

THE ANZ HYDROGEN HANDBOOK VOL II

GLOSSARY

- **AEM:** Anion Exchange Membrane; An electrolyser technology that uses low cost transition metal catalysts with a semipermeable membrane to allow anions to pass (as opposed to using precious metals).
- **Alkaline Technology:** An electrolyser technology that splits water into its constituents through voltage being applied to two electrodes in a caustic electrolyte solution - frequently potassium hydroxide.
- **Ammonia:** An inorganic chemical composed of nitrogen and hydrogen, with its chemical form being NH_3 . Ammonia is a carrier of hydrogen, and is used in applications such as fertilisers, chemical feedstock and explosives.
- **ARENA:** Australian Renewable Energy Agency; Established by the Australian Government to provide funding and improve the competitiveness of renewable energy technologies and increase the supply of renewable energy through innovation that benefits Australian consumers and businesses.
- **ATR:** Autothermal Reforming; A process for producing syngas, composed of hydrogen and carbon monoxide, by partially oxidizing a hydrocarbon feed with oxygen and steam, and subsequent catalytic reforming.
- **Bar:** A metric unit of pressure.
- **BEV:** Battery Electric Vehicles; A type of EV that exclusively uses chemical energy stored in rechargeable battery packs, with no secondary source of propulsion. BEVs use electric motors and motor controllers instead of internal combustion engines.
- **Blue Hydrogen:** Hydrogen produced through fossil fuels and SMR or gasification, but with carbon emissions captured.
- **BOF:** Basic Oxygen Furnace; A steelmaking method in which pure oxygen is blown into a bath of molten blast-furnace iron and scrap.
- **BoP:** Balance of Plant costs; All the supporting components and auxiliary systems needed to deliver the energy, other than the generating unit itself. These may include transformers, inverters, supporting structures etc.
- **Brown Hydrogen:** Produced from coal through gasification. Material carbon emissions released during production.
- **Capacity Utilisation:** The manufacturing/production capabilities that are being utilised by a hydrogen at any given time. It is the relationship between the output produced with the given resources and the potential output that can be produced if capacity was fully used.
- **Cap-And-Trade:** A system for controlling carbon emissions by which an upper limit is set on the amount an organisation may produce, but which allows further capacity to be bought from other organisations that have not used their full allowance.
- **CCS/CCUS:** Carbon, Capture and Storage/Carbon, Capture, Utilisation and Storage; An integrated suite of technologies that captures CO_2 from being released into the atmosphere. CCUS does not include the permanent geological storage of CO_2 .
- **CEFC:** Clean Energy Finance Corporation.
- **Cell Stack:** The fuel cell stack is the heart of a fuel cell power system. It generates electricity in the form of direct current (DC) from electro-chemical reactions that take place in the fuel cell.
- **CO_2 Cluster:** Refers to a grouping of individual CO_2 sources, or to storage sites such as multiple fields within a region. The Permian Basin in the US has several clusters of oilfields undergoing CO_2 -EOR fed by a network of pipelines.
- **CO_2 Hub:** A hub collects CO_2 from various emitters and redistributes it to single or multiple storage locations.
- **CO_2 Network:** An expandable collection and transportation infrastructure providing access for multiple emitters.
- **Compressed Hydrogen:** The gaseous state of the element hydrogen kept under pressure. Compressed hydrogen can range from 350-1000 bar and is used in mobility, storage, transport and refuelling applications.
- **Cracking:** A type of sour corrosion that occurs especially in carbon and low alloy steel when atomic hydrogen diffuses into the inclusions and trap sites of steel and combines to form molecular hydrogen in void spaces.
- **Cryogenic Tank:** A tank that is used to store material (such as liquid hydrogen) at very low temperatures.
- **Curtailement:** The act of reducing or restricting energy delivery from a generator to the electrical grid.
- **De-ionised Water:** Often synonymous with demineralised water, is water that has had almost all of its mineral ions removed, such as cations like sodium, calcium, iron and copper, and anions such as chloride and sulfate. Deionisation produces highly pure water that is generally similar to distilled water, with the advantage that the process is quicker and does not build up on scale.
- **Density:** The degree of compactness of a substance.
- **Distributed Power (Hydrogen):** Hydrogen for use in stationary power generation microgrids for the power utility industry and industrial sites.
- **DRI:** Direct Reduced Iron; This involves splitting natural gas into a mix of carbon monoxide and hydrogen, and using these gases to reduce iron ore to iron metal.
- **EAF:** Electric Arc Furnace Steelmaking; Electric Arc Furnace is a steelmaking furnace, in which steel scrap is heated and melted by heat of electric arcs striking between the furnace electrodes and the metal bath. The main advantage EAF over BOF is their capability to treat charges containing up to 100% of scrap. About 33% of the crude steel in the world is made in EAF.
- **EIA:** Environmental Impact Assessment; Environmental Impact Assessment is a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse.
- **Electrode:** A conductor through which electricity enters or leaves an object, substance, or region.
- **Electrolyte Solution:** A solution that generally contains ions, atoms or molecules that have lost or gained

electrons, and is electrically conductive (often called ionic solutions).

