

ASPIRE Programme

**MODEL COMPREHENSIVE
GUIDELINES FOR STATE-LEVEL**

Green Hydrogen Policy



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Abbreviations

Short Form	Expanded Form
ASPIRE	Accelerating Smart Power and Renewable Energy in India
BIS	Bureau of Indian Standards
CAPEX	Capital Expenditure
CHP	Combined Heat & Power
CNG	Compressed Natural Gas
COD	Commercial Operation Date
DISCOM	Distribution Company
EC	Environmental Clearance
EIA	Environmental Impact Assessment
FCDO	Foreign, Commonwealth & Development Office
FCEVs	Fuel Cell Electric Vehicles
FCI	Fixed Capital Investment
GEI	Global Energy Infrastructure
GH	Green Hydrogen
HVOF	High Velocity Oxygen Fuel
IFFCO	India Farmers Fertilisers Cooperative
INR	Indian Rupee
InSTS	Intra State Transmission System
IOC	Indian Oil Corporation
ISTS	Inter State Transmission System
KGH2	Kochi Green Hydrogen Project
KPI	Key Performance Indicators
LCOH	Levelized Cost of Hydrogen
MMTPA	Million Metric Tonnes Per Annum
MNRE	Ministry of New and Renewable Energy
MoEFCC	Ministry of Environment, Forests and Climate Change
MoRTH	Ministry of Road, Transport & Highways
MSME	Micro, Small and Medium Enterprise
NGHM	National Green Hydrogen Mission
OISD	Oil Industry Safety Directorate
OPEX	Operational Expenditure
PESO	Petroleum and Explosives Safety Organisation
PLI	Production Linked Incentive
PNG	Piped Natural Gas
PNGRB	Petroleum and Natural Gas Regulatory Board

Short Form	Expanded Form
PPA	Power Purchase Agreement
PPP	Public Private Partnership
RD&D	Research, Development and Demonstration
RTC	Round the Clock
SECI	Solar Energy Corporation of India
SERC	State Electricity Regulatory Commission
SEZ	Special Economic Zone
SGST	States Goods and Services Tax
SIGHT	Strategic Interventions for Green Hydrogen Transition
SLDC	State Load Dispatch Centre
SPV	Special Purpose Vehicle
STU	State Transmission Unit
ToD	Time of Day
TRANSCOM	Transmission Company
USD	United States Dollar
UT	Union Territory



Executive Summary

India's Green Hydrogen Transition: A Unified Approach to Clean Energy

India's transition to a Green Hydrogen (GH) economy is a pivotal step towards achieving its clean energy ambitions. The National Green Hydrogen Policy and the National Green Hydrogen Mission (NGHM) have laid the groundwork for this transformation, emphasising the importance of collaboration between national and state governments. As Green Hydrogen emerges as a versatile agent for decarbonisation across various sectors, including transportation, industry and power generation, India's success will depend on how well it can align its policies, infrastructure, and incentives to create a unified and conducive environment for green hydrogen development. By prioritising green hydrogen production and consumption, the national government is paving the way for a sustainable and resilient energy future.

To complement these national efforts, states play a pivotal role in advancing green hydrogen production and consumption. The success of India's Green Hydrogen strategy will hinge on how well states can align their policies with the national framework. This includes developing a Green Hydrogen value chain that encompasses production, storage, transportation, and end-use applications. Regional use case examples demonstrate how states can tailor their Green Hydrogen initiatives to local conditions, maximising the benefits of this clean energy source. To ensure a unified and coordinated approach, model guidelines are proposed in this report, drawn from international and regional experiences. These guidelines focus on aligning state policies with the NGHM, providing clarity and consistency for investors, and enhancing cross-sector coordination. By creating a cohesive framework, states can foster a conducive investment environment, facilitating

seamless green hydrogen implementation across the country.

Drawing from international experiences, including from the UK, the global insights offer valuable lessons for Indian states as they develop their policies for Green Hydrogen sector. Countries that have successfully advanced Green Hydrogen initiatives have implemented a range of measures, including monetary support, Green Hydrogen classification schemes, and the establishment of Green Hydrogen hubs. Although Government of India has also initiated various measures like R&D, Pilots, Skill Building, Hydrogen hubs, etc., however, there are international best practices that India can adopt such as improving financial incentives, streamlining approvals, and enhancing R&D efforts.

For Green Hydrogen policies to be effective, several enablers must be in place. These include reducing capital expenditure on electrolyzers, optimising operational costs related to renewable electricity and transmission, and ensuring the availability of land and water resources at suitable locations. Additionally, financing costs, including interest rates and the cost of equity, must be managed effectively. By addressing these factors, India can create a favourable environment for green hydrogen projects, driving further investment and innovation in the sector.

In conclusion, India's journey towards a Green Hydrogen economy is both ambitious and essential for achieving its climate goals. The success of this transition will depend on the effective alignment of national and state policies, the implementation of global best practices, and the removal of barriers to investment and development. By focusing on these key areas, India can establish itself as a global leader in green hydrogen, contributing significantly to the global effort to combat climate change.

Key Takeaways:

- Alignment between the central and state policies to steer GH ambition is essential. States must align their policies with national guidelines to create a cohesive and attractive environment for green hydrogen investments. The model guidelines in the report are based on this core principle.
- Addressing key enablers such as capital and operational costs, land and water availability, and financing will be crucial for the successful implementation of green hydrogen policies.
- Drawing from both domestic and international experiences, the model guidelines suggest 10 key thematic sections to guide policy formulation, which are discussed in detail in the report.
- State may adopt a 5-pronged approach to implement the model guidelines to develop their policies for GH sector, including policy coherence and alignment with NGHM, strategic assessment of resources and demand within a state, developing a comprehensive and adaptive framework basis the model guidelines, engaging industry stakeholders and incorporating feedback to the final policy.
- Upcoming policies must address areas that currently hinder the sector growth, such as availability of land banks at strategically advantageous areas (like ports, export centres), clarification on components of electricity charges and the aggregation of state-level demand.
- With a total of 73 clearances required, including 43 state-level clearances for Green Hydrogen projects, initiatives like the integration of state-level single window clearance with National Single Window System (NSWS) can simplify procedures, reduce bottlenecks and enhance transparency in the approval process.
- Specialised training initiatives, including training of trainers and technical programs for existing workforce in the grey hydrogen value chain, are necessary

to develop a skilled workforce that can support the transition and Green Hydrogen ecosystem's growth.

- Policies must be designed to be end-use agnostic, thereby promoting demand-side measures across a broad range of sectors, ensuring widespread adoption and utilisation of Green Hydrogen and its derivatives in States.



01 | Introduction

The transition to a sustainable energy future is a global imperative and Green Hydrogen has emerged as a key element in this landscape. As a versatile, clean and safe energy carrier, it can play a significant role in the quest for a sustainable energy future. India, with its ambitious renewable energy targets and commitment to the Paris Agreement, is uniquely positioned to leverage this technology. Green Hydrogen produced using renewable energy can reduce the reliance on fossil fuels and is seen as major driver for a low-carbon, self-reliant economy.

1.1 Conducive Green Hydrogen Policy Landscape in India

India has been actively promoting Green Hydrogen as part of its clean energy transition.

While India initiated discussions and research activities on hydrogen in 2006, no significant policies were implemented around that timeframe. Later, in February 2022, Ministry of Power notified a 'Green Hydrogen/Green Ammonia Policy' to support the Green Hydrogen sector with favourable policy enablers. In January 2023, Ministry of New and Renewable Energy released National Green Hydrogen Mission (NGHM) to make India a Global Hub for production, usage and export of Green Hydrogen and its derivatives.

1.1.1 National Green Hydrogen Policy

Green Hydrogen Policy 2022 facilitates the creation of a favorable Green Hydrogen ecosystem in the country through the following key measures:

- **Reduction in input cost of renewable electricity for Green Hydrogen production:** The policy provides waiver of inter-state transmission charges for Green Hydrogen/ Green Ammonia producers. The policy also enables priority access to Inter State transmission System (ISTS) for RE capacity set up for Green Hydrogen/ Green Ammonia production. Open Access for Green Hydrogen/ Green Ammonia plants to be granted within 15 days of application. Renewable energy used for production of Green Hydrogen/ Green Ammonia can be banked at fixed rate as decided by regulatory state commissions. Further, the policy clarifies that hydrogen production using banked renewable energy shall also be defined as Green Hydrogen.
- **Infrastructure access and development:** The policy directs Port Authorities to facilitate land to set up bunkers for storage of Green Ammonia by manufacturers of Green Hydrogen/ Green Ammonia at applicable charges. Further, the policy proposes development of Manufacturing Zones to host Green Hydrogen/ Green Ammonia production. Under the policy guidance, land in Renewable Energy Parks can be allotted for production of Green Hydrogen/ Green Ammonia.
- **Establishment of Single Window Portal:** for all statutory clearances and permissions in a time-bound manner.
- **Eligibility of RPO compliance:** RE for Green Hydrogen/ Green Ammonia production to be counted towards RPO compliance of consuming entity. RE consumed beyond obligation of producer to be counted towards RPO compliance of DISCOM in whose area the project is located.
- **Demand aggregation** from different sectors to achieve competitive prices.

1.1.2 National Green Hydrogen Mission

India's Green Hydrogen (GH) policy is a comprehensive strategy to position the country as a global leader in the production, utilisation and export of hydrogen and its derivatives. The policy is integral to India's broader goals of energy independence by 2047 and net-zero emissions by 2070.

National Green Hydrogen Mission (NGHM):

Launched in January 2023, NGHM is the cornerstone of India's Green Hydrogen policy with an initial financial

outlay of INR 19,744 crore (approximately USD 2.37 billion). The mission aims to develop at least 5 million metric tonnes per annum (MMTPA) of Green Hydrogen production capacity by 2030, supported by 125 GW of additional renewable energy capacity.

The NGHM's objective is to establish India as a global leader in production and supply of Green Hydrogen, facilitate export opportunities through supportive policies, ensure a mandated share of domestic consumption, reduce reliance on fossil fuels and position India as a leader in Green Hydrogen technology and markets.



