Uttar Pradesh Green Hydrogen Policy

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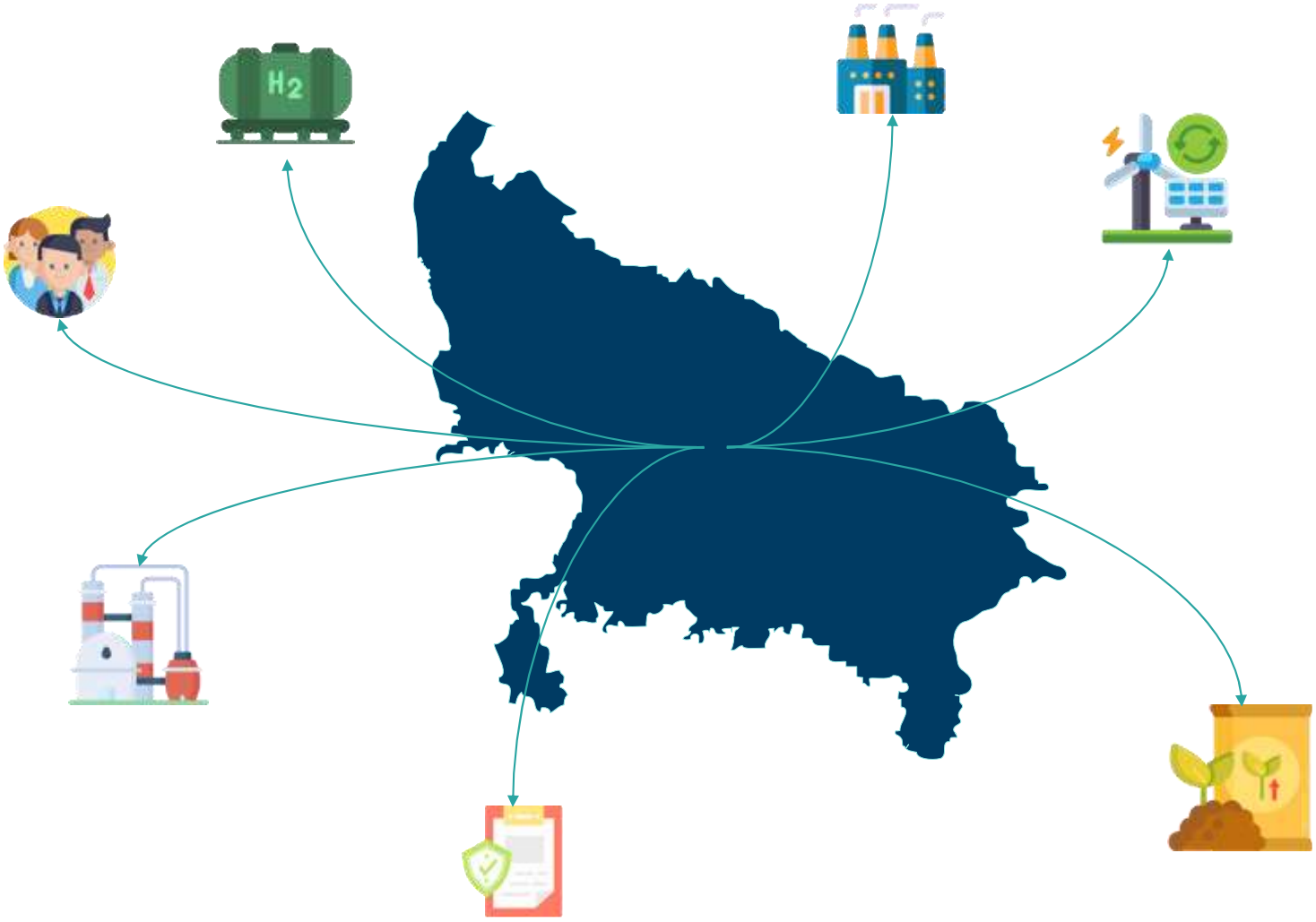

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1. Preamble

Green hydrogen as a clean energy molecule and industrial feedstock will be critical in achieving a net zero future. Currently, green hydrogen is much more expensive than the grey hydrogen produced using natural gas. However, the markets and policy environment, while nascent, are fast evolving and providing an impetus to evolve green hydrogen demand across sectors. The global green hydrogen market is expected to grow nearly 40 percent annually until 2030[i] further accelerating to USD 2.5 trillion by 2050[ii] buoyed by climate commitment and push to decarbonise hard-to-abate sectors like petrochemical, ammonia, steel, heavy duty trucking, shipping, and aviation.

