



# Shale gas energy storage

Does methane adsorption capacity determine shale storage capacity?

An essential indicator of shale storage capacity is the methane adsorption capacity, but additional information is needed. The challenge is to characterize the heterogeneous porous structures of shales and establish the amounts of methane stored as compressed gas and in the adsorbed phase.

Why is shale gas important?

Shale gas is becoming an increasingly important component of the natural gas supply as a result of the recent geopolitical security of supply issues. Shale gas extraction techniques have been developed and are widely used in the U.S. Natural gas production in the U.S. is increasingly driven by exports.

Can hydraulic fracturing provide underground energy storage in shale formations?

In this study, we propose a new underground energy storage technology based on hydraulic fracturing in shale formations (As shown in ). This patented technology utilizes underground artificial fractures created by hydraulic fracturing to store potential energy.

Does shale contain adsorbed gas?

Hao et al. (2013) suggested that adsorbed gas in shale is dominated by pressure at shallow depths, that is, the content of adsorbed gas in shale increases with burial depth. By contrast, the content of adsorbed gas in shale is controlled by temperature in deeper strata, which declines as burial depth increases.

How is gas stored in OM-rich shale?

5. Summary and further research directions Gas is stored mainly in free and sorption states in the nanoscale pores of OM-rich shale, which makes it different from coalbed CH<sub>4</sub> and tight gas. The sorption mechanisms of shale under real geological conditions should be highly complex due to the presence of pore water and non-hydrocarbon gases.

Which Shale is dominated by inorganic storage space?

(Ardakani et al., 2018; Gou et al., 2021a). Continental/marine-continental transitional shale with type II and/or type III kerogen is often dominated by inorganic storage space, and OM pores make little contribution to the total porosity (Gao et al., 2018; Kuang et al., 2020; Xiao et al., 2021).

Shale gas resources are proving to be globally abundant and the development of these resources can support the geologic storage of CO<sub>2</sub> (carbon dioxide) to mitigate the ...

Building upon this work, as well as an assessment by the U.S. Energy Information Administration (USEIA) that provides a "first-order" view of the gas in-place and technically ...

Abstract We consider the feasibility of a novel Carbon Capture, Utilization and Storage (CCUS) concept that



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consists in producing oil and gas from hydrocarbon-rich shales ...

Overall, An XGBoost model with optimal input features is developed in this work, which exhibits both good performance in gas adsorption prediction and good potential for the ...

Broader context The production of shale gas has been drastically increased because of the development of hydraulic fracturing. Though shale gas is a much cleaner energy resource compared to coal and oil, hydraulic ...

Subjects such as heat storage, cavern monitoring and stability, gas or air cooling, constant pressure or constant volume approaches, cycle time and energy extraction, ...

The CO<sub>2</sub>-enhanced shale gas recovery (CO<sub>2</sub>-ESGR) technique is a promising method for enhancing shale gas production and sequestering of CO<sub>2</sub>. In this study, a two-component gas flow model in ...

Traditional energy storage methods often struggle to simultaneously meet the demands of long storage duration, large capacity, high efficiency, and low cost. In this study, ...

(4) Gas storage in shale generally consists of free gas existing in mesopores, macropores, and fractures, adsorbed gas that fills pore throats or adsorbed chiefly on the pore surface, and absorbed gas ...

Shale gas, which is a relatively low-carbon, clean energy with vast resources, offers a viable alternative to current carbon-intensive energy sources and bridges the gap between energy supply and demand. ...

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For shale gas reservoirs, the combined study of adsorbed and absorbed gases provides a better description of gas storage mechanism and characterizes the origina

The proposed one can estimate the hydrogen volume in fractures and matrix systems, and get the actual underground storage volume through pressure response, ...

Interactions between injected CO<sub>2</sub> and shale formation during the process of CO<sub>2</sub> sequestration with enhancing shale gas recovery (CS-EGR) may alter the physical and chemical properties of the rock, ...

Results indicate that Marcellus unconventional shale reservoirs could support both short- and long-term energy storage at capacities of 100-1000 kWe per well. The results ...

Shale gas from unconventional resources will contribute to meeting the energy demand during the transition to a net-zero carbon economy. In this minireview, the current status of understanding methane ...



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Abstract Seasonal underground hydrogen storage in depleted shale gas reservoirs (UHS-shale) could be a feasible technical option for large-scale hydrogen storage, in ...

In this study, we focus on using on-site renewable energy and energy storage to deal with intermittency in renewable energy for decarbonized liquid hydrocarbon production ...

This study investigates the potential of depleted horizontal shale gas wells as hydrogen storage repositories using a numerical model of a hydraulically fractured depleted ...

We tested short-term (diurnal) and long-term (seasonal) energy storage potential by modeling well injection and production gas flowrates as a function of bottom-hole pressure.

CO<sub>2</sub>-enhanced shale gas recovery (CO<sub>2</sub>-ESGR) could efficiently recover gas with synchronous carbon sequestration, which is safer and more reliable than that in conventional reservoirs due to adsorption. ...

Our study analyzed factors that impact energy storage capacity and efficiency, which provides a theoretical basis for optimizing hydraulic fracturing design for energy storage. ...

The results highlight the potential of shale gas reservoirs to store hydrogen as no hydrogen is adsorbed on the shale surface, so there will be no hydrogen loss and no ...

This study explored using shale gas wells and natural gas injection in a manner similar to EOR but with the goal of energy storage. considered Shale wells for energy storage assumwere that ...

This study investigates gas storage and transport in shale formations by using a predictive species-based model that considers the transport of free and sorbed phases through ...

In this study, a two-component gas flow model in shale reservoirs considering the stress-strain-sorption behavior of shale during the CO<sub>2</sub>-ESGR process was developed.

However, its properties, seasonal fluctuations, and the lack of extended energy stability made it extremely difficult to be economically and safely stored for a long term in recent years. Therefore, this paper ...

Presents the first review of underground hydrogen storage in depleted shale gas reservoirs. Integrates recent advances in biogeochemical reactions, surface and interfacial ...

The outcomes confirm that Yanchang shale gas formation can effectively sequester CO<sub>2</sub> while enhancing energy sustainability, making them valuable case studies for ...

Among many factors affecting shale gas exploration potential, the gas-bearing properties of shale (quantity,



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storage state, composition) and their controlling factors are the essential...

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