

Is spatial planning a sustainable approach to subsurface use?

A sustainable approach to subsurface use therefore requires spatial planning for minimized competition and maximized synergies (ARL 2012; Gerling 2010; Bovet 2014).

Are thermal interactions among thermal subsurface uses a planning and exploration requirement?

To ensure the environmental and economic sustainability of an increasingly intensive geothermal use of the shallow subsurface especially in urban areas, Vienken et al. (2016) identified the consideration of thermal interactions among thermal subsurface uses as a planning and exploration requirement.

Where can excess energy be stored?

Converted to compressed air, hydrogen (H_2), synthetic methane (CH_4) or heat, excess energy can be stored in underground salt caverns (gas) or porous geological formations (gas and heat) in the subsurface.

How can a resource efficient and environmentally sustainable thermal use of the subsurface?

Therefore, a resource efficient and environmentally sustainable thermal use of the subsurface requires the parameterization of geological and hydrological conditions connected with the site exploration as well as cost-efficient methods for long-term monitoring of the thermal application (Vienken et al. 2016).

Can seismic FWI and electrical resistivity tomography detect thin gas phase?

Seismic FWI, electrical resistivity tomography (ERT) and gravity monitoring were tested virtually on the fully parameterized, synthetic scenario. Seismic FWI and ERT were shown to be able to identify the thin (order of meters) gas phase in the storage reservoir.

A spatial evaluation was conducted to determine the most suitable locations for establishing green hydrogen infrastructure. This involved utilizing GIS software to overlay normalized project objectives and criteria data. Each sub-criterion was represented as a separate map layer, leading to seven layers for spatial data analysis.

The hybrid energy storage system of wind power involves the deep coupling of heterogeneous energy such as electricity and heat. Exergy as a dual physical quantity that takes into account both ...

The dual map overlay analysis provides a clear visualization of the evolution and distribution of research in the field of electrochemical energy storage within China. This analysis demonstrates how the research field has increasingly intersected with various disciplines, showing a broad and dynamic integration within the Chinese research ...

In fact, because wind turbines (WTs) are installed in different positions on a wind farm, they can be influenced by complex terrain-driven flow, wind shear, and wake effects, and so, the wind field always exhibits spatial heterogeneity and nonstationary features. For example, the wake losses induced by interactions among

multiple WTs cause wind speed ...

Keywords: pumped hydroelectricity, wind farm, GIS applications, spatial analysis, energy storage. 2 Spatial Analysis . Introduction. ... field measurements taken at the potential sites,

The development of predictive maps for geothermal resources is fundamental for its exploration across Nigeria. In this study, spatial exploration data consisting of geology, geophysics and remote ...

For underground water-sealed oil storage, the spatial variability of the surrounding rock has a significant impact on the water-sealed effect of a water curtain system. This study presents a ...

Extensive research has been conducted on the importance of energy storage systems for improving the efficiency of new energy sources. For example, energy storage systems in some Middle Eastern countries, including Iran, can effectively improve the thermal efficiency of new energy sources such as solar energy, then can improve the efficiency of the ...

In Fig. 2 it is noted that pumped storage is the most dominant technology used accounting for about 90.3% of the storage capacity, followed by EES. By the end of 2020, the cumulative installed capacity of EES had reached 14.2 GW. The lithium-iron battery accounts for 92% of EES, followed by NaS battery at 3.6%, lead battery which accounts for about 3.5%, ...

Underground seasonal thermal energy storage (USTES) facilitates the efficient utilization of renewable energy sources and energy conservation. ... interaction spatial definition of heat flow field, and to explore the effect of load variation, including time effect, thermal inertia and delay characteristics, etc. ... Demonstration and analysis ...

Thermodynamic and economic analysis of a novel combination of the heliostat solar field with compressed air energy storage (CAES); a case study at San Francisco, USA Morteza Saleh Kandezi, Seyed Mojtaba Mousavi Naeenian

The use of GIS spatial modeling tools in several resource activities has helped to quantify processes and define models for deriving analysis products. Spatial data analysis and modeling in GIS can make calculations that are too tedious to do manually, and the output of analysis and model provides digital data that is useful for many kinds of ...

Pumped storage power stations in the power system have a significant energy saving and carbon reduction effect and are mainly reflected in wind, light, and other new energy grid consumption as well as in enhancing the proportion of clean energy in the power system [11, 12]. The use of pumped storage and photovoltaic power, wind power, and other intermittent ...

Large-scale mobile energy storage technology is considered as a potential option to solve the above problems

due to the advantages of high energy density, fast response, convenient installation, and the possibility to build anywhere in the distribution networks [11]. However, large-scale mobile energy storage technology needs to combine power transmission and ...

Situated in China's arid and semi-arid zones, the Xinjiang region heavily relies on groundwater for its freshwater supply. This study utilizes data from the Gravity Recovery and Climate Experiment (GRACE) satellite mission, covering the years 2003 to 2021, to quantitatively evaluate the temporal and spatial changes in groundwater storage anomalies (GWSA) in the ...

The PCM consists of a composite Field's metal having a large volumetric latent heat (315 MJ/m^3) and a copper (Cu) conductor having a high thermal conductivity ($384 \text{ W/(m} \cdot \text{K)}$), ... Review on heat transfer analysis in thermal energy storage using latent heat storage systems and phase change materials. Int. J. Energy Res., 43 (2019), pp ...

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