India 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 (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:

India Hydrogen Gas Storage Market size was valued at USD 101.9 million in FY2023, which is expected to reach USD 286.5 million in FY2031 with a CAGR of 13.8% for the forecast period between FY2024 and FY2031. Hydrogen is the first element with various characteristics, such as being lightweight, energy-dense, and available in storage form. Advanced technologies are being implemented to produce clean hydrogen. In August 2021, the government of India commissioned the 'National Hydrogen Mission.' It approved the capital of USD 2,647.22 million (INR 19,744 crores) to build a hydrogen ecosystem in the country. Under the scheme, the government has selected 10 potential states, which include Maharashtra, Karnataka, Odisha, Gujarat, Rajasthan, etc., that will assist in leading countries to achieve sustainable goals.
The advancements in hydrogen fuel cell technology have emphasized the importance of the transportation industry, where the government is building new facilities to explore the progress in hydrogen fuel cells in various modes of transportation such as railways, aviation, waterways, etc. The availability of adequately stored green hydrogen at an affordable price will transform major heavy industries, including steel, refinery, fertilizers, and automotive, reducing the dependency on fossil fuel imports.

Storage Demand Owing to Hydrogen Reserves and Transportation

India's government policies and geographical demographics are enriched in regulations and resources that favor hydrogen expansion which renders hydrogen an extreme potential for building a hydrogen economy. With suitable constraints on an estimation, India has a first-order storage potential for underground hydrogen storage where it can store around 22610 terawatt-hours (TWh) of hydrogen in deep saline aquifers. India comprises major sedimentary basins covering prominent zones in different locations such as the Mumbai offshore (2163TWh), Rajasthan (1211.5TWh), Krishna-Godavri (1788.8), Cauvery and Cambay basins (342.9TWh) having high storage potential for hydrogen storage.

Across the country and within the industry, there are different modes of storage and transportation of hydrogen gas. Before transportation, it must comply with specific regulations, and hydrogen must be compressed or liquified to make transportation cost-effective. Three approaches are generally defined for hydrogen storage and distribution that are extensively under operation. Hydrogen distribution with pipelines, hydrogen transport using trucks and trailers, hydrogen storage, and tank transportation. Channel channels are usually favored over various other transportation modes within the industry or long-distance transportation. Depending on the configuration, hydrogen pipelines are made of metal or plastics, which can either be adjoined with existing pipelines or developing new channels exclusively for hydrogen transport. Thus, the demand for gas storage for hydrogen is driven by the significant surge in demand for sustainability.

Green Hydrogen Compliances

In December 2022, India approved and amended the Energy Conservation (Amendment) Bill, which under the National Green Hydrogen Mission program, led to incentivizing the commercial production of clean hydrogen and deriving the nation from becoming a significant exporter worldwide. Under the program, the invested capital is divided into different aligning projects related to green hydrogen, such as USD 2,145.67 million (INR 17,490 crore) for SIGHT (Strategic Interventions for Green Hydrogen Transition), USD 49.07 million (INR 400 crore) for R&D on green hydrogen, USD 179.84 million (INR 1466 crore) for pilot projects. The commissioned program also inspires to promote the instigation of new projects developing electrolyzer equipment to achieve demand for alternative fuels for industrial applications. The role of Green Hydrogen becomes prominent for India, which has already assigned the target to become energy dependent by 2047 and achieve Net Zero by 2070.

The research for developing proper storage and transport infrastructure is undergoing rapidly under the central program to make India a massive green hydrogen exporter. Particularly for the storage and transportation of hydrogen under the green hydrogen projects, there are regulatory entities to derive compliance with the associated tasks. The Explosives Safety Organization is responsible for regulating explosives materials (gases) and their storage facilities, and Petroleum & Natural Gas Regulatory Board accounts for controlling the implementation of pipelines for the transportation of fuels.

Impact of COVID-19

The COVID-19 pandemic has led to unprecedented economic crises, which also affected the clean hydrogen sector in India and has imposed a long-term disruption to industry growth. The COVID-19 outbreak has consequently affected the global supply chain, government engagement towards industrial development, market structure, etc. During the pandemic, hydrogen demand fell severely and collapsed, subsequently affecting the prices of raw materials and technologies for producing hydrogen. After the pandemic rollout, several measures were taken by the India government to promote investments by enhancing international cooperation. The government urges giant energy sector companies to increase their production to accomplish a green hydrogen market and utilize the fuel source across various sectors.

Impact of Russia-Ukraine War

The prolonged Russia-Ukraine war has negatively impacted India's economy, especially in the energy sector. It has slowed down India's efforts in achieving renewable energy and climate change targets. India imports around 2.5 million tons of LNG from Russia, and they are focusing on increasing the imports as Russian LNG is cheaper than from other gas importer countries. India is prioritizing strategies to produce green hydrogen for decarbonizing its electricity sector, transport, and more efforts on hard-to-abate sectors like fertilizers, steels, alloys, etc.

Key Players Landscape and Outlook

India is the third largest polluter of harmful particulates, and the government is prioritizing its decarbonization goal and Asian energy transition. Adani Green Energy derives vast potential in transforming India's energy sector and imparts a significant role in providing affordable, clean, and reliable green hydrogen. In June 2022, Adani Group partnered with TotalEnergies SE, where an

investment of over USD 5 million was accomplished in instigating vast green hydrogen development-the joint venture targets to produce an equivalent amount of 1 million tons of green hydrogen by 2030. In addition to the project, the company is also involved in operating Kamuthi Solar Power Project, one of the largest solar photovoltaic plants. Thus, these developments are expected to drive the market of hydrogen gas storage in India.

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