



Energy independence through hydrogen

- India's Green Hydrogen Policy 2022 has addressed several critical challenges such as open access, waiver of inter-state transmission charges, banking, time-bound clearances, etc., and is expected to further boost India's energy transition.
- Hydrogen fulfils the three Es of India's energy road map — energy security, energy sustainability and energy access — and India should strive to seize one more E, viz. economic opportunity so that industry can be encouraged to its full potential.

Need for energy independence:

1. India's per capita energy consumption is about one-third of the global average and one-twelfth of the U.S. Increasing growth and economic prosperity would significantly increase India's energy appetite furthering import dependence.
2. This, coupled with volatility in prices, as seen during the Russia-Ukraine crisis and the roller-coaster ride of energy prices from historic lows in 2020 to record highs in 2021, could pose a serious threat to our energy security, accentuating an unequivocal need to strive for energy independence.

Hydrogen: The new age fuel

1. It is touted as India's gateway to energy independence. Hydrogen has a multifaceted role to play in the futuristic energy landscape, be it energy storage, long-haul transport, or decarbonisation of the industrial sector.
2. In the long run, two envisioned prominent fuels are hydrogen and electricity. Though both are energy vectors, hydrogen can be stored on a large scale and for a longer duration explicitly affirming its huge potential to become a great balancer to the ever-increasing supply of variable renewable energy.
3. It will complement and accelerate renewables into India's clean energy transition, thereby supporting India's ambitious plan to achieve 500 GW of renewable capacity by 2030.
4. Hydrogen has a major role to play in the decarbonisation of India's transport sector. The advantages of fuel cell vehicles over battery electric vehicles are faster fuelling and long-driving range thereby making them ideal for long-haul transportation which is a major constraint with Li-Ion batteries.

5. In the industrial segment, hydrogen can de-carbonise 'hard-to-abate' sectors such as iron and steel, aluminium, copper etc. It is a huge prospect to produce fuels such as methanol, synthetic kerosene and green ammonia.

Electricity and water demand would increase

1. Transition to hydrogen through electrolyzers and renewable energy means an exponential increase in electricity demand

2. Apart from the ever-increasing electricity demand, the high cost of hydrogen manufacturing and water scarcity could also pose a challenge. Production of 1 kg of hydrogen by electrolysis requires around nine litres of water.

Five-step strategy: Demand-side

1. On the demand side, a five-step strategy should be devised. Firstly, to create an initial demand, a mandate should be given to mature industries such as refining and fertilisers, with adequate incentives.
2. Secondly, industries manufacturing low emission hydrogen-based products inter alia green steel and green cement need to be incentivised by government policies.

HCNG is hydrogen-enriched compressed natural gas (CNG).
In Delhi, instead of physically blending hydrogen with CNG, hydrogen-spiked CNG will be produced using compact reforming process patented by Indian Oil Corporation

- It is cleaner and more economical; power output of HCNG engine is also better than CNG ones
- 4-tonne-per-day** production plant will come up at DTC's Rajghat-1 bus depot by December
- 50 CLUSTER BUSES WILL RUN ON HCNG**
- ₹40cr** cost of HCNG plant
- 6-month** pilot project will start in January

BENEFITS OF HCNG

- 4%** more fuel economy than CNG
- 70%** more reduction in carbon monoxide emissions compared to CNG
- 4%** more fuel economy than CNG

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3. Thirdly, blending hydrogen with natural gas can act as a big booster shot which can be facilitated by framing blending mandates, and regulations and promoting H-CNG stations.
4. Further, to promote FCEVs, hydrogen fuel stations may be planned on dedicated corridors where long-distance trucking is widespread.
5. Lastly, the concept of carbon tariffs needs to be introduced on the lines of European countries.

On the supply side

1. Firstly, investment in R&D should be accelerated to bring its cost at par with fossils.
2. Secondly, the Sustainable Alternative Towards Affordable Transportation (SATAT) scheme with a target to produce 15 MMT of compressed biogas could be leveraged by exploring biogas conversion into hydrogen.
3. Thirdly, to commercialise and scale-up nascent technologies, a Viability Gap Funding (VGF) scheme may be introduced for hydrogen-based projects.
4. Further, to secure affordable financing, electrolyser manufacturing and hydrogen projects need to be brought under Priority Sector Lending (PSL).
5. Lastly, since two dominant cost factors for green hydrogen are renewable energy tariffs & electrolyser costs, and India has the advantage of one of the lowest renewable tariffs; the thrust should be on reducing the cost of electrolysers by implementing the Production Linked Incentive (PLI) scheme. This could help India become a global hub for electrolyser manufacturing and green hydrogen.

