United States Hydrogen Gas Storage Market Assessment, By State [Physical-based (Gas, Liquid, Others) and Material-based(Chemical Hydrogen, Adsorbent, Interstitial Hydride, Others)], By Storage Type [Pressurized Composite Vessels, Fiber Reinforced Composite Vessels, Cryo-Compressed Vessels, Others], By Technology [Geological Based, Compression, Liquefaction, Material Based, Others], By End User [Energy & Industry (Nuclear Plant, Power Grids, Others), Mobility(Shipment, Heavy Transport, Others), Space Exploration, Others] By Region, Opportunities and Forecast, 2016-2030F

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Report description:

United States Hydrogen Gas Storage Market size was valued at USD 322.5 million in 2022, expected to reach USD 1187.79 million in 2030 with a CAGR of 17.7% for the forecast period between 2023 and 2030. The rising awareness of climatic change and concerns has led the government to focus on building reliable and safe green hydrogen storage and transportation systems. With the continuous efforts to reduce emissions and carbon-based fuels, the importance of hydrogen fuel cells can be accounted as it assists in creating a greener solution to the power development projects including small electronic devices to huge carrying vehicles, aviation, and the human community. Storage and transportation are substantially important for hydrogen fuels because building proper hydrogen storage can be explored for its utilization. The growing investment for innovative technologies to store hydrogen is rising exponentially, creating a huge potential for the United States to expand economically.

Underground Hydrogen Storage (UHS) is gaining credibility across the United States which is a long-duration, low-emission alternative that helps to balance supply and demand for a whole electrical grid. Installation of grid power stations extensively requires clean hydrogen and effectively reduces toxic gas emissions. Apart from UHS other storage technologies such as high-pressurized vessels are particularly significant in storing hydrogen and other natural gases. The continuous effort for new innovations and technological advancements of clean hydrogen is expected to unveil the expansion and development of hydrogen gas storage market in the United States.

Underground Storage Potential

Hydrogen as a carbon-free energy carrier is gaining commercial importance because it carries effective potential for cost-effective and carbon-free energy storage and transport. Underground hydrogen storage (UHS) across the United States can store around 327 TWh (9.8 MMT) of pure hydrogen. Existing underground gas storage facilities are an essential source to store and deliver gas which will meet the demand for hydrogen storage projects by 2050. Its cost-effective system can explore the positive characteristics of UHS along with a smaller surface footprint. In addition to these advantages, it restricts safety risk factors such as surface-ground gas ignition and natural and manmade disaster such as soil erosion, flooding, etc. Considering pure methane storage, the current working-gas energy (WGE) of operating underground storage in the United States is around 1,282 TWh, and an estimated reduction of cumulative WGE by the transition of methane to pure hydrogen can be achieved by about 75% (327 TWh).

Meanwhile, Mitsubishi Power has begun constructing a 300 GWh underground storage facility in Utah state (United States) comprising two caverns with capacities of around 150 GWh, exclusively storing hydrogen produced by a massive 840 MW hydrogen-capable gas turbine adjoined cycle power plant. With significant investment by various energy companies underground gas storage has a positive market growth for a long time.

Hydrogen as a Fuel

Hydrogen is generally considered a potential fuel with near-zero greenhouse gas emissions. The transportation sector accounts for 14% of greenhouse gas emissions, where strategies are continuously developing to transition to 100% renewable energy. Hydrogen-powered fuel cells extensively drive various transport applications due to the pollution-free energy source. Concerning transportation, hydrogen can be used in three different applications such as fuel-cell electrical vehicles (FCEVs), hydrogen combustion engines, and hydrogen-methane-mixtures for combustion engines. While burning, fuel cell-electrical vehicles (FCEVs) only emit water vapor and warm air, which puts an advantage on conventional internal combustion engine vehicles.

Car manufacturers are implementing solutions that store highly pressurized hydrogen in gaseous form, such that an appropriate amount of storage allows FECVs to run for 500-600 km between the refueling stations. The required hydrogen fuel cell allows only high purity composition to prevent any probability of catalyst poisoning because even a trace (ppm or ppb range) can impart severe effects on the performance of fuel cells. The significance of FECVS using hydrogen as a fuel is one of the significant factors for investors exploring opportunities that are creating massive potential for the hydrogen gas storage market.

Impact of COVID-19

The COVID-19 pandemic has led to unprecedented disruptions across supply chains and technologies which caused severe reduction in investment across green energy alternatives. The economy of the United States also showed unusual consequences where the havoc and fear led to the shutdown of producing green hydrogen and its storage and transportation, despite the challenging circumstances, investment across such domain instigated to bring economy and concern to environment back to the track. An estimated report for United States concluded that by 2030 the exploded hydrogen boom in the green energy sector could yield around 700,000 employments across various sectors. Hydrogen-powered fuel vehicles are growing in demand, which has the potential to compensate for the consequences of COVID-19.

Impact of Russia-Ukraine War

The annexation of Russia on Ukraine has developed sternness in energy security, leading to a rise in fuel prices. Green hydrogen-based fuels can resemble a prominent role in the decarbonization strategy where carbon emissions are difficult to achieve. The soaring oil and gas prices have urged the United States to find alternatives such as fossil-produced hydrogen and find favorable ways to accelerate investment plans in clean hydrogen assets. In August 2022, under the Inflation Reduction Act (IRA) the United States commenced significant strategies for generating clean hydrogen. In October 2022, the cost of pure green hydrogen ranges between USD 3.8 to 5.8 per kg, and the impact of war has led to lower prices in a very short time interval. The

progressive efforts by the United States to reduce its dependence on importing oil and gas have derived them from building green hydrogen as an alternative fuel source. This is creating a massive opportunity for the United States hydrogen gas storage market to expand and rise and motivate investors towards it.

Key Players Landscape and Outlook

Energy sector companies are heavily investing in sustainability goals to develop technologies for producing green energy and adequate storage. Mitsubishi Power, a segment of Mitsubishi Heavy Industries (MHI), is constructing an underground hydrogen storage system that covers a large area of 4,800 acres of land. Deep underground in the form of salt domes (salt caverns) where each dimension of 67m in diameter and 580m in height is constructed for storing hydrogen produced from renewable energy. Bloom Energy Corp. is considered one of California's most prominent green hydrogen companies that has exclusively installed over 900 MW of fuel cells. The company's technology benefited from government incentive strategies like the Inflation Reduction Act. (IRA). The government policies are booming energy industries to build hydrogen fuel from renewable sources, driving investors to lead the market in different sectors.

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