Synthetic methane energy storage

What is synthetic methane?

Synthetic methane,or e-methane,is a so-called electrofuel. These 'e-fuels' are made from two raw materials: hydrogen that's produced from water via electrolysis (preferably using renewable energy),and CO 2 captured from the air around us or exhaust gases.

Is synthetic methane production economically feasible?

A feasibility study of synthetic methane production focusing on green H 2 production is conducted to investigate how to make the technology economically feasible. Cost estimation for methane production is performed by classifying various scenarios of H 2 production based on water electrolysis technologies and renewable energy resources.

Is synthetic methane a viable alternative to fossil fuels?

According to an increase in concerns for environmental issues,the energy transition toward sustainable and alternative energy has received much attention. Synthetic methane,which is a fuel synthesized by the reaction of green hydrogen (H 2) and carbon dioxide (CO 2),is perceived as a promising alternativeto fossil-fuel-based natural gas.

What are the applications of synthetic methane?

Most of the current industrial applications of methane are essentially in petroleum or natural gas markets,and as such,synthetic methanation is limited to removal of CO 2 and CO during steam methane reforming in processes such as ammonia production.

Do we need hydrogen or methane storage on-site?

In this operating strategy,there is no needfor hydrogen or methane storage on-site. Fig. 4 shows the calculated methane production costs for different electricity prices. The methane production costs in 2030 are in the range of 33.60EUR/MWh for an electricity price of 0EUR/MWh and 204.82EUR/MWh for an electricity price of 100EUR/MWh.

How can methane be stored and transported?

The methane can be stored and transported,in either liquid or gas forms,using the existing infrastructure. At the Swiss and German sites,the synthetic methane was injected directly into existing gas grids consisting of pipelines and underground storage tanks. The methane content was more than 99 %,which is higher than conventional gas supplies.

City gas companies are testing synthetic methane technologies and advancing plans to import synthetic methane toward transitioning away from fossil fuels. ... When using hydrogen produced through water electrolysis powered by renewable energy, emissions are essentially considered zero. ... storage tanks designed for LNG, and city gas piping can ...

energy model to ensure the supply of electricity in times of low wind or sunlight availability, for example in winter in Central Europe [7]. An often-named motivation in literature for the production of synthetic methane (e-methane) is the storage of excess electricity because large gas storage facilities exist in Europe [8]. However, from an ...

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. Storage options include storage of synthetic methane, hydrogen or compressed air in salt caverns or porous formations as ...

An ever-increasing global energy demand with subsequent development in solar and wind energy systems has made the compelling case for investigations on renewably powered synthetic reactors for the production of hydrogen and hydrogen carriers as a means of energy ...

Hydrocarbons have high power density and energy, thus playing an important role in power vehicles. Compared to traditional fuels such as hydrogen, kerosene, and monomethyl hydrazine, methane has a higher energy density and ...

The synthesis of methane from hydrogen and carbon dioxide creates an energy resource that is suitable for long-term storage. Once this process is powered by renewable electricity, it produces a clean fuel for producing electricity and heat and supports large-scale renewable energy deployment, energy transition and climate change mitigation. This paper ...

A.2 Renewable Energy Directive and Fuel Quality Directive 91 B Production capacity of electrolysers 93 ... For synthetic methane to be considered a zero emission fuel, the hydrogen would have to stem from water electrolysis, using water and renewable electricity as inputs; the CO 2 would have to be "recycled 2" and could be captured from