- Geothermal can also provide cost effective heat on an industrial scale for buildings and can be deployed in urban areas. This is something few 'green' heating sources can do.

Geothermal harnesses the vast amount of heat that occurs naturally deep underground. This technology should not be confused with ground source heat pumps, which operate near the surface and are often referred to as 'shallow geothermal energy'. Deep geothermal plants require either a hot water aquifer or 'hot rocks' beneath the drilling location, and are thus highly dependent on local geology. Note that non-volcanic areas may be suitable (e.g. Paris has 40+ successful geothermal heat plants). The UK has five companies capable of developing geothermal internationally - Hotspur Geothermal, GT Energy, EGS Energy, Geothermal Engineering and Green Energy Geothermal (GEG), but the UK supply chain is limited.

There are broadly two types of geothermal plant: direct heat systems supplying large heat customers such as district heating networks, and power plants that use steam-driven turbines to produce electricity. The latter often use deeper boreholes - up to 5 km - and are more complex and more expensive overall (a 20 MW geothermal power plant represents an investment of roughly \$80-100 million). Unlike most renewable energy technologies, geothermal plants can meet continuous base load demands. Because of their small footprint they can be sited in urban areas (e.g. the UK's only example is close to Southampton rail station).



Key points / messages:

The UK excels at:

- ✓ Exploration including geological surveys and drilling, design maintenance and operation of plant
- ✓ Designing and implementing the policy and incentive structure required to make Geothermal facilities economically viable
- ✓ Smaller scale 'well head' turbines (CEG specialise in these)
- ✓ General design, engineering and construction services applicable to all types of Geothermal facility

The UK can also do:

- ✓ District heating design and development

The UK doesn't do:

- ✗ Large scale geothermal turbine manufacture



Energy from Waste

Elevator pitch

- With the right policy frameworks and incentives, waste can be a valuable commodity, producing energy in the form of heat, electricity and biofuels.
- The UK has significant expertise in designing and implementing appropriate frameworks and incentives schemes, as well as designing and delivering many forms of EfW facility, along with surrounding infrastructure.

Energy from waste covers a range of technologies and processes that turn waste products into energy. This can range from simply burning rubbish in a power station to power a turbine and generate electricity, to more complex processes like anaerobic digestion, which generates useful gases such as methane, or advanced conversion technologies (ACTs) - like gasification and pyrolysis - that produce syngas for use in the production of power, heat, renewable transport fuels or green chemicals.

For EfW to be effective, the supporting waste collection and management infrastructure must be set up correctly and incentives must drive behaviour accordingly. Strong national and local policies are required to discourage landfill or dumping and support proper collection and separation of waste. The commercial model can be based on waste treatment (cost vs. landfill) and/or selling the produced product (e.g. the power generated).

The UK has expertise in EfW across the supply chain, but is not a world leader or the cheapest supplier of equipment. Our main expertise lies in establishing the required waste management framework and incentives, design, engineering and construction. We also have world leading expertise specifically in anaerobic digestion and ACTs, which are both complicated processes and difficult to get right.



Key points / messages:

The UK excels at:

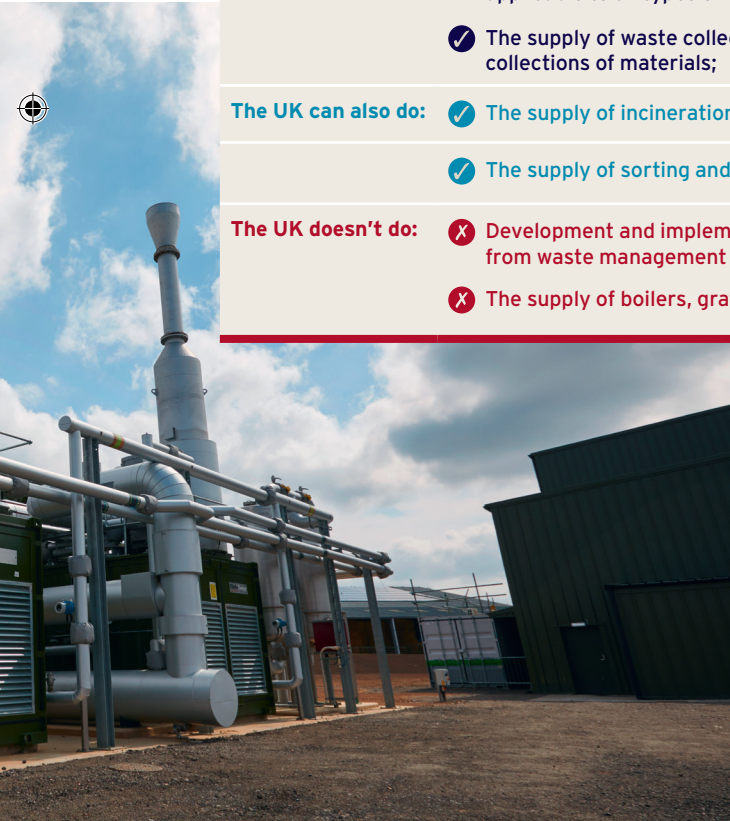
- ✓ Designing and implementing the policy and incentive structure required to make EfW facilities economically viable;
- ✓ The end-to end implementation of anaerobic digestion, including design, build and operation;
- ✓ General design, engineering and construction services applicable to all types of EfW facility;
- ✓ The supply of waste collection vehicles and bins for separate collections of materials;

The UK can also do:

- ✓ The supply of incineration and ancillary equipment;
- ✓ The supply of sorting and bailing machinery;

The UK doesn't do:

- ✗ Development and implementation from scratch of large energy from waste management systems;
- ✗ The supply of boilers, grates and pumps for incinerators.



Green Finance

Green finance is defined as funding any means of reducing carbon emissions or raising resource efficiency. For the purposes of renewable energy, it is about sourcing funding for the development and delivery of specific projects in overseas markets. We would not classify the funding itself as an export, more an enabler – important when assessing export potential. Renewable Energy is still *relatively* new and the risk profile for projects, particularly in difficult markets or new technologies, can make securing funding difficult. Any type of financing requires related services (banking, insurance, legal, accounting, etc.), which we would include as part of our definition of green finance and which can be classed as exports.

Key points / messages:

The UK excels at:

- ✓ The structuring of financial packages to allow commercially viable renewable energy projects internationally;
- ✓ Raising capital for renewable energy projects;
- ✓ Legal services, with a world respected legal system and appetite for English law contracts;
- ✓ Accounting and insurance services.





Department for International Trade

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DIT

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