In India too, green hydrogen has emerged as one of the crucial levers underpinning the country's 'Atmanirbhar Bharat' vision. India's commitment to achieving net zero by 2070 also places a strong policy signal for all the stake holders toward deep decarbonisation priorities at the national and sub-national levels. The Government of India-led *'National Green Hydrogen Policy 2022'* and *'National Hydrogen Mission 2022'* will be transformational anchors in the coming decade to achieve Prime Minister's vision of India becoming a global hub for green hydrogen. The national efforts are starting to set the foundation for building a conducive green hydrogen economy, thus providing opportunities for states to come forward with their policy efforts.

Uttar Pradesh is India's third largest state economy (310billion USD[1]),contributing 8 percent to the national Gross Domestic Product (GDP).[iii]The state's existing 'Industrial Investment and Employment Promotion Policy 2017' carved a pathway for industrial expansion and attracted investments for regional development.[iv]The state stands to establish a benchmark of "SabkaSath, Sabka Vikas, and Sabka Vishwas", with the ambition of becoming a 1 trillion USD economy by 2030.[v]

Within this context, the Government of Uttar Pradesh (UP) recognises the opportunity and necessity to take immediate actions in the collective effort towards net zero goal while ensuring economic development and just transition. The Government of UP has been nominated as nodal agency to UPNEDA vide Govt order no 773/87-2022-23/Ati.urja/2022 dated 29th august 2022 and proposes the **'Uttar Pradesh Green Hydrogen Policy 2022'** to promote growth and employment in the state while prioritising decarbonisation and the state's contribution to India's climate goals. The policy shall promote green hydrogen/ammonia production, market creation, and demand aggregation. The policy shall ensure a conducive ecosystem in the state to support its ambition to be a leading green hydrogen/ammonia economy.

2. Definitions

i. **"Electrolyser":** A "Electrolyser" is a system or device that uses electricity to split water molecules into hydrogen and oxygen, thereby producing hydrogen gas as a sustainable source of clean energy.

[1]2022 prices; Real GDP at constant prices. Accessed from RBI state statistics available at: https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=20678. Necessary conversions undertaken to convert 2011-12 INR prices to 2022 USD prices.

ii. **"Energy Transition":** Energy transition is an energy paradigm revolution. In the case of the current energy transition, this means the transition from non-renewable energy sources to renewable sources.

iii. **"Net Zero":** Net zero means cutting greenhouse gas emissions to as close to zero as possible, with any remaining emissions re-absorbed from the atmosphere by oceans and forests, for instance.

iv. **"Nitrogenous (N-) Fertilisers":** Nitrogenous Fertiliser refers to one of the most common categories of fertilisers produced out of nitrogen (N) chemical combinations. In N-fertilisers, the nitrogen percentage is more significant than any other nutrient in the compound.

v. **"Green Hydrogen/Ammonia":** Green Hydrogen/Ammonia are produced by the process of electrolysis of water using renewable energy or using banked renewable energy. Biomass-based hydrogen, produced using pyrolysis of biogas or other biomass products, is also classified as green hydrogen.

vi. **"Grey Hydrogen"**:Grey hydrogen is produced from natural gas, or methane, using steam methane reformation but without capturing the greenhouse gases made in the process.

vii. **"Hydrogen Valley":** A "Hydrogen Valley" is a geographical area – a city, a region, or an industrial cluster – where several hydrogen applications are combined into an integrated hydrogen ecosystem that consumes a significant amount of hydrogen, improving the economics behind the project.[vi]

