International Journal of Engineering Sciences & Research Technology

(A Peer Reviewed Online Journal)
Impact Factor: 5.164

IJESRT

IJESRT
INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

HYDROGEN: THE FUTURE ENERGY CARRIER

Pankaj P. Jadhav
Student, Dept. of Electrical Engineering, Dr. Babasaheb Ambedkar Technological University, Lonere Raigad, Maharashtra(India)

DOI: 10.5281/zenodo.3865887

ABSTRACT

Clean hydrogen is enjoying unprecedented political and business momentum, with the number of policies and projects around the world expanding rapidly. Further acceleration of efforts is critical to ensuring a significant share of hydrogen in the energy system in the coming decades. Per unit of energy, hydrogen supply costs are 1.5 to 5 times those of natural gas. Low-cost and highly efficient hydrogen applications warrant such a price difference. Also, decarburization of a significant share of global emissions will require clean hydrogen or hydrogen-derived fuels. Currently, significant energy losses occur in hydrogen production, transport and conversion. Reducing these losses is critical for the reduction of the hydrogen supply cost.

KEYWORDS: energy carrier, Hydrogen, electrolytes, Fuel cells.

1. INTRODUCTION

A hydrogen-based energy transition will not happen overnight. Hydrogen will likely trail other strategies such as electrification of end-use sectors, and its use will target specific applications. The need for a dedicated new supply infrastructure may limit hydrogen use to certain countries that decide to follow this strategy. Therefore, hydrogen efforts should not be considered a panacea. Instead, hydrogen represents a complementary solution that is especially relevant for countries with ambitious climate objectives.

2. HYDROGEN AND RENEWABLES

Hydrogen can help tackle various critical energy challenges. It offers ways to decarbonizes a range of sectors – including intensive and long-haul transport, chemicals, and iron and steel – where it is proving difficult to meaningfully reduce emissions. It can also help improve air quality and strengthen energy security. In addition, it increases flexibility in power systems.

Hydrogen is versatile in terms of supply and use. It is a free energy carrier that can be produced by many energy sources.

Hydrogen can enable renewables to provide an even greater contribution. It has the potential to help with variable output from renewables, such as solar photovoltaic (PV). Hydrogen is one of the options for storing energy from renewable and looks poised to become a lowest-cost option for storing large quantities of electricity over days, weeks or even months. Hydrogen and hydrogen-based fuels can transport energy from renewable sources over long distances.

3. HYDROGEN USE AND FUTURE PROJECTIONS

Around 95% of all hydrogen is generated from natural gas and coal. Around 5% is generated as a by-product from chlorine production through electrolysis. In the iron and steel industry, coke oven gas also contains a high hydrogen share, some of which is recovered.

The vast majority of hydrogen today is produced and used on-site in industry. The production of ammonia and oil refining are the prime purposes, accounting for two-thirds of hydrogen use. Ammonia is used as nitrogen fertilizer and for the production of other chemicals. At petroleum refineries, hydrogen is added to heavier oil for transport fuel production.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

4. A SHIFT TOWARDS PRODUCTION OF GREEN HYDROGEN

Water can be converted into hydrogen and oxygen using an electrolyser and electricity. Electrolysis plays a central role in the deployment of renewable hydrogen. In terms of hydrogen usage, the emphasis has shifted. Whereas 15 years ago transport was at the centre of all developments, the field of applications has recently broadened with much more emphasis on stationary applications in industry and the buildings sector, as well as feedstock for chemical products. On one hand, the falling costs of renewable power have increased the appeal of these stationary applications; on the other hand, the urgency of climate action has increased and now constitutes a key driver.

Efforts to ramp up green hydrogen and hydrogen use for the energy transition are increasing in many countries, with an emphasis on larger-scale, more power system-friendly electrolysis.[2] Projects have moved into the megawatt-scale; however, further R&D, mass production and learning-by-doing is needed to achieve significant cost reductions. The trend in recent years indicates exponential growth in project scale.

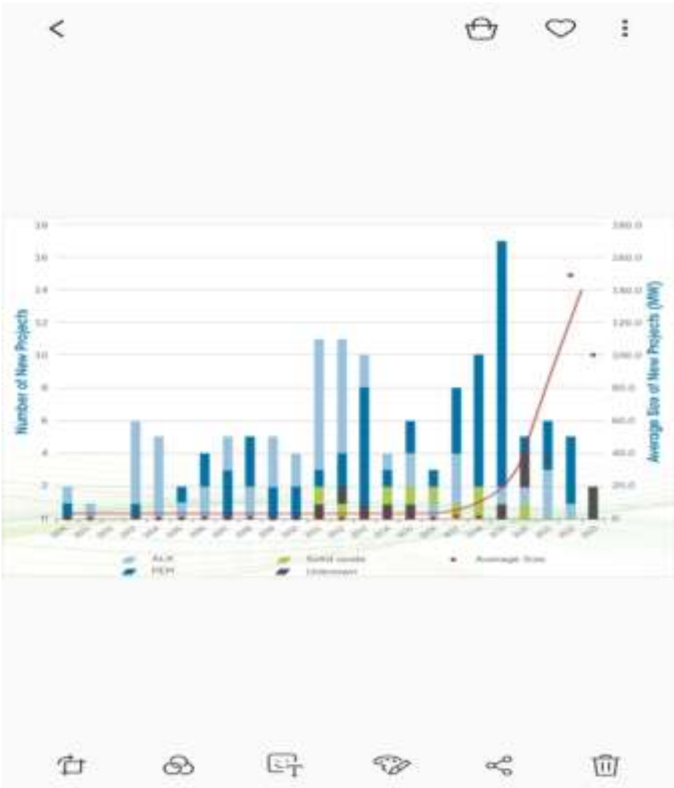

Chart-1: Timeline of Power to hydrogen projects by electrolytes

One option is the production of hydrogen from fossil fuels with CO_2 capture and storage (CCS), so called blue hydrogen. Blue hydrogen has been proposed as a bridging solution as the cost of producing hydrogen from renewable power decreases. It offers a prospect of continuity to fossil fuel producers, and it can help to meet climate objectives at acceptable cost. While producing large volumes of blue hydrogen could be important to support increasing hydrogen demand as well as kick-start global and regional supply chains for hydrogen and hydrogen-derived fuels

5. CONCLUSION

In order to combat limited resources, primary energy has to be converted into heat and electricity. Electricity is partially used directly and also used to produce CO_2-neutral synthetic fuels, which do not increase climate change. The science and technology for the conversion of renewable energy as well as the synthesis of fuels from electricity, water and CO_2 is of great economic value because developing countries in Asia are becoming

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

large market areas. Therefore, the new technology would allow the challenge of the increasing energy demand to be solved and would liberate heavily industrialized countries in the West from their economic dependence on fossil fuels.

REFERENCES

[1] G.D.Rai "Non-conventional Energy Sources," Science-1988
[2] Kim J, Lee Y, Moon I, "Optimization of hydrogen supply chain under demand uncertainty", 2008
[3] Balat M. "Potential importance of hydrogen as future solution to environmental and transportation problems", 2008.