Transport sector:

1. On the transportation front, ammonia, having a high energy density could be promoted as a mode of transportation.
2. A hydrogen transportation system could also be built on the foundation created for natural gas by using its existing infrastructure. Additionally, hydrogen transportation projects may be integrated with PM Gati Shakti Master Plan.



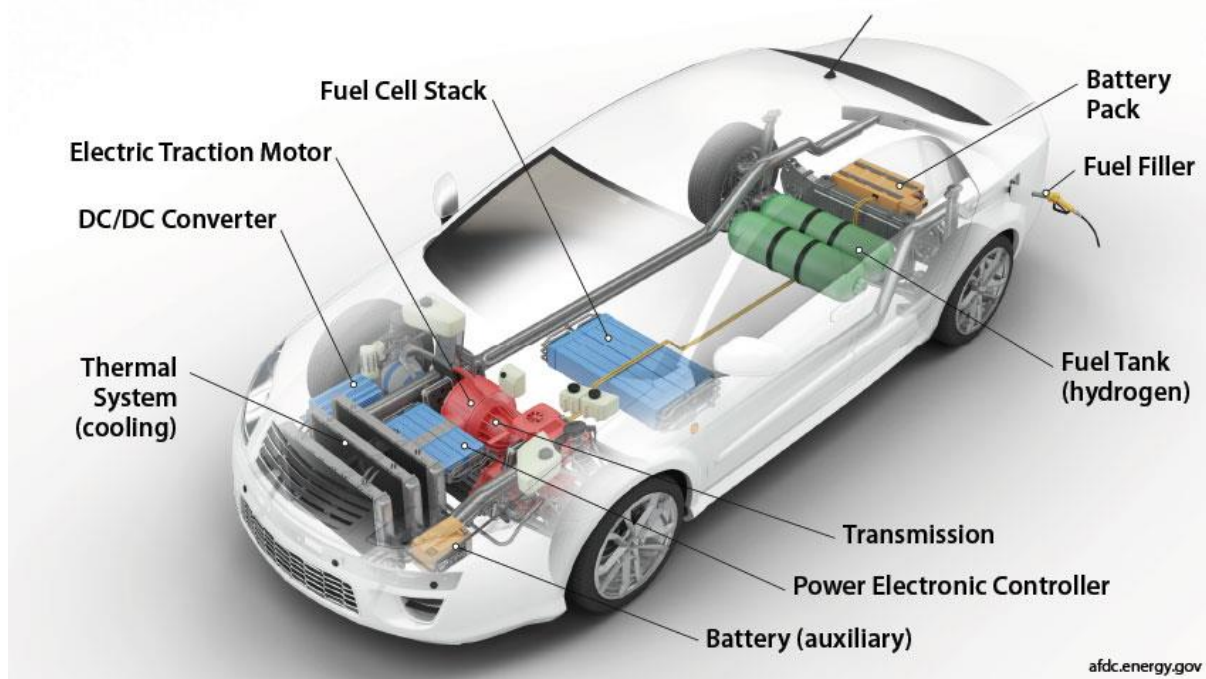
Climate action and import independence:

1. Hydrogen could completely transform India's energy ecosystem by shifting its trajectory from an energy importer to a dominant exporter over the next few decades. India could export to projected future import centres like Japan, South Korea, etc.
2. With hydrogen, India could lead the world in achieving Paris Agreement's goal to limit global warming to 2°C compared to pre-industrial levels. Hydrogen could lay the foundation for a new India which would be energy-independent; a global climate leader and international energy power.

In COP 26, Prime Minister Narendra Modi had given a clarion call of Panchamrit (five goals), with an ambitious target to achieve Net Zero by 2070. Hydrogen will certainly play a decisive role in India's Net Zero ambition and in making India 'Aatmanirbhar in energy'.

