

Geological exploration of energy storage reservoirs

What is geological thermal energy storage (GeoTES)?

Geological Thermal Energy Storage (GeoTES) Charged with Solar Thermal Technology Using Depleted Oil/Gas Reservoirs and Carnot-Battery Technique Using Shallow Reservoirs: Preprint. Golden, CO: National Renewable Energy Laboratory. NREL/CP-5700-88744.

Why do we need geological reservoirs?

The identification of adequate geological reservoirs is a key component of the development and implementation of an energy storage technology.

Why is energy storage important in the geological subsurface?

Energy storage in the geological subsurface provides large potential capacities to bridge temporal gaps between periods of production of solar or wind power and consumer demand and may also help to relieve the power grids.

Can a geological reservoir be used as a storage technology?

After identification of the existing geological reservoirs, the feasibility of adopting a specific storage technology will be a function of a techno-economic analysis. Understanding which factors will influence more this techno-economic analysis will vary with the storage technology.

What are potential storage reservoir sites in the geological underground?

Potential storage reservoir sites in the geological underground mainly comprise salt caverns, saline aquifers, depleted hydrocarbon reservoirs and rock caverns. Adapted from . Essentially, a geological reservoir is prepared prior to injection, to effectively create an underground, pressurised storage container.

How can geological formations ensure large-scale energy storage?

One way to ensure large-scale energy storage is to use the storage capacity in underground reservoirs, since geological formations have the potential to store large volumes of fluids with minimal impact to environment and society.

This region enables the study of geological reservoirs from their formation to their current or future use (fluids, minerals, metals, storage, geothermal energy). The GER Master's ...

A successful CO₂ storage site necessitates the same elements as a petroleum system, except a source rock and a migration pathway. In other words, a CO₂ storage site requires a reservoir rock, a seal rock, and a ...

Numerous solutions for energy conservation become more practical as the availability of conventional fuel resources like coal, oil, and natural gas continues to decline, ...

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Geological conditions, reservoir evolution and favorable exploration directions of marine ultra-deep oil and gas in China ... and the storage space is composed of pores and ...

Carbon dioxide (CO₂) storage in oil and gas reservoirs is one of the most effective methods for enhancing hydrocarbon recovery efficiency and mitigating climate ...

Hydrogen has recently received a lot of attention owing to its potential to help in the storage and distribution of intermittent RESs and to provide energy system flexibility by making ...

To reduce emissions from the energy industry, companies worldwide are focusing on carbon capture, utilization, and storage (CCUS) projects. Additionally, energy storage in deep reservoirs, such as ...

To enable hydrogen as a low-carbon energy pathway, inter-seasonal or longer-term TWh storage solutions (e.g., 150 TWh required for the UK seasonal energy storage) will be required, which can be addressed by ...

Abstract. Transition to cleaner energy sources is crucial for reducing carbon emissions to zero. Among these new clean energy types, there is a growing awareness of the ...

Underground hydrogen storage in geological formations could be a cheap and environmentally friendly medium- and long-term storage route. Hydrogen can be stored underground in different layers such as aquifers, porous rocks, and salt ...

It is critical to have detailed characterization of the GeoTES reservoir to accurately predict important attributes such as the storage volume, fluid transmissivity within the ...

The exploration phase of MD-BTES involves identifying suitable geological formations for energy storage through boreholes. SKEWS, an acronym for "Saisonaler ...

By storing surplus electrical energy as compressed air in geological formations, CAES systems can pledge steady and dispatchable power during high-demand energy. This ...

depleted oil and gas reservoirs, deep coal seams, and saline formations, as well as other geological structures and media such as basalts, salt caverns, oil or gas shales, and ...

One main approach for CCUS application is through CO₂ sequestration into subsurface geological formations, which mainly include saline aquifers, depleted oil and gas ...

Nine papers in this collection are focused on this type of geothermal resources, from exploration to reservoir engineering aspects. Xu et al. used classical and integrated ...

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Reservoir characterization involves understanding and employing various methods to delineate reservoir heterogeneity (Lucia et al., 2003). According to Jia et al. (2012), this task ...

The global shift towards renewable energy sources and the accelerating adoption of electric vehicles (EVs) have brought into sharp focus the indispensable role of lithium-ion ...

This study offers a preliminary geological evaluation of the feasibility of converting fault-controlled fracture-type carbonate reservoirs into gas storage facilities and outlines ...

New techniques and methods for energy storage are required for the transition to a renewable power supply, termed "Energiewende" in Germany. Energy storage in the geological subsurface provides large potential ...

Geological H₂ storage plays a central role to enable the successful transition to the renewable H₂ economy and achieve net-zero emission in the atmosphere. Depleted oil and gas reservoirs are already ...

Exploration for geologic hydrogen resources is likely to employ many of the same strategies and technologies that are currently used in petroleum exploration, with some added elements taken from mineral and ...

Utilizing energy storage in depleted oil and gas reservoirs can improve productivity while reducing power costs and is one of the best ways to achieve synergistic development of ...

The two complementary datasets, from the landstreamer and nodal data, help to de-risk geological carbon storage in Denmark and is a solution we recommend to be adapted for ...

Urgent verification is needed for energy storage feasibility, for this reason, this paper combines the development history of CAES technology to research on the site selection ...

Idealized single-well natural gas storage schematic showing working gas and cushion gas. Figure source: Energy & Fuels 2003, 17, 240-246(esd.lbl.gov)

cannot be predicted by surface -based exploration methods. This way, the geologic models and their underlying uncertainties ... 2020). Suitable reservoirs for thermal ...

State Key Laboratory of Oil and Gas Reservoir Geology and Exploration As the first state key laboratory in the upstream field of China's oil and gas industry, the State Key Laboratory of Oil and Gas Reservoir Geology and ...

For these different types of underground energy storage technologies there are several suitable geological reservoirs, namely: depleted hydrocarbon reservoirs, porous ...

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This paper explores the potential of hydrogen geologic storage (HGS) in China for large-scale energy storage, crucial for stabilizing intermittent renewable energy sources and ...

The results of the Fenton Hill EGS project demonstrated the potential for in-reservoir energy storage (IRES) in such systems, wherein accumulated geofluid and reservoir ...

Through lab experiments, simulations, and field testing, we study the temperature, mechanics, hydraulics, and chemistry of geothermal reservoirs to understand what geologic conditions, such as depth or rock type, are most ...

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