Figure 1: Key Policy Initiatives taken under NGHM

SIGHT Component I - Incentive Scheme for Electrolyser Manufacturing

- Outlay of INR 4,440 Crore for 5 years
- Tenders have been released for two tranches of 1,500 MW each (total 3000 MW) with inclusion of Electrolyser manufacturing based on
 - any stack technology, and
 - indigenously developed stack technology- large and smaller units

SIGHT Component II - Incentive Scheme for Green Hydrogen Production

- Outlay of INR 13,050 Crores for 3 years
- Two Modes for bidding
 - Mode 1: Bidding on least incentive demanded for 3 years
 - Mode 2: Bidding on lowest cost of procurement through aggregated demand
 - Mode 2A: Green Ammonia
 - Mode 2B: Green Hydrogen

Pilot Projects - Outlay of INR 1,466 Crores for three sectors

- Steel: INR 455 Crores for pilots until 2029-30, for blending GH in steel production via hydrogen injection in DRI and blast furnace setup
- Transportation: INR 496 Crores until 2025-26 for fuel cell and IC engine-based propulsion in trucks/ buses/four-wheelers, and for hydrogen refuelling stations
- Shipping: INR 115 Crore until 2025-26 for retrofitting vessels for GH or derived fuels and establishing bunkering and refuelling facility

Research and Development - Outlay of INR 400 Crores till 2025-26

Four categories of projects:

- Mission Mode Projects with short term horizon (0-5 years)
- Grand Challenge Projects with medium-term horizon (0-8 years)
- Blue Sky Projects having long-term horizon (0-15 years)
- Centre of Excellence

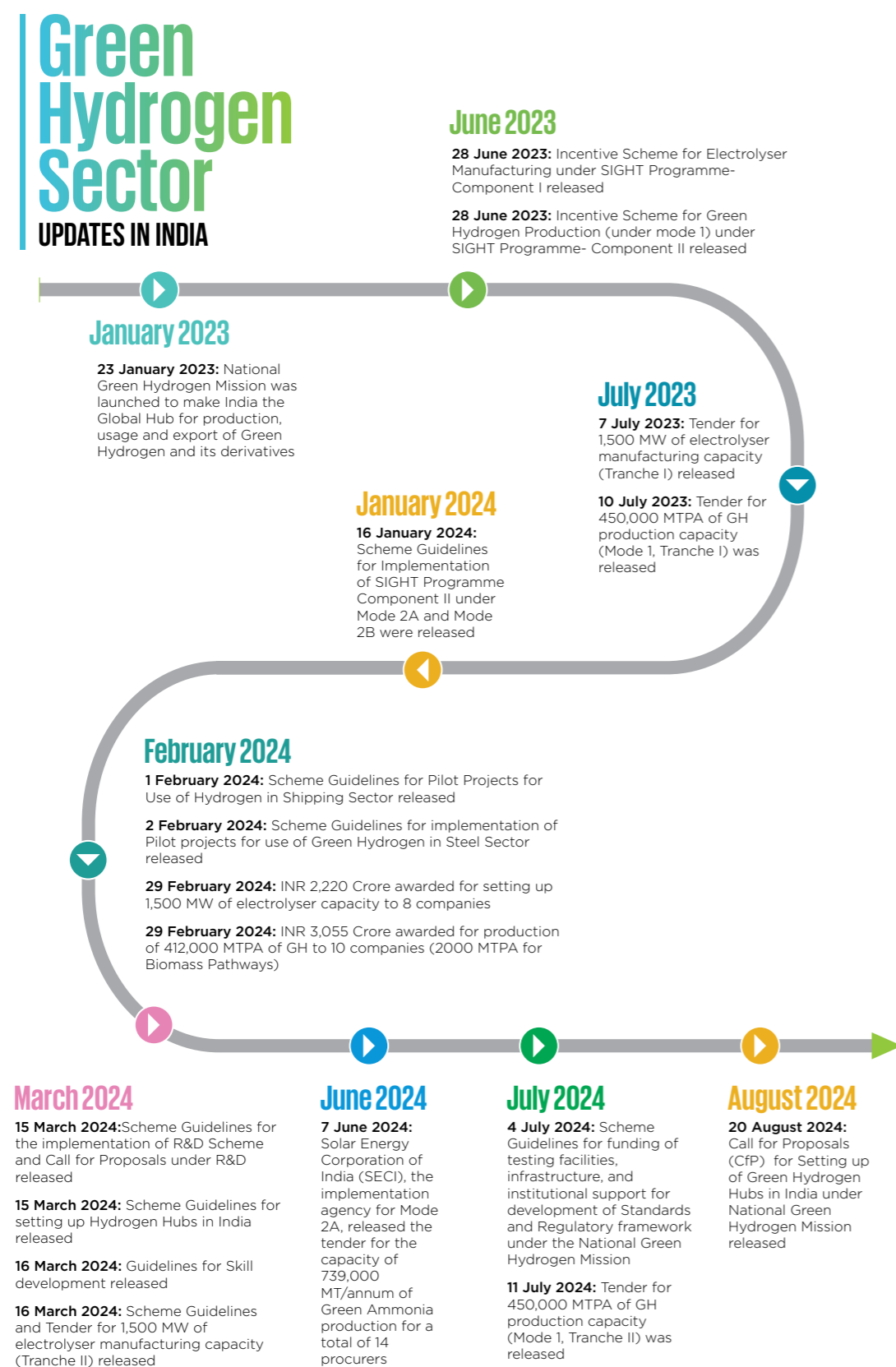
Areas identified:

- | | |
|---|--|
| • High-efficiency, Low-cost Electrolysers | • Advanced Materials |
| • Membranes, 3rd-gen electro-Catalysis | • Green Steel, Hydrogen from Biomass |
| • Fuel Cells | • Seawater Electrolysis via innovative chemistry |
| • Low-cost storage and transportation | |

Hydrogen Hubs - Outlay of INR 200 Crores till 2025-26

- Hydrogen hub will be a region where there exists a network of Hydrogen producers, end-use (domestic or export) with sufficient supporting infrastructure for hydrogen storage, processing and transportation.
- Hydrogen hub may be located inland or near ports for enable exports of Green Hydrogen and its derivatives. Potential locations of such hubs would be regions having clusters of refineries/fertilizer production plants and other end use industries
- Mandate of setting up two hydrogen hubs of at least 100,000 MTPA each

Figure 2: Key Green Hydrogen Sector Updates in India



Initiatives being undertaken in the Green Hydrogen sector in India apart from NGHM:

- 1) State-level Initiatives:** Various states have come up with their own Green Hydrogen policies, namely, Uttar Pradesh, Punjab, Gujarat, Maharashtra, Rajasthan, Andhra Pradesh and West Bengal. Madhya Pradesh and Odisha. These states have an integrated RE policy with Green Hydrogen as a major component.
- 2) Private Sector Initiatives:** The Global Energy Infrastructure (GEI) hydrogen database has identified several projects that are already under way, like the Kochi Green Hydrogen Project (KGH2), GAIL Vijaypur Green Hydrogen Project, Reliance Industries New Energy Giga Complex, NTPC Ladakh Green Hydrogen Mobility Project, etc.¹
- 3) International Collaboration:** India is actively participating in international forums and summits, such as the World Hydrogen summit, to showcase its progress and forge strategic partnerships for Green Hydrogen development.

attract significant domestic and international investments, creating new jobs and fostering innovation.

1.2 Importance of Green Hydrogen for States

States play a pivotal role in advancing Green Hydrogen production and consumption. This section highlights the significance of Green Hydrogen within state contexts.

Green hydrogen is of paramount importance for Indian states as it offers a transformative opportunity to decarbonise, enhance energy security, and drive economic growth. As India seeks to meet its ambitious climate goals, Green Hydrogen provides a sustainable alternative to fossil fuels, especially in hard-to-abate industries like steel, cement, and transportation. For states, investing in Green Hydrogen infrastructure and policies can



¹ India's Hydrogen Ambitions: Powering the Future with Green Fuel | Global Energy Infrastructure, Accessed on 02 July 2024

Moreover, with India's rich renewable energy resources, states can leverage Green Hydrogen to not only meet their own energy needs but also position themselves as leaders in the global energy transition, thereby contributing to national and global climate objectives.

1.3 Green Hydrogen Value Chain

Green Hydrogen value chain includes production, storage, transportation and end-use applications. Regional use case examples illustrate practical scenarios.

For a successful Green Hydrogen ecosystem a few key elements are desirable for the long-term sustainability of the market. It is imperative that there exists a physical ecosystem which ensures the production of Green Hydrogen and derivatives like ammonia, methanol etc, its storage and transport (if required) as well as the consumption of such green fuels or chemicals.

As is the general practice followed in some of the major projects globally, we do see that a holistic ecosystem is either in place or is being developed to secure resources (like renewable energy, water, land etc.), equipment (electrolysers, BoP), transport and distribution systems (like pipelines) and potential offtakers (like automotive sector, refineries, fertilisers, steel plants, district heating systems etc.) with the aim of covering the overall hydrogen value chain (for e.g., projects across Rotterdam, Hamburg, Tees Valley) and recently approved US Hydrogen hub projects as well. The intention is to make pilot projects with a vision of scaling the systems up to become fully functional, self-sustaining projects with assured suppliers and offtakers, while parallelly taking forward the learnings from the small-scale pilot phase.

