



March 2024

Glossary

Alternating current AC

A type of electricity transmission in which the voltage varies in a wave fashion, resulting in a current flow that periodically reverses direction. In Great Britain the direction is reversed 50 times each second, which is known as a frequency of 50 Hz. The majority of onshore electricity transmission is AC in Great Britain.

Area of Outstanding Natural Beauty AONB

Designated area in England, Wales, or Northern Ireland that is recognised for its exceptional natural beauty and cultural heritage. AONBs are protected landscapes that are managed to conserve and enhance their natural and cultural assets, while also supporting sustainable development and public access under the *Countryside Rights of Way Act 2000*. As of 2023 these became commonly known as National Landscapes.

Balancing Mechanism

The ESOs primary tool used for balancing national electricity supply and demand on Great Britain's electricity transmission network in real time. The balancing mechanism uses a variety of techniques to manage imbalances between generation and demand, including reducing generator output, using energy storage solutions, demand response programs and other measures.

Black, Red, Amber, Green BRAG

Qualitative ratings provided for various assessment criteria ranging from Green - most desirable to Red - least desirable and Black - not desirable. This type of rating features in our four design criteria used to assess our recommended network solution.

Bipole

A high voltage subsea cable used in transmitting electrical power using direct current (DC) systems.

Boundary

The transmission network is split into regions and the interface between two regions is called a boundary.

British Energy Security Strategy BESS

The British Energy Security Strategy is a UK government publication, it sets out how Great Britain will accelerate the deployment of wind, new nuclear, solar and hydrogen, whilst supporting the production of domestic oil and gas in the nearer term.

Cable corridor

The route taken by cables, either undersea or onshore.

Cap and floor regime

An Ofgem created regime used to encourage investment in electricity interconnectors, where the 'floor' is the minimum amount of revenue that an interconnector can earn, and the 'cap' is the maximum.

Capacity

The maximum rated power output of an electricity generation or transmission technology, usually measured in kilowatts (kW), megawatts (MW), gigawatts (GW) or terawatts (TW).

Capital expenditure Capex

Funds used by a company to acquire, upgrade and create assets such as computer hardware, property, or equipment.

Carbon Capture and Storage CSS

Carbon Capture and Storage (CCS) is a technology that captures and stores carbon dioxide (CO₂) emissions from industrial processes, power plants, or other sources to reduce greenhouse gas emissions and mitigate climate change.

Celtic Sea

Area of sea off the coasts of South Wales and South West England where the Crown Estate's Offshore Wind Leasing Round 5 seeks to establish a new floating wind sector in the Celtic Sea.

Central Design Group CDG

This group was set up in 2021, to establish and support the development of the *Holistic Network Design (HND)* by the ESO and to ensure stakeholder views were considered in the design.

Centralised Strategic Network Planning CSNP

The future electricity transmission network planning process across Great Britain (onshore and offshore).

Circuit breaker

A switch that connects or disconnects a circuit, generator or transmission equipment.

Competitively appointed transmission owner CATO

A CATO is a party that has won an auction to construct a tranche of onshore transmission infrastructure and act as steward of that infrastructure for the first 25 years of its physical life.

Connection Use of System Code CUSC

The contractual framework for connecting to and using the national electricity transmission system.

Constraint

A situation where energy is restricted in its ability to flow between two points, for example, due to thermal or voltage limitations.

Constraint costs

The cost of redispatching generation often to prevent unacceptable network flows across parts of the network that have limited capacity.

Cost-benefit analysis CBA

Cost-benefit analysis is a systematic process for calculating and comparing the benefits and costs of a project or decision. It involves identifying, quantifying, and monetising the benefits and costs of different alternatives and then comparing them to determine the most desirable option.

Crown Estate Scotland CES

Manages land and property owned by the Monarch in right of the Crown in Scotland, set up following the Scotland Act 2016 and pays all revenue profit to the Scottish Government. They are responsible for the leasing of seabed offshore in Scotland.

Curtailments

Curtailment is the intentional reduction or limitation of the output of a power plant or generator often due to constraints or limitations in the power system, such as insufficient demand or transmission capacity.

Decarbonisation

The process of reducing carbon emissions (e.g. generated by burning fossil fuels).

