Hydrogen Horizons - Powering Tomorrow Sustainably

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Hydrogen: Fuel of the Future?

1. Why is hydrogen called an energy carrier and not an energy source?

Hydrogen is called an *energy carrier* because it stores and delivers energy but doesn't occur freely in nature in usable form. It must be *produced* using energy from other sources (like electricity from solar, wind, or fossil fuels). Just like electricity, hydrogen can be *used to transport energy* from the place of production to the place of use. That's why it's a carrier, not a source.

2. What are fuel cells, and how do they work?

Fuel cells are devices that convert chemical energy into electrical energy through a clean electrochemical reaction – usually between hydrogen and oxygen.

Here's how it works:

• Hydrogen enters the anode side → electrons are stripped → travel through an external circuit (creating electricity).

• Meanwhile, protons move through an electrolyte to the cathode where they combine with oxygen and electrons → producing only water and heat. No smoke, no pollution – just clean power.

3. List two global companies or countries investing heavily in hydrogen energy.

• Japan – A pioneer in hydrogen tech; Tokyo even used hydrogen-powered vehicles during the Olympics!

• Hyundai (South Korea) – A global leader in hydrogen fuel cell vehicles (like the Hyundai NEXO).

Other honorable mentions: Germany, Australia, Toyota, Shell, and Tesla.

4. What challenges exist in using hydrogen fuel at a large scale?

Hydrogen's got potential, but it's not all sunshine and rainbows. Major challenges include:

• Storage Issues: Hydrogen is super light and explosive – needs high-pressure tanks or cryogenic tech.

• High Production Cost: Clean hydrogen (green hydrogen) is still expensive due to tech limitations.

• Infrastructure Gaps: Very few hydrogen refueling stations worldwide.

• Energy Loss: Energy is lost during electrolysis, compression, and conversion in fuel cells.

5. What is the status of India in producing electricity through Hydrogen Fuel Cells?

India is stepping up big time. With its National Hydrogen Mission, launched in 2021, India is aiming to become a global hub for green hydrogen.

Key updates:

• Companies like Reliance, NTPC, and Indian Oil are investing in hydrogen tech.

• Pilot projects for hydrogen buses and stations have started in cities like Delhi and Bengaluru.

• Focus is on using solar and wind energy to produce hydrogen. We're not there yet, but the train has definitely left the station.