- **Embrittlement:** A partial or complete loss of a material's (commonly steel) ductility, thus making it brittle.
- **Energy Transition:** Energy transition refers to the global energy sector's shift from fossil-based systems of energy production and consumption— including oil, natural gas and coal — to renewable energy sources like wind and solar, as well as lithium-ion batteries.
- **EU ETS:** European Union Emissions Trading Scheme; The EU ETS is a cornerstone of the EU's policy to combat climate change and its key tool for reducing greenhouse gas emissions cost-effectively. It is the world's first major carbon market and remains the biggest through a cap and trade principle.
- **FAT:** Factory Acceptance Test; Helps verify that newly manufactured and packaged equipment meets its intended purpose. The FAT validates the operation of the equipment and makes sure the customers' purchase order specifications and all other requirements have been met.
- **FCEV:** Fuel Cell Electric Vehicles; An electric vehicle that uses a fuel cell, sometimes in combination with a small battery or supercapacitor, to power its onboard electric motor. Fuel cells in vehicles generate electricity generally using oxygen from the air and compressed hydrogen.
- **Feasibility Study:** An assessment of the practicality of a proposed plan or method.
- **Fossil Parity:** Happens when the use of renewable energies cost less than, or equal to, the price of using power from conventional sources such as coal, oil and natural gas (fossil fuels). Also known as grid parity.
- **Gas Blending (Hydrogen):** Hydrogen blending into natural gas pipelines/networks for large scale gas supply or energy storage.
- **Gasification:** The process of producing syngas under controlled conditions through partial oxidation of coal.
- **GHG:** Greenhouse Gas.
- **Green Hydrogen:** Produced through electrolysis of water using a renewable power source. Zero carbon emissions in production.
- **Grey Hydrogen:** Produced from methane or natural gas through steam methane reforming. Material carbon emissions released during production.
- **Grid Stabilisation (Hydrogen):** Hydrogen for use in stationary power generation for grid stabilisation – optimising power from base load for the power utility industry.
- **Guarantee of Origin:** Allows for a standardised process of tracing and certifying the provenance of hydrogen and the associated environmental impacts.
- **H₂:** Hydrogen in molecular form.
- **HDPE:** High Density Polyethylene; A hydrocarbon polymer prepared from ethylene/petroleum by a catalytic process; A kind of thermoplastic which is famous for its tensile strength and ability to withstand high temperatures.
- **Hydride:** A binary compound of hydrogen with a metal.
- **Hydrocarbons:** Hydrogen chemically bonded with carbon.
- **ICE:** Internal Combustion Engine.
- **IEA:** International Energy Agency; An autonomous intergovernmental organisation established to shape a secure and sustainable future for all.
- **Industrial Feedstock (hydrogen):** Hydrogen feed for various industrial processes to produce an end product, such as ammonium nitrate.
- **Industrial Separation:** The separation of CO₂ from other gases produced at large industrial process facilities such as coal and natural-gas-fired power plants, steel mills, cement plants and refineries.
- **Ion-exchange Membrane:** An ion-exchange membrane is a semi-permeable membrane that transports certain dissolved ions, while blocking other ions or neutral molecules. Ion-exchange membranes are therefore electrically conductive.
- **IPCC:** Intergovernmental Panel on Climate Change; The United Nations body for assessing the science related to climate change.
- **IRA:** Inflation Reduction Act (United States policy).
- **kW:** Kilowatts.
- **LCOE:** Levelised Cost of Electricity; A measure of the average net present cost of electricity generation for a generating plant over its lifetime. It is used for investment planning and to compare different methods of electricity generation on a consistent basis.
- **Liquefaction:** The process of making something, especially a gas, liquid.
- **LNG:** Liquefied Natural Gas.
- **LOHC:** Liquid Organic Hydrogen Carrier.
- **LPG:** Liquefied Petroleum Gas.
- **Material Handling:** Equipment used for the movement, protection, storage and control of products throughout manufacturing, warehousing, distribution and consumption processes.
- **Methylcyclohexane (MCH):** An organic compound classified as saturated hydrocarbon. It is a colourless liquid with a faint odour and can be used as a solvent. It is mainly converted in naphtha reformers to toluene.
- **MGO:** Marine Gasoil.
- **MJ/kg:** Mega joules per kilogram; A measurement of specific kinetic energy.
- **MMV:** Monitoring, Measurement and Verification; Plays a vital role in ensuring CO₂ storage site occurs over its entire lifecycle from pre-injection to operations to post-injection.
- **Mobility (Hydrogen):** Hydrogen for use in powering transport and other mobility applications including maritime, light and heavy vehicle.
- **MtCO₂:** Metric tons of carbon dioxide equivalent. A metric measure used to compare the emissions from different greenhouse gases based upon their global warming potential (GWP).
- **MWh:** Megawatt hour.