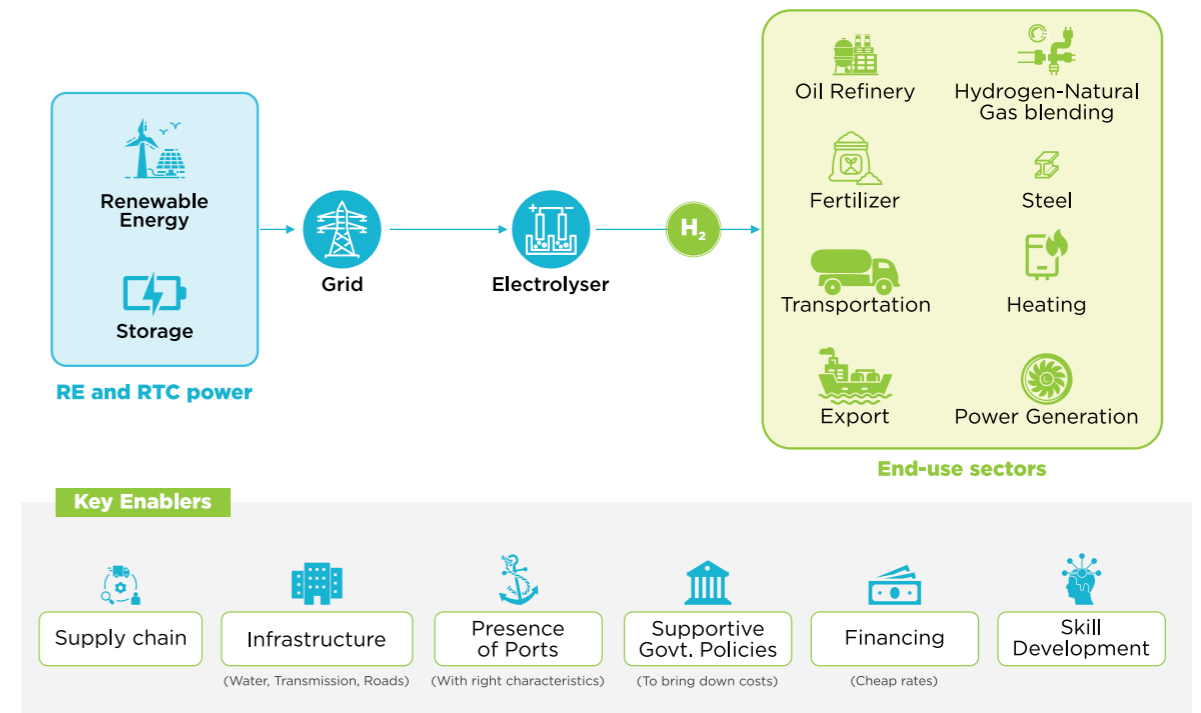
The physical infrastructure in the form of ample renewable electricity producing facilities like wind and solar, along with storage facilities, be it batteries or pumped hydro, as applicable, need to be present to ensure the

availability of sufficient amount of round the clock renewable energy for steady running of the electrolysers. The presence of robust central or state level power grids are also necessary to help transport the renewable power from resource rich regions to demand centres where electrolysers can be set up for splitting water into hydrogen and oxygen. The renewable power can even be procured from outside the state in case the state lacks sufficient low-cost renewable power resources.

Presence of demand centres, especially anchor industrial demand centres in the form of refineries, fertiliser plants, steel plants, export (for ammonia), ports, etc. is critical to ensure the availability of a steady market for the consumption of green chemicals or fuels like Green Hydrogen or Green Ammonia. The proximity to hydrogen production facility is preferable to help minimise transportation costs. Further, the effective production and delivery of the product would need supply chain and infrastructure enablers such as the following:

1. Supply Chain: To enable a steady supply of both raw materials and equipment to be used in the hydrogen pilot project as well as the scaled up commercial hub
2. Infrastructure: Presence of electricity evacuation, water supply and hydrogen distribution infrastructure
3. Ports: Proximity to ports to enable the export of commodities (Green Hydrogen/ Green Ammonia) and equipment (electrolysers, fuel cells, other manufactured components) or imports of commodities and equipment
4. Supportive Government policies: Government policies in the form of fiscal or financial incentives for Green Hydrogen related projects
5. Financing: Availability of low-cost financing options for Green Hydrogen projects
6. Skill development: Upskilling or reskilling options for both current and prospective workforce

Figure 3: Illustration of key considerations for a Green Hydrogen ecosystem along with key enablers



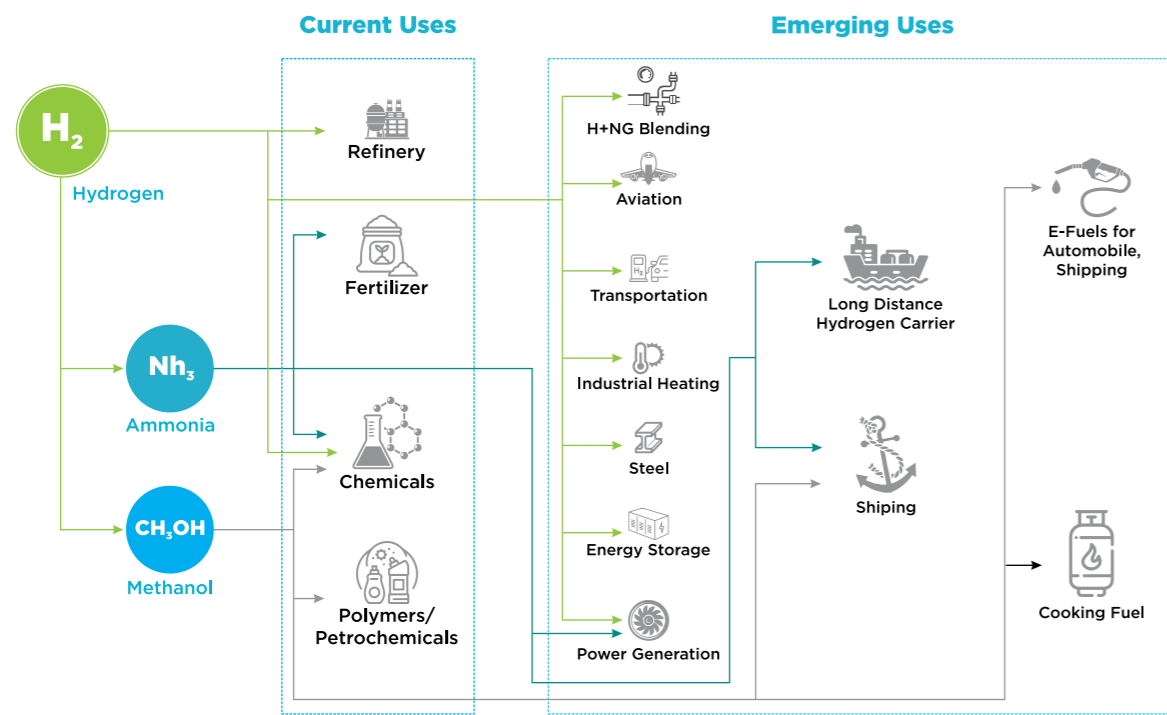
1.4 Green Hydrogen as a versatile agent of decarbonisation

Hydrogen is a unique element which can be used as a clean fuel and feedstock across several industrial sectors. The product of combustion of hydrogen is only water. Currently, hydrogen finds application in oil and gas refining, ammonia production for fertilisers, chemicals, and the polymer industry. As the industries march forward with their decarbonisation strategies, hydrogen and its derivatives like ammonia and methanol will find increasing usage in emerging sectors as well like aviation, shipping, power generation etc. Fig. 1 shows some of the areas of application of hydrogen and its derivatives in near- and long-term future. Because of the versatility of hydrogen, it is sometimes referred to as the "Swiss Knife of Decarbonisation".²



² Opinion of Mr. Bill Gates, founder and former CEO of Microsoft Corporation

Figure 4: Potential sectors involving end-use of hydrogen, indicating its versatility as a fuel and feedstock



Although hydrogen is the most abundant element in the Universe, yet on Earth, hydrogen exists in the form of compounds. The most widely available compound of hydrogen on Earth is water (H₂O), which is abundantly available in the world's oceans, glaciers and freshwater sources like rivers and lakes. Additionally, hydrogen also exists as a crucial constituent of all organic life forms on Earth, thus, organic wastes like crop residues, human and animal wastes, food waste etc. also provide an excellent source of hydrogen. A significant portion of ancient life forms, subjected to fossilisation over millions of years to form hydrocarbons like oil, natural gas and coal also contain hydrogen. However, the extraction of hydrogen from various sources may not entirely be carbon-free or carbon-neutral

In India, hydrogen has traditionally been used in several key industries such as refineries, fertilisers and chemicals. These industries primarily use “grey hydrogen,” which is produced from fossil fuels. However, with the push towards sustainability, there is a growing

interest in transitioning to Green Hydrogen. Further, there are many emerging applications of Green Hydrogen which India is set to explore.

National Green Hydrogen Mission focuses on certain applications of Green Hydrogen in phased approach:

- Phase I (2023-2026): India will establish the foundation of its Green Hydrogen ecosystem, focusing on pilot projects, infrastructure, and policy support. Key sectors like refining, fertilisers and heavy-duty transport will drive early demand, with R&D improving technology efficiency.
- Phase II (2026-2030): This phase aims to scale up production, position India as a global leader in Green Hydrogen exports and broaden adoption across sectors. It will also enhance international collaborations and domestic manufacturing capabilities.

Phase I Implementation:

a) Fertiliser Production: India is one of the largest producers of fertilisers. Hydrogen is a critical raw material in the production of ammonia, which is then used to manufacture fertilisers. The Fertiliser industry holds a big potential to reduce carbon footprint with the usage of Green Hydrogen.

ACME group has announced Green Hydrogen and Green Ammonia plants in Rajasthan and Tamil Nadu. Indian Farmers Fertiliser Cooperative (IFFCO) has partnered with ACME Cleantech Solutions to buy 200,000 tonnes of Green Ammonia. Apart from this development, there are multiple Green Ammonia projects being set across the country by various private sector players.

b) Refineries: Hydrogen is used in refineries to remove sulphur from fuels. Using Green Hydrogen can significantly reduce emissions from this process.

Various petrochemical companies like BPCL, HPCL, CPCL, MRPL etc. have announced Green Hydrogen projects for application in refineries.

c) City Gas Network: Hydrogen can be blended with compressed natural gas (CNG) to reduce carbon emissions from city gas networks.

GAIL, OIL, GGL, BPCL, THINK Gas etc. have taken initiatives to blend Green Hydrogen with natural gas in the city gas distribution grid.

Phase II Implementation:

a) Steel manufacturing: Green Hydrogen can be used as a reducing agent in steel production, reducing dependence on coal and lowering carbon emissions.