3. Policy Overview

3.1. Title of the policy

This policy shall be known as the '***Uttar Pradesh Green Hydrogen Policy 2022***' (here after 'Policy')

3.2. Scope of the policy

The policy shall support production, consumption, market creation, and other elements across the green hydrogen/ammonia value chain. Green hydrogen has a large potential for uptake in Nitrogenous (N-) Fertilisers, Chemicals, Refineries, Heavy-duty vehicles, Energy storage and Iron and Steel sectors. In the near term, this policy shall focus primarily on **two major hydrogen/ammonia demand centres in the state of UP – Nitrogenous (N-) Fertilizers and Refinery**. The policy shall also cover other emerging industries and applications of green hydrogen in the future.

The policy envisions to begin the state's journey of becoming a green hydrogen/ammonia economy through focused support on these specific sectors. The chemicals & fertilisers, and refineries sectors contribute to nearly 50 percent and 5 percent of UP's industrial emissions,[vii] respectively. Thus, promoting green hydrogen/ammonia in these sectors could help address more than 50 percent of the state's industrial emissions.

3.3. Operative period

The policy shall come into effect on the date of its notification. It shall remain **valid and operational for the next five years ('Operative Period')**or until the government amends this policy or notifies a new policy..

3.3. Vision and Objectives

The vision of the policy is to **make Uttar Pradesh a leading green hydrogen/ammonia economy in India**. It aims to provide a conducive green hydrogen ecosystem for new and existing investments, promote inclusive growth, support innovation, and implement solutions for the holistic and sustainable development of the state. The state envisions to promote green hydrogen/ammonia as the foundational pillar for the green energy transition in UP and make the state ready for a net-zero economy in the future.

Objectives:

1. Enable ease of doing business for setting up and promoting investments in green hydrogen/ammonia production facilities and green hydrogen-based products manufacturing units.
2. Encourage innovation in green hydrogen/ammonia production and consumption technologies to reduce the cost of green hydrogen/ammonia to competitive levels.
3. Advance infrastructure development, such as pipeline networks, renewable (RE) capacities, etc., across the green hydrogen/ammonia value chain to promote the emergence of new manufacturing units and hydrogen valleys.
4. Stimulate green hydrogen/ammonia market creation by providing fiscal and non-fiscal incentives.
5. Develop a green hydrogen/ammonia-ready workforce and generate employment opportunities through a skill development programme.

3.4. Targets

The Government of Uttar Pradesh shall be a leading green hydrogen/ammonia producer and a 100 percent green hydrogen/ammonia consuming state by 2035.In the policy period, the Uttar Pradesh Green Hydrogen Policy 2022 envisions achieving the following targets:

1. Reduce green hydrogen cost to 2.0 USD/Kg in the policy period and make efforts to decline it further to 1 USD/Kg in long-term.
2. Achieve 20 percent green hydrogen blending in total hydrogen consumption of the state by 2028 for existing fertiliser and refinery units, reaching 100 percent by 2035.
3. Set up state centre of excellence (CoE) to lead research, development, and techno-economic innovation activities.
4. Achieve the number one rank in the ease of doing business index based on the Business Reform Action Plan (BRAP) recommended by the Department of Industrial Policy and Promotion (DIPP)

4. Framework of change

The Government of UP shall exemplify a green hydrogen/ammonia economy for the country. The policy's change framework shall align with the state's vision of 'SabkaSath, Sabka Vikas, andSabka Vishwas'. The framework will be using 6-I principles: *1.Intent, 2.Investment, 3.Innovation, 4.Infrastructure, 5.Inclusiveness, and 6.Integration.*

Six principles of UP's change framework:

1. **Intent:** The state shall keep the purpose of 'SabkaSath, Sabka Vikas, and Sabka Vishwas' a priority, along with the vision and objectives described in this policy.
2. **Investment:** The state shall promote investment through a conducive business ecosystem for the private players across the green hydrogen/ammonia value chain.
3. **Innovation:** The state shall promote innovation to bring down costs and build trust among stakeholders for adopting green hydrogen/ammonia.
4. **Infrastructure:** The state shall support the infrastructure development to make the green hydrogen/ammonia economy a reality.
5. **Inclusiveness:** The state shall ensure a just transition, providing new green employment opportunities and benefits to vulnerable end consumers.
6. **Integration:** The state shall ensure a seamless flow of communication, collaboration and integration of different government departments and other stakeholders, which would be essential for implementing this policy and its integration with state's clean energy transition.