- **Net Zero Carbon Emissions:** Refers to achieving an overall balance between greenhouse gas emissions produced and greenhouse gas emissions taken out of the atmosphere.
- **NH₃:** Ammonia in molecular form.
- **Nm³/h:** Normal meter cubed per hour; Unit used to measure gas flow rate.
- **Oxy-Combustion:** Oxy-fuel combustion is the process of burning a fuel using pure oxygen, or a mixture of oxygen and fuel gas, instead of air. Since the nitrogen component of air is not heated, fuel consumption is reduced, and higher flame temperatures are possible.
- **PEM Technology:** Polymer Electrolyte Membrane; An electrolyser technology that creates a reaction using an ionically conductive solid polymer, rather than a liquid.
- **Petrochemicals:** The chemical products obtained from petroleum by refining. Some chemical compounds made from petroleum are also obtained from other fossil fuels, such as coal or natural gas, or renewable sources such as maize, palm fruit or sugar cane.
- **Pink Hydrogen:** Hydrogen through electrolysis when the electrical energy comes from nuclear power, as opposed to renewables.
- **Pipelines:** Long pipes, typically underground, for conveying oil, gas, hydrogen, etc. over long distances.
- **Post-Combustion:** The removal of CO₂ from power station flue gas prior to its compression, transportation and storage in suitable geological formations, as part of carbon capture and storage.
- **POX:** Partial Oxidation; Partial oxidation is a type of chemical reaction. It occurs when a substoichiometric fuel-air mixture is partially combusted in a reformer, creating a hydrogen-rich syngas which can then be put to further use, for example in a fuel cell.
- **PPA:** A power purchase agreement, or electricity power agreement, is a contract between two parties, one which generates electricity and one which is looking to purchase electricity.
- **Pre-Combustion:** Pre-combustion capture refers to removing CO₂ from fossil fuels before combustion is completed. For example, in gasification processes a feedstock (such as coal) is partially oxidized in steam and oxygen/air under high temperature and pressure to form synthesis gas.
- **Purple Hydrogen:** Also known as Pink Hydrogen.
- **Red Hydrogen:** Also known as Pink Hydrogen.
- **Refuelling Station:** Fuelling stations are repositories of fuel (including hydrogen) that have been located to service commercial and naval vessels.
- **Salt Cavern:** Artificial cavities in underground salt formations, which are created by the controlled dissolution of rock salt by injection of water during the solution mining process.
- **Sequestration:** Carbon sequestration is the process of capturing and storing atmospheric carbon dioxide. It is one method of reducing the amount of carbon dioxide in the atmosphere with the goal of reducing global climate change through either geologic or biologic methods.
- **Skid-Mounted Module:** A skid mount is a popular method of distributing and storing machinery and usually-stationary equipment. Simply put, the machinery at point of manufacture is permanently mounted in a frame or on to rails or a metal pallet.
- **SMR:** Steam Methane Reforming; A method for producing syngas by reaction of hydrocarbons with water. Commonly natural gas is the feedstock. The main purpose of this technology is hydrogen production.
- **Syngas:** A fuel gas mixture consisting primarily of hydrogen, carbon monoxide, and very often some carbon dioxide. The name comes from its use as an intermediate in creating synthetic natural gas and for producing ammonia or methanol.
- **Synthetic Hydrocarbons:** Synthetic liquid fuels (e.g. gasoline, diesel, jet-fuel equivalent).
- **tCO₂:** Total carbon dioxide; Measure of carbon dioxide which exists in several states.
- **Turquoise Hydrogen:** Produced when natural gas is broken down with the help of methane pyrolysis into hydrogen and solid carbon. The process is driven by heat produced with electricity, rather than through the combustion of fossil fuels. Where the electricity driving the pyrolysis is renewable, the process is zero-carbon.
- **UAV:** Unmanned Aerial Vehicles.
- **Vector:** An alternative substance, form or method of energy transportation such as transporting a gas in liquid form.
- **White Hydrogen:** A naturally-occurring geological hydrogen found in underground deposits and created through fracking.
- **Yellow Hydrogen:** Hydrogen through electrolysis when the electrical energy comes from grid electricity, as opposed to renewable.

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