Hygenco and Jindal Stainless Limited have installed a Green Hydrogen Plant for steel production.

b) Mobility: Hydrogen fuel cell buses, trucks and four-wheelers can help reduce urban air pollution and reliance on diesel in transport segment.

Multiple Green Hydrogen projects have been announced by NTPC, NHPC, IOCL for mobility applications. Further, a joint venture between Advik Hi-Tech and Pure Hydrogen will aim to build global supply chain of products and components for hydrogen powered vehicles and powered products.

c) Shipping: Retrofitting existing ships to run on Green Hydrogen or its derivatives and development of bunkering and refueling facilities in ports along international shipping lanes are the two focus areas in shipping sector.

Beyond Phase II Implementation:

a) Railways: Hydrogen-powered trains provide an opportunity for green public transport.

The Indian Railways is developing hydrogen-powered trains to replace diesel engines.

b) Aviation: Hydrogen-Powered aircraft, Sustainable Aviation Fuel (SAF), Green Hydrogen utilisation in airport operations and establishment of hydrogen production and refueling infrastructure at major airports can be the future focus area for India.



02

Empowering States for a Unified Green Hydrogen Future: Model Guidelines to Align, Attract and Accelerate India's Transition

As India advances its Green Hydrogen ambitions, the role of state governments in shaping the regulatory landscape becomes increasingly vital. To ensure that all states are aligned with national objectives and are equipped to attract investments, there is a need for model comprehensive guidelines. These guidelines will act as a sample guidance for states to follow, ensuring consistency, clarity, and coordination across the country.

A. Establishing a Unified Framework to Attract Green Hydrogen Investments Across States:

States play a pivotal role in creating a regulatory and infrastructural environment necessary to support Green Hydrogen projects. However, without a consistent and coordinated approach, the varying policies across states may lead to a fragmented landscape, hindering the nation's overall progress in achieving goals. Model guidelines will provide a standardised framework that states can adopt or adapt, ensuring a more uniform and attractive investment climate.

B. Aligning State Policies with NGHM for Synergised Progress:

Aligning state policy targets and timelines with the NGHM is crucial to effectively track progress and synergise efforts across the nation. By adopting these

model guidelines, states may ensure their policy frameworks complement the incentives and strategies already provided under the NGHM, thus avoiding duplication of efforts and maximising the benefits of national-level support.

C. Providing Clarity and Consistency to Foster a Conducive Investment Environment:

The model guidelines will aim to offer clear guidance on various aspects related to incentives, definitions, and implementation strategies, which is essential for creating a conducive environment for all stakeholders. This clarity and alignment will help streamline state policies, reducing uncertainties that could otherwise deter investment.

D. Enhancing Cross-Sector Coordination for Seamless Green Hydrogen Implementation:

Given the cross-cutting nature of Green Hydrogen applications across various sectors, enhanced coordination among state-level departments and agencies is necessary for smooth implementation. The model guidelines will serve as a comprehensive reference that states can use to amend existing policies or draft new ones, ensuring that their efforts are aligned with

national objectives and best practices, thereby facilitating a more cohesive and efficient transition to a Green Hydrogen economy.

So far, states like Uttar Pradesh, Andhra Pradesh, Maharashtra, Rajasthan, and West Bengal have announced dedicated Green Hydrogen policies, while Punjab and Haryana have released draft versions. Odisha and Madhya Pradesh have integrated Green Hydrogen into their State Renewable Energy Policies. These early movers underscore the growing recognition of Green Hydrogen's potential. However, to ensure that all states benefit from a cohesive strategy and to prevent disparities in progress, the adoption of model comprehensive guidelines will be crucial. These guidelines will not only align state efforts with national objectives but also provide a clear and consistent framework that supports robust investments, fosters innovation, and accelerates India's transition to a Green Hydrogen economy.



03 | State Policy Experiences

National Green Hydrogen Mission (NGHM) of India has laid the foundation for an integrated strategy to achieve the mission targets. All concerned Ministries, Departments, agencies and institutions of the Central and State Government will undertake focused and coordinated steps to ensure successful achievement of the Mission objectives. The Integrated Mission Strategy provides states an opportunity to establish themselves as front runners in the Green Hydrogen sector through project development, manufacturing, setting up renewable energy capacity, and promoting export of Green Hydrogen derivatives. NGHM requests states to put in place fair and rational policies for provision of land and water, suitable tax and duty structures and other measures to facilitate establishment of Green Hydrogen projects.

Government of India has identified 10 potential states that could be the key enablers in producing Green Hydrogen in India to kickstart the National Green Hydrogen Mission (NGHM) which include Karnataka, Odisha, Gujarat, Rajasthan, Maharashtra, Tamil Nadu, Andhra Pradesh, Kerala, Madhya Pradesh and West Bengal. These states are likely to have Green Hydrogen / Green Ammonia production zones or clusters. These states have been identified based on the existing steel and fertiliser industries, refineries and ports located there, along with the operational and potential RE generation capacity in the regions³.

Aligned with the Integrated Mission Strategy, Uttar Pradesh, Andhra Pradesh, Maharashtra,

Rajasthan, and West Bengal have come up with dedicated Green Hydrogen Policies. The Green Hydrogen Policies of Punjab and Haryana are in draft stage as on date. Odisha and Madhya Pradesh have integrated Green Hydrogen into the State Renewable Energy Policies. Uttar Pradesh, Andhra Pradesh, Maharashtra, Rajasthan, Punjab and Haryana have clearly mentioned Green Hydrogen Production targets. Maharashtra and Punjab have planned to create a separate Green Hydrogen fund to support Green Hydrogen ecosystem in the state.

NGHM aims to make Green Hydrogen affordable by creating demand and incentivising supply. The mission focuses on key enablers to support accelerated growth of Green Hydrogen sector. Similarly, State Green Hydrogen Policies are focusing on key enablers in states' purview to boost production and consumption of Green Hydrogen in the state.

The costs of the electrolyzers and renewable energy are the two major components of Green Hydrogen production cost. The costs of capital, supply and treatment of water, storage and distribution, conversion of hydrogen to suitable derivatives, and enabling infrastructure would also contribute to the final delivered cost of Green Hydrogen for any application. The NGHM seeks to undertake the necessary steps to enable cost reduction in all of these aspects. All the state policies are also aligned with this objective.

³ Government identifies 10 states for Green Hydrogen manufacturing; MNRE officials (moneycontrol.com)

Key Best Practices for Accelerating Green Hydrogen Production and Consumption:

Based on the review of nine state-level Green Hydrogen (GH) policies, guidance provided in National Green Hydrogen Mission and market experience, the following key best practices have been identified to accelerate production and consumption of Green Hydrogen:

1. Incentives for Green Hydrogen production, electrolyser manufacturing and RE generation:

- **CAPEX Subsidies and Production-Linked Incentives (PLI):** Offering CAPEX subsidies and PLIs for Green Hydrogen production and electrolyser manufacturing to reduce manufacturing costs and boost domestic production.
- **Incentivising Renewable Energy (RE) Generation:** Providing incentives for the development of RE capacity for Green Hydrogen production, aiming to reduce electricity costs for Green Hydrogen production.

2. Infrastructure Development:

- **Green Hydrogen Storage and Transport:** Developing enabling infrastructure for Green Hydrogen storage and transport that meets required safety standards.
- **Land Provision and Tax Exemptions:** Allocating land and offering land tax exemptions to reduce land acquisition costs.
- **Water Usage Optimisation:** Ensuring priority water allocation and promoting the use of grey water in Green Hydrogen projects to reduce operational water costs.

3. Access to Transmission Infrastructure:

- **Priority Access:** Providing priority access to existing transmission infrastructure and developing new infrastructure to support Green Hydrogen production.
- **Open Access Charge Concessions:** Offering concessions on open access

charges to reduce electricity costs for Green Hydrogen projects.

- **Concessional Banking Charges:** Implementing concessional banking charges and energy storage solutions for round-the-clock (RTC) electricity supply to integrate RE with Green Hydrogen production smoothly.

4. Financial Support and Incentives

- **Interest Subsidies and Innovative Bidding:** Providing interest subsidies and developing innovative bidding mechanisms to reduce project costs.
- **Decentralised Green Hydrogen Production:** Incentivising decentralised Green Hydrogen production to optimise resource utilisation.
- **Demand Enhancement:** Offering direct and indirect incentives to enhance Green Hydrogen demand in various applications.

5. Export Strategies and Streamlined Approvals:

- **Green Hydrogen Export Strategies:** Developing comprehensive strategies to capture export markets.
- **Single Window Clearance:** Establishing a single window clearance system to facilitate time-bound approval processes, reducing project approval time.

6. Skill Development and R&D:

- **Job Creation and Training:** Focusing on skill development and job creation in the Green Hydrogen sector.
- **State Centre of Excellence:** Establishing a State Centre of Excellence dedicated to research and development, pilot projects, international cooperation, public awareness, and stakeholder outreach.



The table below depicts the high-level analysis of the NGHM guidance versus the state level policy provisions.

Table 1: High-Level Analysis of NGHM Guidance vs State-level Policy Provisions

NGHM Guidance	State Policies Provisions
	Electrolysers/Equipment Manufacturing
<ul style="list-style-type: none"> • Undertake the necessary steps to enable electrolysers cost reduction • Boost domestic manufacturing to ensure production of electrolysers in India at significantly lower costs 	<ul style="list-style-type: none"> • Direct and indirect incentives for electrolyser manufacturing to reduce the cost of manufacturing and to boost domestic manufacturing <ul style="list-style-type: none"> ○ Out of 9 states with dedicated Green Hydrogen Policies or integrated Green Hydrogen into Renewable Energy (RE) Policies: <ul style="list-style-type: none"> ▪ 8 states have focused on reducing the cost of electrolysers and other equipment. ○ They achieve this by: <ul style="list-style-type: none"> ▪ Providing direct incentives for manufacturing. ▪ Offering infrastructure support through the creation of Green Hydrogen hubs.
	Green Hydrogen Production & Storage
<ul style="list-style-type: none"> • Provide enabling infrastructure • Optimise water requirements with the use of industrial or municipal wastewater for hydrogen production 	<ul style="list-style-type: none"> • Incentivising RE capacity development for Green Hydrogen production to bring down the cost of electricity for Green Hydrogen production: <ul style="list-style-type: none"> ○ Out of 9 states under consideration: <ul style="list-style-type: none"> ▪ 5 states have explicitly mentioned incentivising the development of RE capacity for Green Hydrogen production.