Department for Energy Security and Net Zero

A UK Government department focused on the energy portfolio from the former Department for Business, Energy and Industrial Strategy (BEIS) responsible for delivering security of energy supply, ensuring properly functioning energy markets, encouraging greater energy efficiency and seizing the opportunities of net zero to lead the world in new green industries.

Department for Environment, Food and Rural Affairs Defra

A UK Government department responsible for improving and protecting the environment. They aim to grow a green economy and sustain thriving rural communities supporting food, farming and fishing industries.

Detailed network design DND

The process that follows the recommended network design which will identify in more detail the infrastructure design. It will be carried out by the party responsible for developing each part of the network.

Direct current DC

Electrical current that flows in one direction only.

Direct current circuit breakers DCCBs

A circuit breaker that is specifically used to connect or disconnect a circuit, generator, load or piece of transmission equipment on a DC network.

Earliest in service date EISD

The earliest date when the project could be delivered and put into service, if investment in the project was started immediately.

Early Competition

Early competition is a tender process to select a bidder to provide a solution or a specific need on Great Britain's electricity transmission system. It is "early" as it is a tender exercise which is undertaken before the completion of preliminary works i.e. detailed design, surveying and consenting phases of solution development.

Electricity Generation

Electricity generation refers to the process of producing electrical energy from an energy source, such as coal, natural gas, nuclear fuel, or renewable resources like wind, solar and hydro power.

Electricity Grid

An electricity grid, also known as an electrical grid or power grid, is a network of interconnected power generation, transmission and distribution facilities that delivers electricity from power plants to consumers.

Electricity System Operator ESO

The Electricity System Operator (ESO) is the electricity system operator for Great Britain ensuring that Great Britain has the essential energy it needs by ensuring supply meets demand every second of every day.

Electricity Ten Year Statement ETYS

Report published by the Electricity System Operator providing a forecast of Great Britain's electricity supply and demand over the next ten years.

Electricity Transmission Network Planning Review ETNPR

This is an Office of Gas and Electricity Markets (Ofgem) consultation which is aimed at reviewing Great Britain's electricity network planning processes.

Electrification

The process of replacing or updating technologies that typically use fossil fuels (coal, oil, and natural gas) with technologies that use electricity as a source of energy.

Electrolysis

Process of using electricity to split water into hydrogen and oxygen.

Energy Act 2023

An Act of the Parliament of the UK that creates a comprehensive new regime for energy production and security and the regulation of UK's energy sector.

Energy Network

All interconnected and installations used for transmission and distribution of energy and/or energy sources. This includes electricity transmission and/or distribution grid infrastructures, heating, or cooling transmission networks, gas transmission and/or distribution systems.

Energy Security

The uninterrupted supply of energy sources (often at an affordable price).

Future Energy Scenarios FES

Report published by the Electricity System Operator publishing a range of credible scenarios for the future of energy out to 2050.

Gas-insulated high-voltage switchgear GIS

Type of compact electrical substation equipment, commonly used in locations with limited space, such as urban areas.

Geographic information system GIS

Computer-based system used to capture, store, analyse, and display geographic or spatial data, such as maps and satellite imagery used in various applications, including urban planning, environmental management and emergency response.

Gigawatt GW

A unit of power. 1 GW = 1,000,000,000 watts.

Gigawatt hour GWh

A unit of power consumer over a period of time. 1 GWh = 1,000,000,000 watt in 1 hour.

Greenhouse gas

Gases in the Earth's atmosphere that trap heat and contribute to the greenhouse effect, which is the warming of the Earth's surface. The increase of greenhouse gases in the atmosphere is a major contributor to climate change, as it causes the Earth's temperature to rise and leads to changes in weather patterns, rising sea levels, and other environmental impacts.

Grid losses (transmission losses)

Amount of electrical energy lost during the transmission and distribution of electricity through the power grid due to factors such as resistance in the transmission lines and transformer losses.

High voltage alternating current HVAC

AC power transmission at voltages at and above 132 kilovolts (kV) in Scotland and 275 kV and above in England and Wales. This technology is what most onshore infrastructure consists of, including overhead pylons and substations.

High voltage direct current HVDC

DC power transmission at voltages at and above 132 kilovolts (kV). They are typically used to transmit large amounts of electrical power over long distances with minimal losses, and the use of high voltages is one of the key factors that allows for this level of efficiency. HVDC technology is frequently used for subsea cabling.

