

India must embrace green hydrogen

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Opinion

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Green hydrogen (Representation image)

The global carbon emissions from fossil fuels reached a record high in 2024. According to the World Meteorological Organisation, Earth's average surface temperature temporarily hit 1.5°C above the pre-industrial era in 2024. Global warming of 1.5°C above pre-industrial levels is considered a threshold beyond which we may start experiencing the worst impacts of climate change. Keeping this value below 1.5°C is a key target in international climate negotiations.

The temporary breach of the “1.5°C” target is a warning that we are closer to irreversible climate change. We are nearing a tipping point after which limiting future global warming may not be possible. There is thus an urgent need to intensify climate change mitigation efforts. Decarbonising the economy is at the heart of climate change mitigation since it addresses the primary driver of global warming: emissions of greenhouse gases particularly carbon dioxide. Decarbonising the economy implies reducing or eliminating carbon dioxide emissions from industrial activities.

This is done by stopping the use of fossil fuels like coal, oil and gas which emit carbon dioxide into the atmosphere. Transitioning from fossil fuels to clean and renewable energy sources, improving energy efficiency and adopting carbon capture technologies are key steps towards decarbonizing the economy. While the transition to solar and other renewable energy sources is picking up pace, it is still slow looking at the increasing impacts of climate change which are occurring faster than predicted. The on-going slow green energy transition can be boosted with green hydrogen technology.

Adoption of green hydrogen can fuel the kind of renewable energy revolution we need today. While the use of hydrogen in industry is not new, “green hydrogen” is a new concept that has emerged in this century. Hydrogen is a colourless gas and is rarely found in its free molecular form. To use it in industry requires the extraction of hydrogen from its compounds such as water or hydrocarbons. When hydrogen is extracted from hydrocarbons like natural gas or coal, this process results in greenhouse gas emissions. Hydrogen extracted in this way is called grey (natural gas) or black/brown (coalbased) hydrogen. The carbon emitted during the production of hydrogen from hydrocarbons can be captured and stored or sequestered so that it does not enter the atmosphere. When this add-on process is included, the hydrogen produced is referred to as blue hydrogen. Blue hydrogen is considered better than grey or black/brown hydrogen but is still not the best option since it does not eliminate carbon emissions altogether.

Green hydrogen, on the other hand, is the cleanest form of hydrogen and is mainly generated from water using renewable energy sources. Splitting water into hydrogen and oxygen through a process called electrolysis requires electricity; hydrogen so produced is called green hydrogen only when this electricity is generated from renewable energy sources like solar or wind energy. Green hydrogen production does not use fossil fuels or emit carbon emissions into the atmosphere. It can be used as a clean fuel for power generation, transportation and in industrial processes. Green hydrogen can also replace fossil fuels in difficult to decarbonise industries such as chemicals, steel and in cement manufacturing. Green hydrogen is thus an expressway to achieving India’s net-zero emissions target.

India has already launched a National Green Hydrogen Mission to promote green hydrogen as a clean energy source. Awareness about green hydrogen remains limited mainly because using hydrogen as fuel is not new and there is lack of clarity in stakeholders between grey and green hydrogen. According to a World Economic Forum 2024 report on Green hydrogen enabling measures roadmap for adoption in India, industry players need to be made aware of technology developments taking place around

them in such new sectors. Academic and research institutes need to play their part by setting up knowledgesharing industry consortiums and helping generate awareness. Government agencies also need to pitch in with incentives to create parity between prices of grey hydrogen (currently cheaper) and green hydrogen. Greater public understanding is crucial for support and advocacy.

Raising awareness about multiple benefits of green hydrogen through media campaigns and stakeholder engagement will help in its widespread adoption thereby helping combat climate change. Green hydrogen is a clean fuel and energy carrier that can also be used for storing surplus renewable energy. It can be produced using renewable energy powered electrolysis of water which requires careful planning in installing such units. Materials for electrolysis should be efficiently sourced and recycled. Research for making green hydrogen production more efficient should start but the transition to green hydrogen must continue since the window to act on climate change is closing. The urgency to transition away from fossil fuels requires that we engage all hands on deck; novel solutions like green hydrogen should be utilized hand-in-hand with all other renewable energy options.

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- Atmosphere
- Carbon Dioxide
- carbon emissions