NGHM Guidance	State Policies Provisions
	<ul style="list-style-type: none"> • Providing enabling Green Hydrogen storage and transport infrastructure that meets required safety standards: <ul style="list-style-type: none"> ○ Only one state has rolled out direct incentives for the development of pipelines for Green Hydrogen transport. ○ 4 states have either: <ul style="list-style-type: none"> ▪ Mentioned the development of storage and transport facilities. ▪ Discussed developing guidelines, rules, regulations, and standards regarding the same. • Land provision and land tax exemptions to bring down land cost: <ul style="list-style-type: none"> ○ 6 states are providing government land for Green Hydrogen projects. ○ 7 states have provided some guidelines for land allocation for Green Hydrogen projects. ○ 4 states have provided exemptions on land taxes (either 100% or less). ○ 8 states have provided exemptions on stamp duty (100% by 7 states and 50% by 1 state). ○ 4 states have exempted land use conversion charges. • Priority water allocation and promotion to grey water usage in Green Hydrogen projects to reduce operational cost of water usage: <ul style="list-style-type: none"> ○ 6 states have facilitated the provision of water for Green Hydrogen projects on a priority basis. ○ Rajasthan, Punjab, and Haryana are focusing on grey water usage for Green Hydrogen projects by providing preferential treatment. ○ No state is offering a water subsidy
<ul style="list-style-type: none"> • Provide policy provisions for transmission, connectivity, banking, open access, and energy storage for Green Hydrogen production projects to bring down cost of input renewable energy 	<ul style="list-style-type: none"> • Priority access to existing transmission infrastructure and addition of new transmission infrastructure to support Green Hydrogen production: <ul style="list-style-type: none"> ○ 4 states are providing transmission connectivity for RE plants established for the production of Green Hydrogen/ Green Ammonia on a priority basis. ○ Out of these 4 states: <ul style="list-style-type: none"> ▪ 3 states have explicitly mentioned the development of additional infrastructure to accommodate new RE capacity.

NGHM Guidance	State Policies Provisions
	<ul style="list-style-type: none"> • Concession on open access charges to bring down the cost of electricity for Green Hydrogen projects: <ul style="list-style-type: none"> ○ 7 states are exempting Intra-state transmission charges in the range of 25% to 100%. ○ Wheeling charges are exempted in 7 states in the range of 50% to 100%. ○ Out of these 7 states: <ul style="list-style-type: none"> ▪ One state has provided the facility of reimbursement on wheeling charges with an upper cap. ○ 7 states have provided 100% exemption on cross-subsidy surcharge. ○ 6 states have rolled out 100% exemption on additional surcharges. ○ All the states are providing electricity duty exemption: <ul style="list-style-type: none"> ▪ 8 states at 100%. ▪ 1 state at 50%. • Concessional banking charges and energy storage for RTC electricity supply for smooth integration of RE with Green Hydrogen production: <ul style="list-style-type: none"> ○ 6 states have clearly mentioned the provision of banking facilities for Green Hydrogen projects. ○ There are no details in state Green Hydrogen policies on banking charges. ○ Only one state has mentioned incentivising energy storage to ensure Round-The-Clock electricity supply for Green Hydrogen production.
<ul style="list-style-type: none"> • Reduce the cost of capital required to build projects • Develop mechanisms for dollar denominated Bids 	<ul style="list-style-type: none"> • Interest subsidy and innovative bidding mechanism for cost reduction <ul style="list-style-type: none"> ○ One state has provided interest subsidy on financing for Green Hydrogen projects. ○ There is no mention of new bidding mechanism in state policies.
<ul style="list-style-type: none"> • With the targeted interventions, reduce input and capital costs for Green Hydrogen projects 	<ul style="list-style-type: none"> • CAPEX subsidy to attract investment in the Green Hydrogen sector by reducing upfront project cost <ul style="list-style-type: none"> ○ 5 states have provided Capex incentives for Green Hydrogen projects in the range of 10% to 40% of capital investment. ○ 2 states are providing additional incentives for anchor units (first few Green Hydrogen projects in the state) ○ 5 states have provided either full or partial exemption from State's Goods and Services Tax (SGST)

NGHM Guidance	State Policies Provisions
<ul style="list-style-type: none"> Decentralised Green Hydrogen production through: Biomass-based hydrogen production systems Modular electrolysers connected to rooftop solar or other decentralised RE plants like small hydro etc. 	<ul style="list-style-type: none"> Incentivising decentralised Green Hydrogen production for optimal utilisation of resources <ul style="list-style-type: none"> Based on the availability of high volume of biomass in the state, Green Hydrogen Policies of Punjab and Haryana focus on biomass-based hydrogen production systems. No state has focused on other options of Green Hydrogen production using decentralised RE sources.
Green Hydrogen Demand Creation	
<ul style="list-style-type: none"> Demand creation through capturing export markets, substituting imports and catering to domestic demand 	<ul style="list-style-type: none"> Enhancing Green Hydrogen demand through direct and indirect incentives for demand applications: <ul style="list-style-type: none"> 2 states are providing a subsidy of INR 50 per kg of Green Hydrogen for blending with natural gas for CNG and PNG networks. Out of these 2 states: <ul style="list-style-type: none"> One state is extending the same benefits for Green Ammonia production, use in mobility, steel production, and other industrial processes. The same state is also focusing on Green Hydrogen demand aggregation. The other state has set a target to achieve a certain Green Hydrogen percentage in existing industries and is promoting 100% Green Hydrogen/Ammonia production and consumption in new units. 2 states have provided capital subsidies in the range of 20% to 30% for Green Hydrogen fuel cell vehicles and Green Hydrogen refuelling stations. Out of these 2 states: <ul style="list-style-type: none"> One state is also incentivising the first 10 industries for consuming Green Hydrogen.
	<ul style="list-style-type: none"> Green Hydrogen export strategies to capture export markets: <ul style="list-style-type: none"> No state has specifically identified their Green Hydrogen export strategies in the state policies. One state mentioned setting up bunkers near ports for Green Hydrogen storage. No state policy focuses on strengthening port infrastructure to facilitate future Green Hydrogen shipments. No state has mentioned developing international trade partnerships to facilitate Green Hydrogen export.

NGHM Guidance	State Policies Provisions
Other Focus Areas	
Pilot Projects	<ul style="list-style-type: none"> 6 states are envisaging to support pilot projects in emerging applications of Green Hydrogen.
Research & Development	<ul style="list-style-type: none"> 8 states have explicitly focused and incentivised Research and Development activities.
Skill development and job creation	<ul style="list-style-type: none"> 6 states have focused on skill development activities while 7 states have focused on job creation. Only 2 states have clearly mentioned number of jobs that can be generated in the state through Green Hydrogen sector.
Public Awareness and Stakeholder Outreach	<ul style="list-style-type: none"> States will focus on public awareness and stakeholder outreach through Centre of Excellence
International Cooperation	<ul style="list-style-type: none"> States will facilitate international cooperation through Centre of Excellence
Ease of Doing Business	<ul style="list-style-type: none"> 7 states have facilitated various measures such as single window clearance to facilitate time bound approval processes, simplified and reduced regulatory checklist, uninterrupted power and water supply, mechanisms for raising and resolving grievances etc. to enhance ease of doing business.

When developing state-specific Green Hydrogen policies, states must consider several critical factors to foster the sector's growth. These include the availability of land, water, and renewable energy resources, as well as the presence of domestic demand. Additionally, a supportive policy ecosystem for the renewable energy sector and the availability of port infrastructure for exporting Green Hydrogen and its derivatives are essential.

For instance, states like Maharashtra, Tamil Nadu, Odisha, and Gujarat possess significant renewable energy (RE) resources, robust domestic industrial demand, and the potential to export Green Hydrogen and its derivatives via their well-established port infrastructure. Conversely, the northeastern states of India are rich in hydropower resources but struggle with high transmission and distribution (T&D) losses. Decentralised Green Hydrogen production in these regions can capitalise on their hydropower capabilities to meet industrial demand and support future applications such as clean long-haul mobility and green industries. Additionally, these states can utilise their existing cross-border energy trading partnerships with neighbouring countries to export Green Hydrogen and its derivatives, further enhancing their economic prospects and regional energy security.

04 | Global Policy Experiences

The global energy landscape is shifting towards cleaner energy sources to address climate change and improve energy security. Low-emission H₂ has emerged as a key tool to reduce carbon emissions and governments are trying to leverage it to achieve their net-zero ambitions. 41 governments, that account for almost 80% of CO₂ energy-based emissions, have adopted H₂ roadmaps and strategies.

As part of this study, we have reviewed Green Hydrogen strategies and associated policy mechanisms implemented by global leaders in Green Hydrogen including United Kingdom (UK), United States of America (USA), Australia, Japan and European Union (EU). This review identifies best practices and strategies that can be adopted by India to further accelerate its Green Hydrogen journey at a national and regional level.