HND essential option

A reinforcement that has, through the connection assessment process, been determined to be essential to ensuring a network compliant with the Security and Quality of Supply Standards (SQSS).

Holistic Network Design HND

The ESO's network design process that recommends a coordinated onshore and offshore electricity transmission network design. In 2022, the first *HND* or HND1 was published recommending the network needed to facilitate the UK Government ambition for connecting 50 GW of offshore wind in Great Britain by 2030.

Holistic Network Design Follow-Up Exercise HNDFUE

The HNDFUE is a follow on to the HND that aims to facilitate connecting further 21 GW of offshore wind farms in addition to the HND in Scotland. The HNDFUE is contained within this *Beyond 2030* publication suite.

Innovation and Targeted Oil and Gas INTOG

INTOG is a leasing round run by Crown Estate Scotland. Developers can apply for the rights to build offshore wind farms specifically to power oil and gas installations in Scottish waters, helping to decarbonise the oil and gas sector. It also provides an opportunity to enable small scale innovation projects.

Interconnector

A subsea high voltage cable that connects the electricity systems of two countries.

Investment recommendations

Outcome for each potential solution assessed against the future energy network needs. Recommendations are to either Proceed, Hold, or Stop.

Landing point

The location where an underwater cable makes landfall.

Large onshore transmission investment LOTI

This is a funding mechanism for the TOs as part of the *Revenue, Incentives, Innovation and Outputs (RIIO 2)* price control that allows TOs to bring forward investment projects worth more than £100m that have not been funded in the price control settlement.

Late competition

Late competition is a tender process to select a bidder to provide a solution or a specific need on Great Britain's electricity transmission system. It is "late" as it is a tender exercise which is undertaken after the completion of preliminary works. That is detailed design, surveying and consenting phases of solution development.

Least worst regret LWR

An economic tool in the cost benefit analysis to recommend whether or not to proceed with a potential solution especially when the solution is needed in some scenarios but not across all of them.

Low Carbon Electricity

Electricity that is produced with substantially lower (or none) greenhouse gas emissions than conventional fossil fuel power generation.

Marine conservation zone MCZ

A Marine Conservation Zone (MCZ) is a type of protected area in the inland waters in England and Wales and offshore

waters around the United Kingdom. MCZs are designated by the UK government under the Marine and Coastal Access Act (2009) to protect and conserve marine habitats, wildlife, and geological features. They are designed to safeguard important marine ecosystems and to promote sustainable use of marine resources. Activities such as development and fishing may be restricted or prohibited in MCZs to help protect sensitive habitats and species.

Marine Management Organisation MMO

The Marine Management Organisation (MMO) is a UK government agency responsible for managing the country's seas and oceans. The MMO is responsible for implementing policies related to marine planning, fisheries management, marine conservation, and licensing of marine activities, such as marine renewable energy projects, dredging, and coastal development. The MMO operates in English and Welsh waters, up to the six-nautical-mile limit, and in offshore waters beyond the UK's territorial sea. They are a key stakeholder in the ESO's network planning exercises.

Marine Protected Area MPA

Marine Protected Area (MPA) is a globally recognised term which, in the case of UK and Irish waters, describes sites which are protected under national or European legislation. Such sites include Highly Protected Marine Areas (HPMAs) and MCZs, as well as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). In combination within UK waters, they form an interconnected network, aiming to protect a range of marine habitats and species.

Marine Scotland

Marine Scotland is a Scottish government directorate, responsible for the integrated management of Scotland's seas. They are responsible for implementing policies related to marine planning, fisheries management, marine conservation, and licensing of marine activities, such as aquaculture, oil and gas exploration, and marine renewables. They are a key stakeholder in the ESO's network planning exercises. In 2023 they became known as Scottish Government's Marine Directorate.

Megawatt MW

A unit of power. 1 MW = 1,000,000 watts.

Megawatt hour MWh

A unit of power consumer over a period of time. 1 GWh = 1,000,000 watt in 1 hour.

Monopole

A HVDC link using a single converter at each end.

Multi-purpose interconnectors MPIs

Interconnectors connected to offshore windfarms in GB waters.

National Electricity Transmission System NETS

The network and asset infrastructure that forms the electricity transmission system.

National Grid Electricity Transmission NGET

Transmission owner that owns and maintains the high-voltage electricity transmission network in England and Wales.

