

July 2022

Glossary

This document sets out to explain and define the words used in the *Pathway to 2030* suite of documents and *Network Options Assessment 2021/2022 Refresh*, published in July 2022.

Alternating current AC

Electricity transmission in which the voltage varies in a sinusoidal 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.

Anticipatory investment AI

Investment that goes beyond the needs of immediate generation and demand, reflecting the needs created by a likely future generation project(s) or demand source(s).

Balancing and Settlement Code BSC

The BSC contains the rules and governance arrangements for electricity balancing and settlement in Great Britain. The BSC covers the metering of the physical production and demand for electricity from generators, suppliers and interconnectors in relation to their contracted positions. It also covers the calculating and settling of any imbalances when delivery or offtake doesn't match those positions. The BSC sets out a framework for making a submission to buy or sell electricity into or out of the market at close to real time.

Balancing Services Use of System BSUoS

The BSUoS charge recovers the cost of day-to-day operation of the transmission system, including the cost of balancing the electricity system and the internal costs of the Electricity System Operator (ESO).

Bilateral connection agreement BCA

A connection agreement between the ESO and a developer connected (or to connect) to the national electricity transmission system.

Black Red Amber Green BRAG

Offshore and onshore environmental constraints analysis categories that signify the degree of constraint: black, red, amber, and green.

Bootstrap

Subsea high voltage direct current (HVDC) link providing undersea connections between two points on the national electricity transmission system.

Boundary

The transmission system is split by boundaries that cross important powerflow paths where there are limitations in capability or where we expect additional bulk power transfer capability will be needed.

British Electricity Trading and Transmission Arrangements BETTA

BETTA created a fully competitive British-wide market for the trading of electricity generation (the wholesale market).

British Energy Security Strategy BESS

The BESS 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.

Busbar

In electrical power transmission, a busbar is a metallic bar used to electrically connect circuits and apparatus.

Cable corridor

The route taken by cables, either undersea or onshore.

Capacity

The maximum rated power output of an electricity generation 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 IS systems, property, or equipment.

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. The purpose of the CDG is to act as a vehicle for us to consult and collaborate with Transmission Owners (TOs) on the *HND*, and to consult with stakeholder groups as the *HND* is developed. The CDG is chaired by the ESO with the TOs and ESO as members. The Department for Business Energy and Industrial Strategy (BEIS), Ofgem and the Scottish and Welsh Governments are observers.

Centralised Strategic Network Planning CSNP

A review of the existing electricity transmission network planning processes across Great Britain (i.e. onshore and offshore). It is considering the need for improvements that will enable Great Britain's electricity transmission network to efficiently meet anticipated future needs of the changing energy system to meet decarbonisation targets.

Circuit breaker

An AC switch that connects or disconnects a circuit, generator, load or piece of transmission equipment and automatically shuts off the power when required to prevent damage.

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 and Infrastructure Options Note CION

The CION process has been used to recommend connection options for offshore generators and interconnectors. It evaluates options for the required transmission infrastructure, which leads to the identification and development of the overall efficient, coordinated and economical connection point, onshore connection design and, where applicable, offshore transmission system / interconnector design. The *HND* has replaced this process for offshore developers in its scope.

Connection Use of System Code CUSC

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

Constraint costs

The cost of taking balancing actions to redispatch generation to prevent unacceptable network flows across parts of the network that have limited capacity. These consist of actions to decrease generation output in one part of the country, and actions to increase generation output in a different part of the country.

Cost-benefit analysis CBA

A method of assessing the benefits of a given project in comparison to the costs. This tool can help to provide a comparative base for all projects to be considered.

Decarbonisation

The process of removing carbon emissions (e.g. generated by burning fossil fuels) from our economic and social activities.

Department for Business, Energy and Industrial Strategy BEIS

A UK Government department with responsibilities for business, industrial strategy, science, innovation, energy, and climate change. They aim to lead economy-wide transformation by backing enterprise and long-term growth, generating cheaper, cleaner, homegrown energy.