Best practices that can be leveraged by Indian states

4.1 Areas of improvement / strengthening within the Indian ecosystem

Indian states have demonstrated progress in Green Hydrogen initiatives. However, further advancements can be achieved by leveraging international best practices as set out in the table below:

Table 2: International Best Practices that can be Adopted to Improve State-Level Policies for Green Hydrogen

Theme	Indian baseline	Key areas
Production incentives		
Monetary support	States such as Maharashtra have allocated INR 8,562 crore to provide subsidies and benefits for policy implementation and setting up of Green Hydrogen Ecosystem Fund respectively.	<ul style="list-style-type: none"> • Low Carbon Hydrogen Supply Competition, UK: India can adopt measures such as competitions that aim to support innovation in the supply of H2, reduce costs, bring new solutions to the market as is seen in the UK.⁴
Green Hydrogen classification criterion / assurance schemes	States such as Andhra Pradesh, Rajasthan, Haryana and Madhya Pradesh have set out the eligibility criterion for production of Green Hydrogen / RE.	<ul style="list-style-type: none"> • Low-Carbon Hydrogen Standard (LCHS) Certification, UK: India can establish a certification scheme like LCHS that will act as an independent verification system that will enable producers provide assurance to offtakers* that the purchased H2 meets the “low-carbon” standard. It can act as eligibility criterion for other schemes.⁵ • Renewable Fuel Scheme (RFS), Australia: India can generate certificates for H2 producers based on the amount of Green Hydrogen they produce and sell them to liable parties as done under the RFS. These parties must purchase and surrender certificates to meet their obligations.⁶

4 [bing.com/ck/a?!&p=15dfbfa7eb8ababbJmltdHM9MTcyNDExMjAwMCZpZ3VpZD0wY2U3NjE5Ni05YzhhLTlwYjltMTI4OC03NTc3OWQOMzYxZGQmaW5zaWQ9NTIzNQ&ptn=3&ver=2&hsh=3&fclid=0ce76196-9c8a-60b2-1288-75779d4361dd&psq=Low+Carbon+Hydrogen+Supply+2+Competition&u=a1aHR0cHM6Ly93d3cuZ292LnVrL2dvdMvYybm1lbnQvcHVibGJlYXRpb25zL2xvdy1jYXJib24taHlkcm9nZW4tc3VvcGx5LTltY29tcGV0aXRpb24&ntb=1](https://www.bing.com/ck/a?!&p=15dfbfa7eb8ababbJmltdHM9MTcyNDExMjAwMCZpZ3VpZD0wY2U3NjE5Ni05YzhhLTlwYjltMTI4OC03NTc3OWQOMzYxZGQmaW5zaWQ9NTIzNQ&ptn=3&ver=2&hsh=3&fclid=0ce76196-9c8a-60b2-1288-75779d4361dd&psq=Low+Carbon+Hydrogen+Supply+2+Competition&u=a1aHR0cHM6Ly93d3cuZ292LnVrL2dvdMvYybm1lbnQvcHVibGJlYXRpb25zL2xvdy1jYXJib24taHlkcm9nZW4tc3VvcGx5LTltY29tcGV0aXRpb24&ntb=1)
5 <https://www.gov.uk/government/publications/uk-low-carbon-hydrogen-standard-emissions-reporting-and-sustainability-criteria>
6 <https://www.energy.nsw.gov.au/nsw-plans-and-progress/regulation-and-policy/energy-security-safeguard/renewable-fuel-scheme#:~:text=As%20currently%20designed%2C%20the%20RFS,RFS%20is%20a%20certificate%20scheme.>

Theme	Indian baseline	Key areas
		<ul style="list-style-type: none"> • EU Rules for the Classification of Renewable Hydrogen, EU: India can also develop designated guides to promote the use of renewable energy in H2 production as done by the EU. These contain guidelines for H2 produced from electricity supplied by renewable energy production.⁷ • Guarantee of Origin (GO) Scheme, Australia: India can establish an accounting framework as seen in the GO scheme. The scheme measures emissions and related information across the value chain.⁸
Demand creation		
Green Hydrogen hubs	5 states are supporting/promoting Green Hydrogen clusters or hubs.	<ul style="list-style-type: none"> • Tees Valley H2 Vehicle Ecosystem, UK: India can form H2 transport hub as seen in the UK which deploys a Green Hydrogen refuelling station that will serves 25 heavy goods vehicles* (HGV).⁹ <p>India can model the future development of H2 hubs in line with the precedents from USA, Australia and Japan:</p> <ul style="list-style-type: none"> • Regional Clean H2 Hubs Programme, USA: These hubs form a network of clean H2 producers near potential consumers, connected by the necessary infrastructure. These can also be of benefit to India.¹⁰ • Regional H2 Hubs, Australia: These regional H2 hubs are where producers, users and potential exporters of H2 across industrial, transport and energy markets are co-located.¹¹ • Development of H2 Hubs, Japan: These hubs are designed to achieve large-scale adoption of H2 and ammonia. Japan seeks to establish 3 large-scale hubs in major metropolitan areas with significant industrial demand over the next 10 years.¹²

7 [https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/747085/EPRS_BRI\(2023\)747085_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/747085/EPRS_BRI(2023)747085_EN.pdf)
8 <https://www.dceew.gov.au/energy/renewable/guarantee-of-origin-scheme>
9 <https://www.gov.uk/government/publications/tees-valley-hydrogen-transport-hub-successful-bidders/tees-valley-hydrogen-transport-hub-successful-bidders>
10 <https://www.wri.org/update/clean-hydrogen-investments-bil-ira>
11 <https://www.dceew.gov.au/energy/hydrogen>
12 https://www.japan.go.jp/kizuna/2021/03/hydrogen-production_facility.html

Theme	Indian baseline	Key areas
Infrastructure development support		
Monetary support / exemptions	Various Indian states have allowed a provision for allocated land for Green Hydrogen, exemptions from taxes, stamp duty and provision of water supply for Green Hydrogen projects.	<ul style="list-style-type: none"> • Clean H2 Manufacturing and Recycling Programme, USA: This initiative provides funding for R&D and demonstration projects that further new clean H2 production, processing, delivery, storage, reuse and recycling. India can also invest in a programme that deals with recycled H2.¹³
Research and development funding		
R&D and innovation	8 states have undertaken initiatives such as provision of funds for startups and centres of excellence operating in the Green Hydrogen sector.	<p>India can accelerate funding for R&D activities drawing on experiences from the UK, USA, Australia and Japan:</p> <ul style="list-style-type: none"> • Net Zero Innovation Portfolio (NZIP), UK: This £1 billion fund focuses on 10 themes corresponding to the innovation areas in the Net Zero Research & Innovation Framework.¹⁴ • Research, Development, Demonstration, and Deployment activities, USA: This initiative includes funding for 52 projects across 24 states to reduce the cost of clean H2 in US and to further its position in the growing H2 industry globally.¹⁵ • Clean Hydrogen Electrolysis Programme, USA: This programme will fund the development of electrolyser cell and stack manufacturing techniques, processes, and equipment to enable commercial-scale manufacturing of H2.¹⁶ • Hydrogen Research and Development Funding Round, Australia: It aims to support the commercialisation of renewable H2 through innovative R&D in renewable H2 production, storage, and distribution technologies.¹⁷ • Green Innovation Fund, Japan: This fund aims to help Japanese organisations reach to an advantageous position in the international market for carbon neutrality-related technologies and to strengthen their industrial competitiveness.¹⁸

13 <https://www.energy.gov/eere/clean-hydrogen-manufacturing-recycling#:~:text=Clean%20Hydrogen%20Manufacturing%20Recycling%20The%20Clean%20Hydrogen%20Manufacturing,storage%2C%20and%20use%20equipment%20manufacturing%20technologies%20and%20techniques>

14 <https://assets.publishing.service.gov.uk/media/646f13627dd6e70012a9b34c/nzip-anf-progress-report-2021-22.pdf>

15 <https://www.energy.gov/eere/fuelcells/bipartisan-infrastructure-law-clean-hydrogen-electrolysis-manufacturing-and-0#:~:text=This%20announcement%20represents%20the%20first,and%20%24500%20million%20for%20research%2C>

16 <https://www.energy.gov/eere/clean-hydrogen-electrolysis-program>

17 <https://arena.gov.au/funding/hydrogen-research-and-development-funding-round/>

18 https://www.jetro.go.jp/en/invest/investment_environment/jire/report2023/ch3/sec3.html

4.2 Areas of new intervention within the Indian ecosystem

International precedents in the identified regions as highlighted in the table below can serve as new areas of interventions in India's Green Hydrogen sector to accelerate India's Green Hydrogen trajectory.

Table 3: New Areas of Intervention that can be Adopted to Accelerate India's Green hydrogen Sector

Theme	New measure/best practice
Production incentives	
Subsidies	<ul style="list-style-type: none"> • Contracts for Difference* (CfD) Subsidy for Low-carbon Hydrogen, Japan: This subsidy scheme can be adopted in India to address the price differential between low carbon H2 and conventional fuel.¹⁹ • Supply Chain Subsidy (SCS) for Low-carbon Hydrogen, Japan: This scheme aims to ensure that clean H2 and ammonia are sold at the same price as LNG and coal, respectively. India can also benefit from subsidising clean H2 and ammonia.²⁰
Business model for H2 production	<ul style="list-style-type: none"> • Hydrogen Production Business Model (HPBM), and Low Carbon Hydrogen Agreement (LCHA), UK: India can develop a business model such as the HPBM accompanied by its contractual framework such as the LCHA. The model will provide financial incentives to producers of low-carbon H2. They receive a premium based on the difference between their production cost and the market price, encouraging higher sales price. The agreement has a framework that is modelled after the CfD. This covers the difference between the achieved low-carbon H2 sales price and a strike price, with a minimum set at the natural gas price.^{21, 22}
Trading schemes	<ul style="list-style-type: none"> • Auction for Supporting Production of Renewable H2, EU: India can form a bidding market as is being established in the EU. The auction will provide subsidies to renewable H2 producers in the form of a fixed premium per kg of H2 produced for a maximum of 10 years of operation to help close the cost gap and increase revenue stability.²³
Demand creation measures	
Capacity Building of Industries	<ul style="list-style-type: none"> • Hydrogen for Transport Programme and Hydrogen Supply Competition, UK: India can develop programmes as seen in the UK to enhance industrial expertise in green hydrogen technologies.²⁴ • The H2@Scale Initiative, USA: India can create a similar programme fostering collaboration between industries, academic institutions and national labs to build hydrogen capabilities across sectors.²⁵

19 https://www3.weforum.org/docs/WEF_Accenture_Enabling_Measures_Roadmap_for_Low_Emission_Hydrogen_Japan_2023.pdf

20 https://www.meti.go.jp/english/press/2024/0213_003.html

21 <https://www.gov.uk/government/collections/hydrogen-allocation-rounds>

22 <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/natural-gas/081023-uk-sets-out-support-mechanism-for-low-carbon-hydrogen-production#>

