National Hydrogen Mission [UPSC Notes]

What is National Hydrogen Mission?

National Hydrogen Mission mission also called National Hydrogen Energy Mission was an initiative to make the best use of Hydrogen which is one of the most abundant elements on earth. The main goal of this mission is to take advantage of this cleaner fuel.

- On the 75th independence day, the Prime Minister of India announced the hydrogen policy. Under this policy, India is targetting 3/4th of its hydrogen from renewable sources by 2050. This mission will also help to reach sustainable climate goals.
- Hydrogen is considered a potential fuel that can replace fossil fuels in the future. India's target for 2022 is to generate 175 GW of renewable energy, and 450 GW of renewable energy by 2030, and this mission is expected to boost this process. This mission will put an emphasis on the hydrogen from clean energy sources.

Types of Hydrogen

Generating electricity from hydrogen does not produce pollution because the by-product is only the heat and water. However, the process of producing hydrogen can cause pollution. On the basis of the source of production, hydrogen can be classified into the following types.

- Grey Hydrogen- Hydrogen from hydrocarbons is called grey hydrogen. This is the most common method for hydrogen production currently. It produced carbon dioxide as a by-product.
- Black/Brown Hydrogen- this process involves transforming coal into gas. But this process causes high pollution and carbon dioxide and carbon monoxide are released into the atmosphere.
- Blue Hydrogen- it is the hydrogen produced from hydrocarbons where the emissions generated from the process can be captured and stored. They are stored underground by industrial carbon capture storage (CSS). This is a better alternative compared to grey hydrogen.
- Green Hydrogen- just like the name goes, green hydrogen is generated from renewable sources like wind and solar. During the process, electricity splits water into hydrogen and water. By far this is the cleanest way of hydrogen generation.

Green Hydrogen

Green hydrogen is the hydrogen produced by splitting water into hydrogen and oxygen with the use of renewable electricity. It is an efficient and clean energy carrier.

- Hydrogen is found in organic compounds, water, petrol, natural gas, propane, and methanol. Hydrogen as a fuel can be sued in existing internal combustion engines and turbines directly. It is also an alternative for electricity generation.

- Hydrogen in the transport sector has proven to be more beneficial compared to other alternatives. Additionally, it is possible to store hydrogen on board.
- The Hydrogen policy would be a crucial step that would help the government to meet the target of producing 5 million tonnes of Green Hydrogen by 2030.
- The green hydrogen policy would aid in the government's efforts in achieving the commitments made at COP 26.

Features of National Hydrogen Mission

National Hydrogen Mission will lead to producing clean fuel, and it would reduce India's dependence on fossil fuels and crude oil imports. Below mentioned are the features of the National Hydrogen Energy Mission

- Green hydrogen manufacturer can store their renewable power for up to 30 days by coordinating with the distribution companies. The companies may get distribution licensees at concessional prices.
- The manufacturing companies of green hydrogen will get a tax-free inter-state transmission for 25 years.
- Make sure of "grid to market" connectivity to ensure on-time delivery and attract investors.
- Single Portal to ease the business process and activities
- Manufacturers can set up their infrastructure near the ports for trading activities but they have to pay charges to the representative port authorities.
- **The objective of the National Hydrogen Mission-** boost production to meet the domestic demand and to become an exporter of Green Hydrogen.

Activities Carried out under National Hydrogen Energy Mission

- Goal-oriented development and research
- A robust framework for regulations of hydrogen technologies
- To create infrastructures and volumes
- Demonstrations in niche applications

Green Hydrogen in India

- Due to the favorable geographic conditions, India has a huge advantage in harnessing the power of hydrogen and producing hydrogen.
- The demand for hydrogen in India is at around 6 metric tonnes per year, mainly from industry sectors.
- The demand for hydrogen is expected to rise by at least 5-fold by 2050. This means by 2050 the demand for hydrogen will be around 28 MT due to cost reduction, advancements in technology, and initiatives to reduce carbon footprint.
- Production of green hydrogen in India can become cost-effective in the future while will ensure self-sufficiency and energy security.
- The government has scaled up the gas pipeline infrastructure, and also introduced reforms for the power grid and smart grids. These steps would definitely integrate renewable energy.

Challenges in National Hydrogen Mission

- One of the major challenges for using hydrogen commercially is the economic sustainability of extracting blue hydrogen or green hydrogen.
- The technology used for the production and use of hydrogen is at the nascent stage and it is expensive as well which again leads to the high cost of production of hydrogen.
- The high maintenance cost of the fuel cells of a plant is a challenge as well. Using hydrogen for commercial purposes requires a huge investment in technology and infrastructure, storage, transportation, and demand creation for hydrogen.

Need for National Hydrogen Mission

Following are the reasons behind the promotion of the National Hydrogen Energy Mission in India

- Electricity generation in India is majorly dependent on fossil fuels which are nonrenewable. If hydrogen can replace fossil fuels and help in energy production then pollution will be reduced to a large extent. Additionally, the import of coal will be reduced as well.
- Hydrogen is energy efficient, and lighter and it is the most abundant element on the earth. Harnessing the power of hydrogen would help the transportation, iron, steel, and chemical industries immensely.
- Proper implementation of this policy would lead to clean fuels and reduce the dependence on crude oil imports, and fossil fuels.
- Plastic and bio can be converted into hydrogen and the hydrogen missions would help to tackle twin problems of energy security and waste management.

With increasing investment in R&D, compatible legislation, capacity building, and the opportunity for demand creation India is at advantage. It is expected that initiatives can propel India to become a hub of hydrogen power. Also soon India will start exporting hydrogen to its neighbors and beyond.