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. They also support food, farming and fishing industries.

Department for Levelling Up, Housing and Communities DLUHC

A UK Government department responsible for investing in local areas to drive growth and create jobs, delivering the homes the country needs, supporting community and faith groups, and overseeing local government, planning and building safety.

Detailed network design DND

The detailed network design follows the *HND* and will specify the design in an additional level of detail. It will be carried out by the party responsible for developing each part of the network.

Direct current DC

Electrical current that moves in one direction only.

Direct current circuit breakers DCCBs

A DC switch that connects or disconnects a circuit, generator, load or piece of transmission equipment and automatically shuts off the power when required to prevent damage.

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 Opportunities EO

The Early Opportunities workstream encourages developers of offshore wind projects that are working to achieve planning consent, to explore opportunities to coordinate their connections.

Electricity System Operator ESO

The ESO is the electricity system operator for Great Britain. Our control room moves electricity around the country second by second to ensure that the right amount of electricity is where it's needed, when it's needed – always keeping supply and demand in perfect balance.

Electricity Ten Year Statement ETYS

An annual ESO publication that shows the likely future transmission requirements of bulk power transfer capability of the national electricity transmission system, based on the Future Energy Scenarios.

Electricity Transmission Network Planning Review ETNPR

This is an Office of Gas and Electricity Markets (Ofgem) consultation which is aimed at ensuring that electricity transmission network planning can efficiently support the delivery of the UK Government's targets for net zero at lowest cost to consumers.

Embedded Transmission Use of System

Transmission Network Use of System (TNUoS) charges are levied on all licensable generators. Embedded generators are those generators which are connected to, and therefore export their power onto, distribution networks.

Enduring Regime

The Enduring Regime of the OTNR takes a more strategic approach to windfarm development and considers the offshore transmission system holistically with the onshore network to deliver a more coordinated approach and reduce the cumulative impacts of transmission.

Expert Advisory Group EAG

An OTNR governance group that is an independent sounding board, providing sectoral and/or subject expertise. It provides expert input and formal advice to the OTNR working group on technical, societal, commercial and/or procedural matters.

Financial investment decision FID

This is the point at which a project is approved or sanctioned to go ahead (customer side).

Final sums

Where the TO recovers economic and efficient costs from the ESO in the event that abortive costs have been incurred prior to a developer reducing capacity or terminating their connection contract with the ESO.

Future Energy Scenarios FES

The FES is a range of credible pathways for the future of energy out to 2050. They form the starting point for our transmission network and investment planning, and are used to identify future operability challenges and potential solutions.

Generator focused anticipatory investment GFAI

Investment in offshore transmission infrastructure which is led by a developer to support the later connection of specific offshore developments.

Gas-insulated high-voltage switchgear GIS

Gas-insulated high-voltage switchgear (GIS) is a compact metal encapsulated switchgear that uses a gas (commonly SF6) as the insulation medium rather than air.

Geographic information system GIS

This is a system that creates, manages, analyses, and maps all types of data. GIS connects data to a map, integrating location data (where things are) with all types of descriptive information (what things are like there).

Gigawatt GW

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

Gigawatt hour GWh

1,000,000,000 watt hours, a unit of energy.

Greenhouse gas

A gas in the atmosphere that absorbs and emits radiation within the thermal infrared range.

Grid Code GC

Specifies the technical requirements for connection to, and use of, the national electricity transmission system.

Grid losses (transmission losses)

Power lost through the energisation and transmission of energy through the transmission network.

Grid supply point GSP

A point at which a transmission system is connected to a distribution system.

High voltage alternating current HVAC

AC power transmission at voltages above 110 kilovolts (kV).

High voltage direct current HVDC

DC power transmission at voltages above 110 kilovolts (kV).

HND essential option

A reinforcement that has, through the connection assessment process, been determined to be essential for 2030 to provide a network compliant with the rules we must follow when designing the transmission system.