23 <https://observatory.clean-hydrogen.europa.eu/hydrogen-landscape/financial-tools-and-incentives#:~:text=The%20European%20Commission%20estimates%20that,required%20for%20core%20hydrogen%20infrastructure>

24 UK embraces hydrogen-fuelled future as transport hub and train announced - GOV.UK (www.gov.uk)

25 H2@Scale | Department of Energy

Theme	New measure/best practice
Incentives to Industries for Switching to Green hydrogen	<ul style="list-style-type: none"> • Industrial Decarbonisation Challenge Fund (IDCF), UK: India can set up a fund, like the UK, to provide funding to industries looking to decarbonise using Green Hydrogen.²⁶ • The Clean Energy Finance Corporation (CEFC), Australia: An Indian entity can offer loans and equity investments as in Australia for industries transitioning to Green Hydrogen.²⁷
Certification schemes	<i>The 5 policy measures listed in 'Green Hydrogen classification criterion / assurance schemes' theme in the table above have the potential for enabling demand creation across various Indian states.</i>
Awareness generation initiatives	<ul style="list-style-type: none"> • The H2 Knowledge Centre, Australia: India can develop resource hubs as seen in Australia which aims to foster collaboration between the growing Australian H2 industry, government, and R&D ecosystems.²⁸
Infrastructure development support	
Business model for H2 transport and storage	<ul style="list-style-type: none"> • Business Models for H2 Transport and Storage, UK: India can develop business models for H2 as seen in the UK. These models will use Regulated Asset Base (RAB)* system and an external subsidy mechanism to ensure reasonable returns for transport providers while keeping user charges affordable.²⁹
Guidance across Green Hydrogen value chain	<ul style="list-style-type: none"> • National Codes of Best Practice, Australia: India can establish best practice codes as seen in Australia. The codes seek to enhance regulatory outcomes by identifying regulatory obligations associated with the lifecycle activities of relevant H2 or ammonia projects.³⁰



26 Industrial decarbonisation – UKRI

27 Hydrogen - Clean Energy Finance Corporation - Clean Energy Finance Corporation (cefc.com.au)

28 <https://www.csiro.au/en/news/all/news/2022/july/csiro-launches-virtual-hydrogen-knowledge-centre>

29 <https://assets.publishing.service.gov.uk/media/64ca0e6c5c2e6f0013e8d92a/hydrogen-transport-storage-minded-to-positions.pdf>

30 <https://www.dcccew.gov.au/energy/hydrogen/regulatory-review>

*Explanation of technical terms

Offtaker: It is a customer in the H2 industry who agrees to purchase a specific volume of H2 from a producer for a predetermined period and price.

Heavy good vehicles: A large, heavy motor vehicle used for transporting cargo.

Contracts for Difference (CfD): The CfD scheme is the UK government's main mechanism for supporting low carbon electricity generation. Developers are paid a flat indexed rate for the electricity they produce over a 15-year period.

Regulated Asset Base (RAB) model: The RAB model is used in the UK to facilitate private investment in public projects. It allows investors to receive a guaranteed return on investment for the lifetime of the asset. It is commonly used in large scale infrastructure projects such as water, gas and electricity networks.



05 | Key Enablers for Policy Development

Green Hydrogen holds immense potential for India's sustainable energy future and decarbonisation efforts, but its high production costs currently pose a significant challenge for widespread market adoption. The levelised cost of Green Hydrogen (LCOH) represents the average cost of producing hydrogen over the lifetime of a production facility, encompassing capital expenditures, operational costs and energy expenses.

Reducing the LCOH is pivotal for the widespread adoption of Green Hydrogen as a sustainable energy solution. Policy enablers play a crucial role in achieving this reduction by providing financial incentives, regulatory frameworks and infrastructure support, and help driving down the costs, enhance technological advancements and facilitate large-scale adoption.



The following table shows major components of LCOH, their contribution to LCoH, key policy enablers to bring down the particular cost and impact of policy enablers on LCoH:

Table 4: Components Contributing to LCOH and Key Policy Enablers for Cost Reduction

Particulars	Contribution to LCoH (in %age)	Key Policy Enablers	Impact on LCOH
CAPEX			
Electrolyser	5-8%	CAPEX subsidy	High
OPEX			
RE Electricity	50-65%	Incentives for RE Projects as per State's RE Policy Incentive of land Allocation for RE Generation to produce Green Hydrogen RTC RE Generation for Green Hydrogen projects (Promotion to storage facilities) Concessional banking charges Electricity duty exemption	High
Transmission	16-20%	Intra-state transmission charges exemption Wheeling charges exemption Cross-subsidy surcharge exemption Additional surcharges exemption	High
Land Lease	-0.01%	Concessional land lease rates for RE/ Green Hydrogen projects Exemption on land taxes Exemption on stamp duty Exemption on land use conversion charges Establishment of 'Land Banks' near consumption and export centres	Low
Water	-0.05%	Water subsidy Water allocation on priority basis	Low
Maintenance and replacement	3-6%		Medium
Financing Costs			
Interest Cost	3-4%	Interest subsidy	Medium
Cost of Equity	6-10%		High

While Land and Water, as components to GH projects, do not have significant contribution to LCOH, their availability is of paramount importance.

Sufficient land availability at the right location, like near consumption and export centres (ports), offers several strategic advantages like reduction in transportation costs, minimisation of energy losses, proximity to industrial clusters and thereby offtake of Green Hydrogen and its derivatives, ease of exports to cater to international demand for Green Hydrogen and its derivatives, infrastructure synergies reducing need for new infrastructure investments and market certainty. The land parcels for Green Hydrogen projects can be designated at or near these centres as 'Land Banks', as in the case of Renewable Energy plants. This would enable developers to reduce risks and overall costs associated with Green Hydrogen projects.

Similarly, water availability becomes extremely important for overall viability of Green Hydrogen projects. As per the World Bank, India has 18% of world's population but only 4% of its water resources, making it among the most water-stressed in the world. Electrolysis process requires substantial amount of water (9 litres of de-ionised water for 1kg Green hydrogen production, and additional 10-12 litres for purification and process cooling needs). This raises sustainability concerns due to competition for water between hydrogen production and other uses (agriculture, drinking, industry). It is important to provide resource assessment results for developers to minimise risks and plan for water sourcing from alternative methods (desalination or water treatment).

06

Model Guidelines for State Level Green Hydrogen Policies

This document presents the model guidelines for state-level policymaking for Green Hydrogen in India. It aims to provide a comprehensive framework that can guide the development of Green Hydrogen sector in states, considering their unique contexts and capabilities. The guidelines cover a broad range of areas including regulatory

frameworks, financial incentives, infrastructure development, capacity building and public awareness. They are designed to be adaptable, allowing states to tailor their Green Hydrogen policies according to specific needs and circumstances, while aligning with the National Green Hydrogen policy.



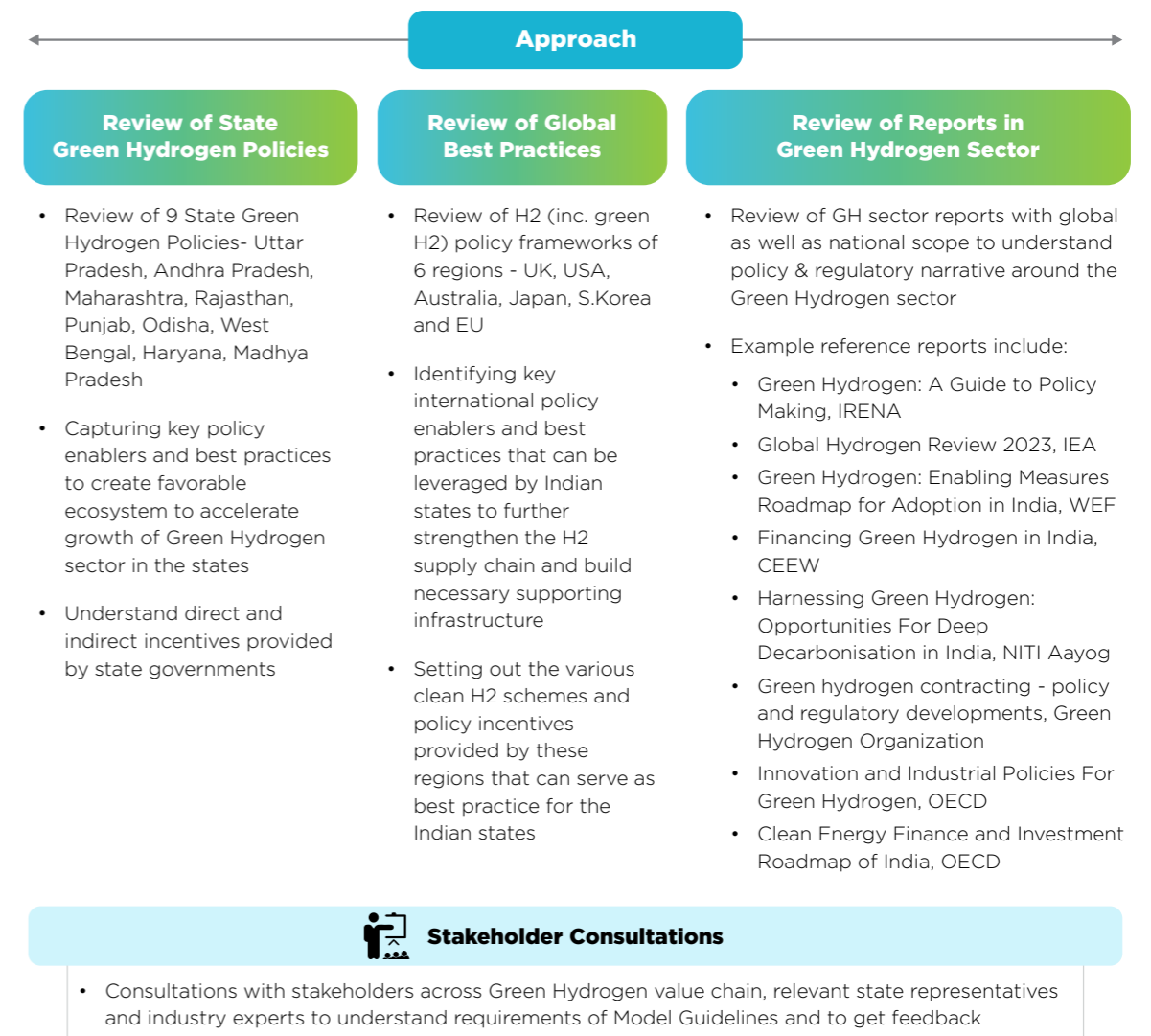
The figure below represents the elements of model comprehensive guidelines for state-specific policy making for Green Hydrogen sector.