Net Present Value NPV

NPV provides a means of evaluating capital projects such as interconnectors, accounting for positive and negative cash flows spread over time, with future cashflows discounted into present value.

Net zero greenhouse gas emissions

An economy where any greenhouse gases emitted are offset by the removal of an equivalent amount. It is usually used in the context of the UK's target to be net zero by 2050, as per the *2008 Climate Change Act* (as amended in 2019).

Network access

Refers to the carefully controlled provision of access to build and commission new infrastructure or maintain the existing assets on the Great Britain transmission system.

Network Assessment

An evaluation of the electrical grid infrastructure to identify potential issues or areas for improvement typically driven by future network need and any changes from the current operation in a given area.

Network Congestion

Electricity network congestion refers to a situation where there is more power needing to be transmitted than network is capable of.

Networks Options Assessment NOA

An ESO run process which provides our recommendation for which network reinforcement projects should receive investment - and when.

Non Standard Interconnectors NSI

Interconnectors that are connected to offshore wind farms in non Great Britain waters.

Office of Gas and Electricity Markets Ofgem

UK's independent National Regulatory Authority, a non-ministerial government department who's principal objective is to protect the interests of existing and future electricity and gas consumers.

Offshore

Situated in the sea.

Offshore Hybrid Assets OHA

The combination of interconnectors with offshore transmission assets, including Multi-Purpose Interconnectors (MPIs) and Non-Standard Interconnectors (NSIs).

Offshore transmission network owner OFTO

A company that is typically selected through a competitive tender process and are regulated by the UK's energy regulator, Ofgem that owns and operates the electrical transmission infrastructure that connects offshore wind farms to the onshore electricity grid.

Offshore Transmission Network Review OTNR

This review looked into the way that the offshore transmission network is designed and delivered and was concluded in May 2023.

Onshore converter station

Electrical substation located on land that converts electrical power from AC to DC or vice versa in high-voltage direct current (HVDC) transmission systems.

Onshore transmission circuit

Set of electrical conductors or cables that transmit high-voltage electrical power between two points on the transmission network.

Operating expenditure Opex

Ongoing cost for running a product, business, or system.

Optimal

An option is optimal when the cost of building the option is outweighed by the benefit the option provides in the assessment.

Power system analysis

A group of studies used to analyse a power system's response to events over different time periods.

Power transfer

The transport of power from one point to another.

Present Value PV

Also known as present discounted value, it is the value today (or some other specified date) of a future amount of money.

Radial

Type of connection that is between a generator or load and a substation on the transmission network.

Reactive power

Reactive power is the component of electrical power that is used to establish and maintain the electric and magnetic fields in alternating current (AC) circuits. It is used to support the voltage and current levels in the system and is important for maintaining the stability and reliability of the power system.

Real power

This term (sometimes referred to as 'active power') provides the useful energy to a load. In an AC system, real power is accompanied by reactive power for any power factor other than 1.

Reinforcements

Solutions that provide additional capability on the National Electricity Transmission Network.

Renewable Generation

Producing electricity from sources that are naturally replenished and do not run out.

Scottish and Southern Electricity Networks Transmission SSENT

Transmission owner responsible for the electricity transmission network in the north of Scotland.

SP Transmission SPT

Transmission owner responsible for the transmission of electricity in central and southern Scotland.

ScotWind

ScotWind is a seabed leasing process launched by Crown Estate Scotland in June 2020 to enable the development of new offshore wind projects in Scottish waters.

Security and Quality of Supply Standard SQSS

Standard that sets out the criteria and methodology for planning and operating the Great British National Electricity Transmission System.

Site of special scientific interest SSSI

A SSSI is a formal conservation designation given statutory status in the UK via the *Wildlife and Countryside Act 1981* (as amended). Usually, it describes an area that is of particular interest to science due to the rare species of flora or fauna it contains or even important geological or physiological features that may lie in its boundaries.

Sixth Carbon Budget

UK Carbon reduction target recommended by the Climate Change Committee for the period from 2033 to 2037, delivering a reduction in UK greenhouse gas emissions of 78 per cent by 2035 relative to 1990, a 63 per cent reduction from 2019.