Holistic Network Design HND

The purpose of the *HND* is to provide a recommended onshore and offshore design that can facilitate the UK Government ambition for 50 GW of offshore wind in Great Britain by 2030.

Infeed

The provision of power from generators onto the national electricity transmission system.

Innovation and Targeted Oil and Gas INTOG

INTOG is a leasing round run by The 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

An asset that links two markets together allowing them to trade commodities such as electricity and gas.

Investment recommendations

As defined in the Network Options Assessment (NOA) methodology, the outcome of the NOA process for each option is one of five investment recommendations: “Proceed”: An option is critical to our future planning. Investment should be made in the next financial year to ensure the option’s earliest in service date remains on course. “Delay”: At this time, it is not economically viable to proceed with this option. The option’s delivery should be delayed by one year. “Hold”: An option is important and required in the future, however due to the lead time in delivering this option, no investment is required this year. Therefore, this option can be delayed by at least one

year. “Stop”: An option is not currently required in our future plan, delivery should be stopped and not be continued. “Do not start”: An option is not currently required in our future plan, delivery work should not begin.

Key performance indicator KPI

A measure of performance.

Landing point

The location where a submarine or other 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.

Leading the Way Scenario LW

One of the *FES* in which it is assumed that Great Britain decarbonises rapidly with high levels of investment in world-leading decarbonisation technologies. Our assumptions in different areas of decarbonisation are pushed to the earliest credible dates. Consumers are highly engaged in acting to reduce and manage their own energy consumption. This scenario includes the highest and fastest improvements in energy efficiency to drive down energy demand, with homes retrofitted with insulation such as triple glazing and external wall insulation, and a steep increase in consumer participation in smart energy services. Hydrogen is used to decarbonise some of the most challenging areas of society such as some industrial

processes, with this hydrogen produced solely from electrolysis powered by renewable electricity. Leading the Way achieves 40 GW of offshore wind by 2030 and meets the UK Government’s target for net zero greenhouse gas emissions in 2050.

Leading the Way 21 + LW21+

LW21 + is a revised Leading the Way *FES* 2021 scenario which now includes updated offshore connection locations for all generators in scope of the *HND*. This scenario is used to align with and support the outputs of the *HND*, and therefore achieves the UK Government’s 2030 ambitions.

Least worst regret LWR

A decision making methodology for assessing multiple future scenarios without applying probability.

Load factor

An indication of how much a generation plant or technology type has output across the year, expressed as a percentage of maximum possible generation. These are calculated by dividing the total electricity output across the year by the maximum possible generation for each plant or technology type.

Local asset reuse factor LARF

A term related to the User Commitment methodology. The LARF is the proportion of an asset or scheme that can be reused should a customer terminate once construction has commenced or spend has been committed.

Main interconnected transmission system MITS

This comprises all the 400 kV and 275 kV elements of the onshore transmission system and, in Scotland, the 132 kV elements of the onshore transmission system operated in parallel with the supergrid, and any elements of an offshore transmission system operated in parallel with the supergrid. It excludes generation circuits, transformer connections to lower voltage systems, external interconnections between the onshore transmission system and external systems, and any offshore transmission systems radially connected to the onshore transmission system via single interface points.

Marine conservation zone MCZ

Marine Conservation Zones (MCZs) are designated under The Marine and Coastal Access Act 2009 (MCAA). The MCAA allows for MCZs to be designated in inshore waters around England and Wales and offshore waters around the whole UK. An MCZ allows for permitted and non-permitted uses within areas of the designation that would need to be considered as part of cable routing if the MCZ is unavoidable. Impacts upon these sites from any proposals would need determined and assessed. Avoiding and minimising effects upon MCZs in the early design phase is therefore advantageous to these sites and a project's life cycle.

Marine protected area MPA

Marine Protected Areas (MPAs) are an equivalent designation to MCZs for nationally important areas in Scottish waters. An MPA allows for permitted and non-permitted uses within areas of the designation that would need to be considered as part of cable routing if the MPA is unavoidable. Impacts upon

these sites from any proposals would need to be determined and assessed. Avoiding and minimising effects upon MPAs in the early design phase is therefore advantageous to these sites and a project's life cycle.