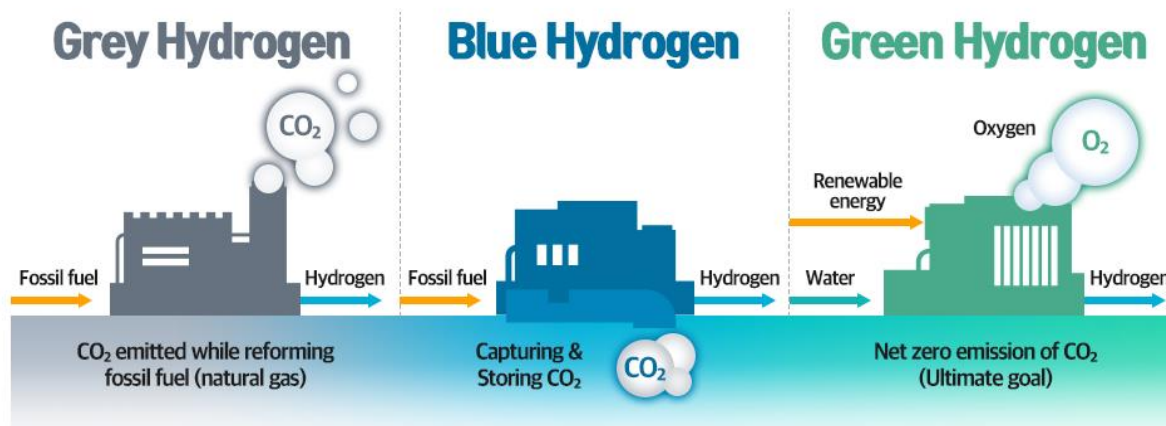
Hydrogen fuel cell electric vehicle working

Hydrogen Fuel Cell Electric Vehicle





Types of hydrogen



Building back to avert a learning catastrophe

1. A joint report by UNESCO, UNICEF and the World Bank, '*The State of the Global Education Crisis: A Path to Recovery*', released in December 2021 had estimated that in the first 21 months of the pandemic, schools in countries around the world were either partially or fully closed for an average of 224 days.
2. During the same period, schools in the Indian States were closed for physical classes, for almost twice the duration, i.e., between 450 days to 480 days.
3. Since the publication of this report, the Omicron variant (B.1.1.529) of the SARS-CoV-2-led surge globally, and the resultant third wave of COVID-19 in India further delayed the re-opening of schools.
4. By March or early April 2022, when re-opened, schools in India had cumulatively closed for physical classes for around 570 days to 600 days — one of the longest school closures in the world.

What the challenge is

1. The recurring discourse on whether to move to hybrid classes or when to close schools is proving a big distraction from more pressing challenges in school education, namely, 'the learning loss'. It is time we plan and act to ensure learning recovery.

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2. Studies have shown that every month of school closure results in the loss of learning ability lags by two months. By that calculation, the learning of children in India has gone back by almost three years.
3. So now that schools are reopening, we cannot start as if nothing has happened.

Bringing all to school:

1. First, the re-opening of schools does not mean that all children have begun returning to school. It is time the Education Departments in every State lead the process so as to ensure that every school in every district ensures that no child has dropped out from the education system and that every eligible child is enrolled.
2. Special attention is needed for the enrolment of all children and girls, especially poor, backward, rural, urban slum-dwellers.

Learning recovery

1. Second, the learning loss during the last two years is humongous and 'learning recovery' should be the priority of every State government.
2. There has to be a focus on the need to assess the learning level of children and then strategise for learning recovery.
3. The mentor teacher initiatives in government schools in Delhi is proof of the potential of what can be achieved if teachers are supported well.

Increase allocations

1. In India, government spending on education accounts for about 3% of GDP, which is almost half the average for the education spending of low- and middle-income countries. The time has come for both the Union and State governments in India to increase financial allocation for school education.

Mental health services and counselling sessions

1. Fourth, there are studies and reports that mental health issues and needs in school-age children have doubled in the pandemic period. This calls for making provision for mental health services and counselling sessions for school-age children.
2. In early March 2022, 20 school health clinics were opened in Delhi and every State needs to start similar initiatives to strengthen school health services.

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3. These initiatives should lay the foundation for more comprehensive approaches such as 'health-promoting schools'.

The supplementary nutrition programme in schools

1. Fifth, mid-day meal services have resumed after a gap of two years. There are 12 crore children in India whose nutritional status is dependent on these school meals.
2. Any disruption in the supply of school meals also means a lack of sufficient nutrition for these children, and thus their weakened immunity and higher susceptibility to various infections.

Social, moral responsibility

It is time to recognise that the risk of COVID-19 in children is very low and far lower than other prevalent health concerns such as dengue, malaria and typhoid and that the benefit of in-person education is far greater than any risk. Real learning does not happen within the four walls of homes or through online classes but it happens when teachers and other children are in school.