The policy has four key pillars to build the state's green hydrogen/ammonia ecosystem: boost the manufacturing ecosystem, lead R&D and innovation activities, provide incentives for promoting green hydrogen adoption, and establish the state's green hydrogen task force.

5. Emerging manufacturing hub

UP's manufacturing expansion and vision of promoting green hydrogen can make the state the green hydrogen/ammonia capital, bridging the national urea deficit and leading exports. The current hydrogen demand in the state stands at around 0.9 million tonnes per annum (Mtpa), primarily used in the N-fertilisers, with some demand in the refinery sector. Future demand for hydrogen is subject to the expected growth in the hydrogen consuming sectors.

To harness the above-described opportunity, UP shall boost its green hydrogen/ammonia production and uptake by improving the ease of doing business and advancing industrial infrastructure for a green hydrogen/ammonia ecosystem.

5.1. Improving ease of doing business

The Government of UP has ongoing initiatives to facilitate investments and businesses in the state. The initiatives range from simplifying procedures to undertaking regulatory reforms for ease of doing business. UP shall undertake the following interventions to facilitate existing and new green hydrogen/ammonia investments. In case of any overlap with the incentives provided in other policies, the incentives provided in this policy shall prevail.

1. Incentives provided in the 'Industrial Investment and Employment Promotion Policy 2017', such as exemption of stamp duty, tax reimbursement, capital interest subsidy, infrastructure interest subsidy, electricity duty, etc., shall apply to new green hydrogen/ammonia investments and expansion of existing fertiliser units in the state

2. The exemptions provided under the 'Scheme for Promoting Establishments of Private Industrial Parks 2017' shall apply to new investments and expansion of existing units towards green hydrogen/ammonia.

3. Government of UP's 'Nivesh Mitra' is a simple, user-friendly, entrepreneur-centric web application that enables existing & prospective investors and entrepreneurs to get online clearances/NOCs from the concerned department with ease. Single window clearance platform would support new green hydrogen/ammonia investment projects and existing units to support seamless expansion.

4. Production of green hydrogen/ammonia or based products shall be considered under the ambit of the 'Make in UP' programme, and the existing incentives shall apply.

5. The grievance redressal timeline shall be further reduced to 15 days from presently 30 days for green hydrogen/ammonia projects.

5.2. Advancing green hydrogen/ammonia ecosystem

The green hydrogen/ammonia ecosystem development will need infrastructure advancements across the value chain. The policy shall support infrastructure development by undertaking the following interventions:

1. Formulate an infrastructure and manufacturing capacity expansion plan for green hydrogen/ammonia to ensure long-term demand and support for UP's ambition to be a manufacturing hub.

2. Promote blending of green hydrogen with grey hydrogen in existing N-fertilizer and refinery units, achieving at least 20 percent of green hydrogen in the consumption mix by 2028 and 100 percent by 2035.

3. Promote 100 percent green hydrogen/ammonia production and consumption in new units from 2025 onwards.

4. Develop green hydrogen/ammonia industrial clusters/hubs/valleys in the state. The clusters/hub/valley model essentially promotes green hydrogen/ammonia production around consumption centres. New capacities shall converge as a cluster which facilitates the easy uptake of green hydrogen/ammonia within the state. Within these clusters/hubs/valleys, if any government land would be available, state shall provide it to green hydrogen/ammonia units at priority.

