

Hydrogen – A Clean & Green Energy!

Dr. Sitaram Dixit, Chairman – Consumer Guidance Society of India (CGSI)

The International Energy Agency (IEA) in its fresh executive report, “The Future of Hydrogen – Seizing Today’s Opportunities” prepared for the June 2019, G 20, Japan, summit states, begin quote, “*This is a critical year for hydrogen. It is enjoying unprecedented momentum around the world and could finally be set on a path to fulfil its longstanding potential as a clean energy solution. The time is right to tap into hydrogen’s potential to play a key role in a clean, secure and affordable energy future. To seize this opportunity, governments and companies need to be taking ambitious and real-world actions now*”, end quote.

Contrastingly adopting hydrogen, as a potential energy fuel is now actually or seems considerably unrealistic and implausible due to current technological development and governmental policy, even though it is also true that most countries and governments today are keen supporters in harnessing hydrogen as a clean energy source, so that it benefits their national consumers, foster innovative technology, trade and industrial development, create skilled jobs for its people, in addition to protecting the environment. Apart from government organizations, some private companies, viz., industrial gas and utilities producers, renewable electricity providers, automobile makers and engineering firms are also showing interest and investing in the hydrogen value chain.

Hydrogen is an important raw material in the chemical industry primarily used as a reducing agent in oil refining, fertilizers, for the making methanol and ammonia, for removing unsaturated double bonds in several molecules, including unsaturated oils and fats during the preparation of hydrogenated vegetable fat or Vanaspati. Adopting in sectors where it is now practically absent like power generation and transport is very much necessary if it must make any noteworthy contribution to clean energy practice.

Basic chemistry teaches us that combining hydrogen with oxygen gives us energy and water, seemingly a very simple reaction to produce clean and green energy. However, to initiate this reaction itself, needs energy and if one must use fossil fuels like coal, oil, gas, etc., to maintain superior efficiency in a commercially operating scale, it defeats the actual purpose, since it only increases pollution and that too at an exorbitant cost. Firstly, it is imperative that we de-couple carbon emissions from energy production and produce clean and green energy. Carbon and particulate emissions from the iron and steel manufacturing companies, transport vehicles, chemical industrial sectors, etc., leads us to serious air pollution problems that cause about 3 million premature deaths worldwide, more significantly in developing countries like India, where it becomes graver with every transient day. Hydrogen, undoubtedly as an energy source, could play a vital role, not only in tackling the critical energy crisis we face today, but also significantly reducing general pollution and averting overall environmental degradation.

Hydrogen gas is nifty and versatile by nature. Modern technology available today can produce hydrogen from a renewable energy source fuels, like nuclear, solar, wind, water, natural gas apart from traditional fossil fuels like oil and coal. Storing and transporting hydrogen for regular consumer use is also possible. Hydrogen can be liquefied and shipped like liquid natural gas (LNG). We can also transport hydrogen through gas pipelines a very popular method already in regular use in oil refineries and ammonia plants. Transforming hydrogen into electricity and storing it in fuel cells or converting it into methane gas for use in home and industry as fuels to drive cars, trucks, ships and planes is also possible.

Hydrogen is a viable low-cost option for storing electricity even for several months from variable output renewables, like solar photovoltaic (PV) and wind energy. Transporting hydrogen and hydrogen-based fuels got from areas with plentiful solar and wind

resources, to energy deficient regions of the world is also possible thus balancing energy offtake in step with commercial supply and consumer demand.

The International Energy Agency, identifies about four short-term opportunities to boost hydrogen usage and drive down costs.

1. Making industrial ports the central precinct for scaling up the use of clean and green hydrogen fuel. Use hydrogen to fuel ships, trucks and other vehicles serving the ports and support nearby industrial units to shift over to using hydrogen instead of fossil fuels, natural gas or coal.
2. Build and make use of existing infrastructure, namely lengthy kilometers of natural gas pipelines to ferry hydrogen.
3. Expand hydrogen usage in transport through convoys, merchandise and trade passages. Make use of hydrogen to power high mileage vehicles to carry passengers and goods along common prevalent paths thereby making travel by fuel-cell transport vehicles more viable.
4. Launch international shipping routes in hydrogen by leveraging lessons from the positive development of the worldwide LNG market.

The International Energy Agency, believes that the recent success to achieve “electrical grid parity” with non-conventional methods to produce electricity from wind, solar photovoltaic batteries, etc., augers well, assuredly silencing cynic critics, who unfailing point out all the earlier false starts had with hydrogen, in spite of favorable government policy support, fiscal incentives, doles and subsidies. Use of hydrogen in buildings, transport and in power generation still faces stiff commercial challenges. Today, hydrogen produced at an industrial scale is almost entirely by use of fossil fuels, coal and natural gas (contributing to large carbon emissions) as it is commercially more economical than producing hydrogen from low-carbon renewable energy source.

The International Energy Agency, study estimates that by 2030 the cost of producing hydrogen from renewable electricity will fall by over 30% due to hydrogen production scale ups and falling costs of renewables, propelling breakthrough innovations and mass manufacturing of fuel cells, refueling equipment and electrolyzers (which produce hydrogen from electricity and water) all leading to significant lower costs. Apart from lower cost, developing necessary local hydrogen infrastructure, like say, refueling stations for easy consumer use is mandatory, requiring closer planning and cooperation between all stakeholders’ viz., national and local governments, industrial investors, consumer, etc. Government and industry should invest in research and development (R&D), ensure regulations that do not create investment barriers, adopt common international safety and trade standards in storing, transporting and tracing any environmental impacts due to large volumes of different hydrogen supplies that will materialize internationally.

Most consumers are price conscious individuals expecting value for their money spent. Easy availability and bearable prices will largely determine the willingness of consumers to accept hydrogen and hydrogen-based products, regardless of what technological advantage or benefit it is likely to offer. International co-operation and commencement of hydrogen trade alone will speed up growth, making an impact on the global energy system. A coordinated governmental approach to scale up hydrogen gas manufacture and use, can help spur infrastructure investments, bring down costs, enable sharing of scientific knowledge and best practices. Our simple common-sense cautions, that rushing through massive energy transition is futile and a cautious graded approach is much more viable. Only time will tell if all the stakeholders will get together and make this possible so that the consumer and our environment will eventually benefit from this hydrogen economy.