Socio-economic welfare SEW

Socio-economic welfare is a common indicator in cost-benefit analysis of projects of public interest. It captures the overall benefit, in monetary terms, to society from a given course of action. It is an aggregate of multiple parties' benefits.

Special area of conservation SAC

SACs are conservation sites that make a significant contribution to conserving the habitats and species identified in Annexes I and II, respectively, of the EC Habitats Directive (92/43/EEC). Afforded statutory status in the UK via the *Conservation of Habitats and Species Regulations 2017* (as amended) and the *Conservation of Offshore Marine Habitats and Species Regulations 2017*.

Special protection area SPA

SPAs are protected areas for specified bird species which qualify for consideration under the *EC Birds Directive (79/409/EEC as amended)*. Afforded statutory status in the UK via the *Conservation of Habitats and Species Regulations 2017* (as amended) and the *Conservation of Offshore Marine Habitats and Species Regulations 2017*.

Strategic Spatial Energy Plan SSEP

ESO's Great Britain-wide plan for the 'most efficient' mix of electricity and hydrogen technologies that meet net zero and deliver security of supply. It will set out locations, capacities and timing of GW-scale supply, co-optimised with large demand sources and high-level network needs.

Supergrid

The national electricity transmission system operated at a nominal voltage of 200 kV and above.

Switchgear

The term used to describe components of a substation that can be used to carry out switching activities. This can include, but is not limited to busbars, isolators/disconnectors and circuit breakers, protection equipment, transformers.

System operability

The ability to maintain system stable and secure network operation, safely, economically and sustainably.

System Operator-Transmission Owner Code STC

Code that defines the relationship between the transmission owners and the system operator.

System stability

Stability is the inherent ability of the system to quickly return to acceptable operation following a disturbance.

Terawatt hour TWh

A unit of power consumer over a period of time. 1 GWh = 1,000,000,000,000 watt in 1 hour.

The Crown Estate TCE

An independent commercial business, created by an Act of Parliament, with a diverse portfolio of UK buildings, shoreline, seabed, forestry, agriculture and common land. They are responsible for the leasing of seabed offshore in England and Wales.

Thermal generation

Thermal generation is the process of generating electricity from heat. This is typically done by burning fossil fuels such as coal, natural gas, or oil to produce steam, which then drives a turbine to generate electricity. Other methods of thermal generation include nuclear power plants, which use nuclear reactions to produce heat, and geothermal power plants, which use heat from the Earth's core to produce steam.

Transmission entry capacity TEC

Maximum level of transmission access at which a power station owner wishes to purchase and use for a given financial year. It is measured on a power station basis only and is specified at the relevant connection site.

Transmission Network

A high-voltage system for the transfer of electric power comprising of transmission lines, substations and switching substations.

Transmission Network Use of System TNUoS

Charges collected by the ESO on behalf of TOs and OFTOs to recover the cost of installing and maintaining the electricity transmission network.

Transmission owner TO

A collective term used to describe the three electricity transmission asset owners within Great Britain, namely National Grid Electricity Transmission, Scottish & Southern Electricity Networks Transmission and SP Transmission.

United Kingdom of Great Britain and Northern Ireland UK

A country consisting of England, Scotland, Wales, and Northern Ireland.

Voltage Control

Voltage control is the maintenance of a stable and consistent voltage level within the electrical grid usually achieved by using devices such as transformers, capacitors, and voltage regulators, which are designed to adjust the voltage level of the grid as needed.

Voltage Regulation

Ability of a system to provide near constant voltage over a wide range of load conditions.

Voltage Source Converter VSC

Type of power converter that can convert AC power to DC power and vice versa. It is commonly used in high voltage direct current (HVDC) transmission systems to control the power flow and voltage levels. VSCs are also used in renewable energy systems, such as wind and solar power, to connect them to the grid.

Whole Energy System

The interaction between electricity, gas and liquid fuels, and how these energy sources best contribute to delivering net zero greenhouse gas emission energy for technology, communications, transport, heat and water.

Wind Farm

Group of wind turbines installed in a specific location to generate electricity from wind energy.

Zero Carbon

When no carbon emissions are being produced from a product or service (for example, a wind farm generating electricity, or a battery deploying electricity).

2050 Net Zero Emissions Target

Target driven by the legal requirement from the *Sixth Carbon Budget* by the Climate Change Committee for the UK to bring all greenhouse gas emissions to net zero by 2050.