5. Promote the deployment of renewable energy generation plants, primarily solar, to cater to the demand for green electricity in the state to produce green hydrogen using the electrolysis process. Incentives provided in '*Uttar Pradesh Solar Energy Policy 2022*' shall apply to this policy, as and when it is notified.

6. Set up a *'Green Hydrogen Ecosystem Fund'* with a vision of raising a corpus through green cess, which shall be instituted to support small infrastructure projects and ecosystem development.

7. Provide financial support for technology advancement and adoption, such as electrolysers, carbon dioxide recovery units, etc., to promote a green hydrogen/ammonia ecosystem.

8. Promote the development of hydrogen-ready pipelines to transport green hydrogen/ammonia to feasible distances.

9. Expand adequate water supply and electricity transmission infrastructure across the state to facilitate the development of green hydrogen/ammonia production units.

10. Provide adequate land at concessional rates for green hydrogen/ammonia production or renewable energy production units planned for green hydrogen, along with the necessary regulatory support in case of availability of government-owned land.

6. Driving research & development (R&D) and innovations

The cost of green hydrogen is the major constraint in its adoption. Currently, the cost of green hydrogen in UP ranges from 2.8 USD/Kg (using Round the Clock (RTC) renewables) to 7.0 USD/Kg (using power from a stand alone solar plant in the state).There is a need to encourage innovation to reduce the cost over time. Challenges exist related to encouraging demand for green hydrogen in new emerging applications, indigenous manufacturing of electrolysers, the system's efficiency, transportation, storage, etc. Innovation led by investments in research and development shall help the state and sector overcome existing challenges. Also a collaborative approach shall be instrumental in driving innovation in UP.

The policy shall support R&D and innovation across the green hydrogen/ammonia value chain through the following interventions:

1. Establish the centre of excellence (CoE) with different academic and research institutions and industries to undertake the following activities:

    i. Facilitate the development of a sustainable green hydrogen/ammonia ecosystem by promoting collaboration among various stakeholders such as academic institutions, renewable energy developers, hydrogen producers, industry consumers, etc.

    ii. Lead experimental research to overcome techno-economic challenges associated with different components of the green hydrogen/ammonia value chain

    iii. Partner with industry players to fast-track green hydrogen/ammonia technology development and deployment in the state

    iv. Promote a skill development programme to build the capacity of the state and train workforce to be ready for the green hydrogen/ammonia transition

2. Support the best available technology acquisition and provide a one-time grant of up to 30 percent of the cost incurred, subject to a maximum of 5 crores for R&D centres, industries, and pilot development.

3. Promote and appreciate advancement in technology innovation and entrepreneurship in the state by organising the 'Annual Green Hydrogen Innovation Awards'. The winning start-ups shall become directly eligible to seek funding under the Uttar Pradesh Start up Policy 2020.

4. Assess green hydrogen's transportation and storage feasibility while supporting R&D activities to find sustainable and economical solutions.

5. Explore technology demonstration and proof of concept pilots for green hydrogen applications in emerging use cases such as heavy-duty transport, energy storage, etc.

6. Conduct a geological survey to identify potential natural hydrogen storage sites in UP.

7. Providing fiscal incentives

In addition to existing industrial policies and incentives offered, the Government of Uttar Pradesh shall provide a holistic package of incentives to facilitate the uptake of green hydrogen / ammonia. If there are overlapping incentives with other state policies, the ones offered in this policy shall apply. The incentives presented as a part of this policy will be revisited and amended with respect to the incentives from the central government's announcement on green hydrogen incentives under the National Hydrogen Mission.

1. **Land and water resources incentives:** The incentives shall apply if the project is for green hydrogen/ammonia production, consumption, or other elements such as storage or transportation.

    - 100 percent exemption from payment of land tax, if any.
    - 100 percent exemption from payment of land use conversion charges.
    - 100 percent exemption from payment of stamp duty.
    - 50 percent exemption from industrial water consumption charges if the water consumption is to produce green hydrogen.