Marine Scotland

Responsible for the integrated management of Scotland's seas, working closely with delivery partners, Scottish Natural Heritage, and the Scottish Environment Protection Agency. Responsible for promoting sustainable economic growth, sustainable management of freshwater fish and fisheries, ensuring compliance with fisheries regulations amongst more.

Megawatt MW

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

Megawatt hour MWh

A unit of energy. 1 MWh = 1,000,000 watt hours.

Monopole

A HVDC link using a single converter at each end.

Multi-purpose interconnectors MPIs

Assets that combine interconnection with direct connections to, and transmission of electricity generated by, offshore wind farms.

National Electricity Transmission System NETS

The network and assets infrastructure that supports the electricity transmission system in England, Scotland and Wales.

National Grid Electricity Transmission plc NGET

Transmission owner in England and Wales.

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

Maintenance and network access is typically undertaken during the spring, summer and autumn seasons when the system is less heavily loaded and access is favourable. With circuits and equipment unavailable the integrity of the system is reduced. The planning of the system access is carefully controlled to ensure system security is maintained.

Networks Options Assessment NOA

An ESO run process that makes recommendations to TOs as to which projects to proceed with to meet future network requirements as designed in the electricity ten year statement.

Office of Gas and Electricity Markets Ofgem

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

Offshore transmission network owner OFTO

A transmission owner who assumes responsibility for offshore transmission assets.

Offshore Transmission Network Review OTNR

The OTNR was launched in July 2020 with the objective to address the barriers in increasing offshore wind capacity to achieve net zero and ensure that the transmission connections for offshore wind generation are delivered in the most appropriate way. This aims to find the appropriate balance between environmental, social and economic costs.

Offshore Transmission Network Review Expert Advisory Group OTNR EAG

An OTNR governance group that is an independent sounding board, providing sectoral and/or subject expertise. It provides expert input and formal advice to the OTNR working group on technical, societal, commercial and/or procedural matters.

Offshore Transmission System Development User Works OTSDUW

In relation to a particular User where the OTSDUW Arrangements apply, means those activities and/or works for the design, planning, consenting and/or construction and installation of the Offshore Transmission System to be undertaken by the User as identified in Part 2 of Appendix I of the relevant Construction Agreement.

Offshore transmission system user assets OTSUA

Plant and apparatus constructed and/or installed by a user under the OTSDUW Arrangements which form an offshore transmission system that once transferred to a relevant Transmission Licensee under an Offshore Tender Process will become part of the national electricity transmission system.

Onshore converter station

Onshore infrastructure on the national electricity transmission system that converts between HVDC and HVAC.

Onshore transmission circuit

Part of the onshore transmission system between two or more circuit-breakers which includes, for example, transformers, reactors, cables and overhead lines but excludes busbars, generation circuits and offshore transmission circuits.

Operating expenditure Opex

Operational expenditure which is an ongoing cost for running a product, business, or system.

Optimal

The option is economically justified in at least one scenario in the *NOA*.

Options Appraisal Summary Table OAST

The purpose of the OAST documents is to show how we have arrived at our final strategic options appraisal.

Pathway to 2030 PT2030

The Pathway to 2030 workstream of the OTNR aims to drive coordination of offshore projects connecting before 2030, including Crown Estate Leasing Round 4 and ScotWind projects.

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.

Quasi-bootstrap

This concept involves the installation of a circuit between the respective offshore substations of two offshore generators, where the offshore substations are not connected to a single common onshore substation. This concept emphasises the potential to provide wider system benefits by reinforcing the onshore system in the form of a quasi-bootstrap. It would not reduce infrastructure or landing points, but is an example of coordination.

Radial

Direct single connection of an offshore wind farm to the onshore transmission network without connection to other points.

