UGS Glossary - English

Glossary of relevant technical Underground Gas Storage Terminology

Scope of Glossary
The glossary covers the relevant technical terminology related to the storage of natural gas in underground gas storage facilities. As the technology is similar, the terminology can be applied for the storage of hydrogen, CO_2, O_2 and other gases.

Term	Definition
Underground Gas Storage (UGS)	All subsurface and surface facilities required for the storage and for the withdrawal and injection of natural gas. Naturally or artificially developed containments in subsurface geological strata are used for the storage of natural gas. Several subsurface storage horizons or caverns may be connected to one common surface facility, which is referred to as the underground gas storage location
Type of Storage	There are several types of underground gas storage facilities, which differ by storage formation and storage mechanism: Porous rocks - Storage in aquifers - Storage in former gas fields - Storage in former oil fields Caverns - Storage in salt caverns - Storage in rock caverns (including lined rock caverns) - Storage in abandoned mines
UGS in Operation	Storage facility capable to inject and withdraw gas
Greenfield Storage Project	New underground storage development project, not based on any existing storage facilities
Storage Capacity	Total ability of a storage facility to provide working gas volume, withdrawal rate and injection rate
Inventory	Total of working and cushion gas volumes stored in UGS

Cushion Gas Volume (CGV) or Base Gas	Gas volume required in a storage field for reservoir management purpose and to maintain an adequate minimum storage pressure for meeting working gas volume delivery with the required withdrawal profile. In caverns, the cushion gas volume is also required for stability reasons. The cushion gas volume may consist of recoverable and non-recoverable in-situ gas volumes and injected gas volumes
Working Gas Volume (WGV)	Volume of gas in the storage above the designed level of cushion gas volume, which can be withdrawn/injected with installed subsurface and surface facilities (wells, flow lines, etc.) subject to legal and technical limitations (pressures, velocities, etc.). Depending on local site conditions (injection/withdrawal rates, utilization hours, etc.) the working gas volume may be cycled more than once a year (see annual cycling capability).
Withdrawal Rate	Flow rate at which gas can be withdrawn from storage fields and caverns, based on the installed subsurface and surface facilities and technical limitations.
Withdrawal Profile	Dependency between the withdrawal rate and the withdrawn working gas volume. The withdrawal profile and the time (utilization hours) required for withdrawal are indicative of the layout of an underground gas storage facility. The withdrawal profile usually consists of a constant rate (plateau) period (see 'Nominal Withdrawal Rate') followed by a period of declining rates.
Peak Withdrawal Rate	Maximum flow rate which can be delivered based on the installed subsurface and surface facilities and technical limitations. This flow rate is normally reached when the storage is at its maximum working gas volume, i.e. maximum allowable storage pressure. Also known as 'maximum design deliverability'
Nominal Withdrawal Rate	Withdrawal rate representing the deliverability of the subsurface and surface facilities available over an extended period of withdrawal (plateau period). This rate corresponds to the constant rate period of the withdrawal profile
Last Day Withdrawal Rate	Withdrawal rate which can be delivered based on the installed subsurface and surface facilities and technical limitations when the storage reservoir or cavern is at or close to its cushion gas volume

Injection Rate	Flow rate at which gas can be injected into a storage field and cavern, based on the installed subsurface and surface facilities and technical limitations
Injection Profile	Dependency between the injection rate and the injected working gas volume. The injection profile and the time (utilization hours) required for injection are indicative of the layout of an underground gas storage facility. The injection profile may include a period of declining rates close to maximum storage pressure
Annual Cycling Capability	Number of times the working gas volume can be withdrawn and injected on an annual basis
Undeveloped Storage Capacities	Additional storage capacities which could be developed in an existing underground gas storage, e.g.: by additional gas injection, increase of the maximum storage pressure, decrease of the minimum storage pressure, additional facilities (wells, re-compression) etc.
Storage Well	Well completed for gas withdrawal and/or injection
Observation Well	Well completed for the purpose of monitoring the storage horizon and/or the overlying or underlying horizons for pressures, temperatures, saturations, fluid levels, etc.
Auxiliary Well	Well completed for other purposes, e.g. water disposal
Abandoned Well	Well permanently out of operation and plugged
Initial Reservoir Pressure	Initial pressure conditions encountered in a porous formation before any change due to operation of the reservoir, for example: start of production or injection. The initial pressure is related to a reference depth/datum level. Also known as 'discovery pressure'
Maximum Allowable Storage Pressure	Maximum pressure of the storage horizon or cavern, normally at maximum inventory of gas in storage. This pressure has to be engineered in order to ensure the integrity of the storage field. The maximum allowable pressure is related to a reference/datum depth and normally has to be approved by authorities

Minimum Storage Pressure	Minimum pressure of the storage horizon or cavern, normally reached at the end of the decline phase of the withdrawal profile. The minimum pressure is related to a reference/datum depth. The minimum pressure of caverns has to be engineered and approved in order to ensure stability
Pressure Datum Level	Reference depth at the porous storage level, normally related to the sea level, used for pressure normalisation and correlation throughout the reservoir. In caverns the depth below surface of the last cemented casing shoe is normally used as the reference level for pressures
Depth Top of Structure/Cavern Roof Depth	Minimum true vertical depth from the surface down to the top of the storage formation/cavern roof
Caprock of a Porous Storage	Sealing formation for gas overlying the porous storage horizon. Caprock prevents the migration of oil and gas out of the storage horizon
Containment	Ability of the storage reservoir or cavern and the storage well completion to resist leakage or migration of the fluids contained therein. Also known as the integrity of a storage facility
Closure	Vertical distance between the top of the structure and the spill point
Spill Point	Structural point within a reservoir, where hydrocarbons could leak and migrate out of the storage structure
Areal Extent of the Storage Structure	Subsurface area of the storage formation at its maximum gas water contact extent
Cavern Convergence	Reduction in geometrical cavern volume caused by e.g. salt creeping. The annual reduction of the geometrical cavern volume is expressed by the convergence rate

Gas volumes are related to temperatures and pressures at normal conditions: 273,15 K (0°C) and 1,01325 bar