2. **Infrastructure incentives:** Infrastructure for green hydrogen/ammonia production including components such as electrolysers, new consumption units and components for production, storage, and transportation. The policy shall provide the following infrastructure incentives:

    a. 30 percent one-time grant support for technology acquisition subject to a maximum of 5 crores for R&D centres and industries.

    b. Capital Expenditure (CAPEX) subsidy shall apply for electrolyser deployment in the state. The subsidy shall apply for every unit capacity to be deployed in the state. Also, the subsidy shall only apply for electrolysers not the whole system and the minimum capacity to avail it shall be higher than 50 MW. The subsidy amount is subject to multiple project variables. Specific criteria for subsidy disbursal shall be defined in guidelines expected in the policy period. Following is electrolyser subsidy offered in this policy:

Year	2023	2024	2025	2026	2027	2028
Subsidy	60%	55%	45%	35%	20%	0%
*The subsidy is in the form of percent of the capital cost to be invested for electrolyser only. The cost subsidy shall apply for the capacity higher than 50 MW systems.						

3. **Operational incentives:** Operating green hydrogen/ammonia production units are equally challenging. Energy and other operational costs are significant in green hydrogen/ammonia production costs. Central government incentives for green hydrogen/ammonia production shall apply to the state. The policy shall provide the following incentives to reduce the operating cost further and make green hydrogen/ammonia more competitive:

    a. 100 percent reimbursement of State's Goods and Services Tax (SGST) for green hydrogen/ammonia production

    b. The incentives mentioned below shall apply to renewable electricity provided for producing green hydrogen/ammonia. The exemptions provided under UP's Solar Policy 2022 shall apply to green hydrogen/ammonia projects. The initiatives mentioned below shall apply in addition to the ones provided in the solar policy.

        i. 50 percent exemption from wheeling charges
        ii. 50 percent exemption from intra-state transmission charges
        iii. 100 percent exemption from cross-subsidy surcharge.
        iv. 100 percent exemption from distribution charges.

    c. An additional subsidy of INR 3500 per tonne of urea will be applicable for every tonne of green urea produced in the state beyond the 10 percent blending share in total production.

4. **Other incentives:** The policy shall provide the following additional incentives:

    a. Provide 50 percent reimbursement of employer's contribution to Employees' Provident Fund and Employees' State Insurance in the form of employment generation subsidy

8. State Level Committee

State level committee shall be formed under the chairmanship of ACS/PS of department of additional sources of energy Govt of UP, for carrying out all the activities and monitoring and evaluation of the 'Uttar Pradesh Green Hydrogen Policy 2022'.
To effectively implement the policy, the committee shall have the following members:

1. Additional chief secretary/Principal secretary, Additional sources of energy deptt. -Chairman
   Or nominated Representative minimum level of special secretary
2. Additional chief secretary/Principal secretary, Finance deptt. -Member
   Or nominated Representative minimum level of special secretary
3. Additional chief secretary/Principal secretary, Revenue deptt. - Member
   Or nominated Representative minimum level of special secretary

4. Additional chief secretary/Principal secretary, Law deptt. - Member
   Or nominated Representative minimum level of special secretary
5. Additional chief secretary/Principal secretary, Agriculture deptt. - Member
   Or nominated Representative minimum level of special secretary
6. Additional chief secretary/Principal secretary , Planning deptt. - Member
   Or nominated Representative minimum level of special secretary
7. Chief Executive Officer Invest UP - Member
8. Subject Matter Expert of state/ Central Govt - Member
9. Director UPNEDA - Member Secretary

The state level committee shall play specific roles and be responsible to take the following actions under the policy:

1. Facilitate coordination with various government departments and agencies.
2. Assign roles and responsibilities to different stakeholders.
3. Monitor the progress of the policy and institutions involved in the process.
4. Monitor the finances and approve the incentives for the beneficiaries.
5. Interpret and modify any provision of this policy.
6. Add or amend any forthcoming provision, guidelines, or scheme.
7. Revisit the targets for progress tracking and update if needed.
8. Monitor, manage and maintain adequate corpus in the *'Green Hydrogen Ecosystem Fund.'*

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