Reactive power

Reactive power is a term used by engineers to describe the background energy movement in an AC system arising from the production of electric and magnetic fields. These fields store energy which changes through each AC cycle. Devices which store energy by virtue of a magnetic field produced by a flow of current are said to absorb reactive power; those which store energy by virtue of electric fields are said to generate reactive power.

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

Additional grid infrastructure implemented to ensure the national electricity transmission system can accommodate existing and future generation and demand.

Required in service dates RISDs

Required in Service Dates highlight when an option is needed ahead of its EISD in order to facilitate the recommended offshore network in 2030.

ScotWind

The ScotWind programme leases areas of the seabed around Scotland for wind farm development.

Security and Quality of Supply Standard SQSS

The Security and Quality of Supply Standard sets out the criteria and methodology for planning and operating the National Electricity Transmission System onshore and offshore.

Site of special scientific interest SSSI

A SSSI is a formal conservation designation. Usually it describes an area that is of particular interest to science due to the rare species of fauna or flora it contains or even important geological or physiological features that may lie in its boundaries.

SP Transmission SPT

Transmission owner in the south of Scotland.

Special area of conservation SAC

Special Areas of Conservation (SAC) are designated under the EU Habitat’s Directive 92/43/EC which is transposed into national law in England, Wales, Scotland, Northern Ireland, and the UK offshore area (beyond 12 nautical miles from the coast). SACs are designated for the conservation of a variety of habitats (e.g. reefs) and species (e.g. the harbour porpoise). These sites would be assessed through the Habitats Regulations Assessment (HRA) process to determine and assess any likely significant effects from any proposal. Avoiding and minimising effects upon SACs in the early design phase is therefore advantageous to SACs and a project’s life cycle.

Special protection area SPA

Special Protection Areas (SPAs) are designated under The EU Directive on the Conservation of Wild Birds (EC/79/409), as amended by Directive 2009/147/EC. “The Birds Directive”

identifies areas that are important for rare and vulnerable bird species as they use them for breeding, feeding, wintering or migration. The Birds Directive is transposed into national law in England, Wales, Scotland, Northern Ireland, and the UK offshore area (beyond 12 nautical miles from the coast). These sites would be assessed through the Habitats Regulations Assessment process to determine and assess any likely significant effects from any proposal. Avoiding and minimising effects upon SPAs in the early design phase is therefore advantageous to these sites and a project’s life cycle.

STC Section K provisions

System Operator Transmission Owner Code Section: Technical, Design and Operational Criteria and Performance Requirements for Offshore Transmission Systems.

Strategic investment factor SIF

The proportion of a scheme spend attributable to a particular customer under the CMP192 securities methodology using the scheme capability and the CUSC.

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, isolators/disconnectors and circuit breakers.

System operability

The ability to maintain system stability and all the asset ratings and operational parameters within pre-defined limits safely, economically and sustainably.

System Operator-Transmission Owner Code STC

The STC 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.

Ten Point Plan for a Green Industrial Revolution

The Ten Point Plan sets out the approach government will take to build back better, support green jobs, and accelerate our path to net zero.

Terawatt hour TWh

1,000,000,000,000 watt hours, a unit of energy.

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.

The Crown Estate Scotland CES

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

The Marine Management Organisation MMO

The MMO's purpose is to protect and enhance the marine environment and support UK economic growth by enabling sustainable marine activities and development.

Transmission entry capacity TEC

TEC represents the 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 Use of System TNUoS

Transmission Network Use of System TNUoS Charges recover the cost of installing and maintaining the electricity transmission network. TNUoS is collected by the ESO on behalf of TOs and OFTOs.

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 plc.

United Kingdom of Great Britain and Northern Ireland UK

A geographical, social and economic grouping of countries that contains England, Scotland, Wales and Northern Ireland. The 2050 Net Zero Emissions Target is on a UK basis.

Voltage control

The regulation of voltage to within statutory limits.

Wider network benefit reinforcement WNBR

A reinforcement of the national electricity transmission system which provides wider system benefits.