6.1 Approach and Methodology in Developing Model Guidelines:

The Model Guidelines are based on literature review and stakeholder consultations. The

suggested Green Hydrogen policy structure and policy provisions are aligned with National Green Hydrogen Mission. The Model Guidelines draw inferences from learnings from State Green Hydrogen Policies and International Best Practices. The Model Guidelines will act as a reference document for the States/UTs while developing or updating State Green Hydrogen Policies.



6.2 State Strategy and Targets

Preamble with “Rationale for Green Hydrogen in State”

- **Energy Diversification and Security:** Highlight the need for Green Hydrogen to diversify the state’s energy mix, reduce carbon emissions, and enhance energy security. Emphasise the state’s commitment to sustainable energy solutions.
- **Resource Availability:** Discuss the unique resources available in the state, such as land, water, and abundant renewable energy sources (solar, wind, hydro), which make it suitable for Green Hydrogen production.
- **Strategic Advantages:** Mention factors like strong domestic demand for hydrogen, existing port infrastructure for export, and any other state-specific characteristics that support the development of a Green Hydrogen economy.

Target Setting

- **Production Targets:** Set clear targets for Green Hydrogen production in Million Metric Tonnes Per Annum (MMTPA), leveraging local renewable energy potential. Aim to harness solar, wind, or hydro energy for hydrogen generation.
- **Consumption Targets:** Establish consumption targets for integrating Green Hydrogen into key sectors such as industry, transportation, and power generation. Promote its use as a cleaner alternative to fossil fuels.
- **Distribution and Export Targets:** Focus on developing robust infrastructure and market mechanisms for the efficient distribution and export of Green Hydrogen. Ensure alignment with the National Green Hydrogen Mission.

Technology Agnostic Policy

- **Inclusive Approach:** Adopt a technology-agnostic policy for Green Hydrogen production, allowing for various production methods including electrolysis using renewable electricity and biomass-based production through reforming or pyrolysis.
- **Incentive Applicability:** Ensure that all incentives specified in the state policy apply equally to any Green Hydrogen production technology.
- **Encouraging Innovation:** Promote innovation and flexibility in Green Hydrogen production technologies to adapt to evolving industry standards and advancements.

Timeline of Policy

- **Implementation Timeline:** Set a clear timeline for the implementation of the Green Hydrogen policy, with a minimum applicability period of 5 years, allowing for periodic reviews and amendments.
- **Policy Review and Integration:** Periodically review the policy to ensure its relevance and effectiveness. Consider superseding or combining with other policies to promote a comprehensive Green Hydrogen ecosystem.
- **Adaptability:** Allow for amendments to the policy based on periodic reviews, technological advancements, and market changes to maintain alignment with national and international goals.

Review Mechanism

- **Monitoring and Evaluation:** Establish mechanisms for the periodic review and adjustment of targets. Monitor progress, assess technological advancements, market dynamics, and policy impacts.

- **Continuous Improvement:** Stimulate continuous improvement and innovation by setting ambitious yet achievable targets. Encourage states to push the boundaries of Green Hydrogen production and utilisation.
- **Addressing Challenges and Opportunities:** Regular reviews to address emerging challenges, capitalise on new opportunities, and ensure alignment with broader national climate goals.

Financial Outlay

- **Financial Allocation:** Financial outlay may be specified for the implementation of the state Green Hydrogen policy, ensuring sufficient funding for various initiatives.
- **Alignment with National Mission:** Refer to the financial outlay of the National Green Hydrogen Mission to align state policy outcomes with national objectives.
- **Investment Attraction:** Encourage investment by providing a clear financial framework and incentives for Green Hydrogen projects, fostering growth and innovation in the sector.

6.3 Regulatory Framework for Green Hydrogen in State

Establishment of State Nodal Agency

- **Designate a Dedicated State Nodal Agency:** Assign a state-specific body as nodal agency to coordinate with Central Regulatory Authority/Ministry for the Green Hydrogen sector, ensuring alignment with the Central guidelines and mandates. This body will oversee policy implementation and compliance with established guidelines and standards.
- **Monitoring and Enforcement:** The state nodal agency will monitor and enforce safety, environmental, and operational standards for Green Hydrogen

production, storage, and distribution. It will also facilitate approval and permitting processes for new projects, streamlining bureaucratic procedures.

- **Stakeholder Liaison:** Act as a liaison between government agencies, industry players, and local communities to address concerns and promote collaborative efforts in the Green Hydrogen sector.



Setting Eligibility Criteria

- **Technical Specifications and Safety Standards:** Develop detailed technical requirements for Green Hydrogen production, storage, and distribution. This includes specifications for electrolyser types, efficiency benchmarks, hydrogen purity, energy conversion processes, and equipment performance. Safety standards should cover handling, storage, leak

prevention, and emergency response protocols, ensuring robust protection for workers, communities, and the environment.

- **Adoption of Certified Guidelines:** States should adopt technical specifications and safety guidelines issued by certified agencies like, PESO, MORTH, OISD, PNGRB, and other authorised bodies to ensure projects are safe, technologically advanced, and efficient.

There are a total 94 recommended standards for the GH sector, out of which 73 have been published/under publishing by various authorities, 19 are under review and 2 are being developed.

Source: Green Hydrogen Standards and Approval Systems in India, CEEW, June 2024

the deployment of Green Hydrogen infrastructure. The states shall notify specific timeline for approval process for setting up Green Hydrogen project or Electrolyser Manufacturing unit. The timeline for approval shall be in specific

number of days ('n'). The states may also specify information about automatic approval of projects post specific number of days ('n') post submission of application for approval.

To set up GH projects, there are in total 73 approvals that have to be taken in the following areas:

- General and Legal (27); b) Renewable Energy (14); c) Fire Safety (13); d) Pollution Control (8);
- Labour (8); f) Land Allocation and Use (3)

Out of the total 73 approvals required for Green Hydrogen projects, State Government entities hold jurisdiction for 43, Central Government entities hold jurisdiction for 23 approvals and seven approvals fall under local government bodies.

Source: Green Hydrogen Standards and Approval Systems in India, CEEW, June 2024

Environmental and Social Standards

- **Environmental Impact Assessments (EIAs):** As per the Clarification issued by Ministry of Environment, Forest and Climate Change (MoEFCC), dated 28th July 2023,
 - **Standalone Ammonia Project/ Activity** is not included in the schedule of the EIA notification, 2006, and thus Environmental Clearance (EC) is not applicable to such projects.
 - **Standalone plants producing Green Hydrogen/Green Ammonia by way of electrolysis of water using Renewable Energy** shall not require prior EC under the provisions of EIA Notification, 2006. However, requisite consents under the provisions of the Air Act, 1981 and Water Act, 1974 shall be applicable. In case the Green Hydrogen/Green Ammonia plant are set up within the premises of an existing unit which requires prior EC, the component of such Green Hydrogen/Green Ammonia plant would require to be included through amendment in the existing EC.

- **Social Standards:** Ensure projects contribute positively to local communities by creating jobs, engaging with the community, and providing fair compensation for land use.

Formulating an Approval Committee

- **Dedicated Approval Committee:** Establish a committee within the Nodal Agency composed of experts in renewable energy, environmental science, engineering, finance, and regulatory affairs. This committee will evaluate project proposals to ensure they meet established eligibility criteria, maintaining high standards of quality, safety, and efficiency in the Green Hydrogen sector.

Establishment of Single-Window Clearance

- **Single-Window Clearance Facility:** Create a single-window clearance facility for the permitting process of Green Hydrogen production units or electrolyser manufacturing units. This facility will reduce construction period and accelerate



6.4 Financial Incentives and Support

States may outline various financial incentives that could be provided to encourage production of Green Hydrogen production and manufacturing of electrolyzers or both. These incentives could include:

Production-Linked Incentives (PLIs)

- **Electrolyser Manufacturing:** PLIs for electrolyser manufacturing may be offered by the States as per the following:
 - **Alignment with SIGHT Programme-Component I:** States may offer

1. The first tender for setting up Manufacturing Facilities for Electrolysers under SIGHT scheme (Tranche-I) was launched on 7 July 2023, for a total of 1,500 MW Electrolyser capacity. Out of the outlay of INR 4,440 Crore, INR 2,220 Crore was awarded as support for setting up 1,500 MWPA of electrolyser manufacturing capacity, to 8 companies.
2. The second tender for setting up Manufacturing Facilities for Electrolysers under SIGHT scheme (Tranche-II) was launched on 16 March 2024, for a total of 1,500 MW of Electrolyser capacity. There are three buckets being offered within the tender:
 - a. Bucket 1- Electrolyser manufacturing capacity based on any stack technology- 1,100 MW
 - b. Bucket 2A- Electrolyser manufacturing capacity based on indigenously developed stack technology- 300 MW
 - c. Bucket 2B- Electrolyser manufacturing capacity based on indigenously developed stack technology- smaller units- 100 MW

- **Green Hydrogen Production:**
 - **Alignment with SIGHT Programme-Component II:** States may provide PLIs similar to the SIGHT programme-Component II- Mode 1 (directly incentivising Green Hydrogen production based on lowest financial

PLIs akin to the SIGHT Programme-Component I to encourage investment in electrolyser manufacturing.

- **Incentive Structure:** Incentives could be linked with competitive auctions and provided in INR/kW for total electrolyser manufacturing capacity, limited to a specified number of years ('n'). The duration can be determined by market maturity and sector support needs.
- **Project Limits:** States may cap the number of projects that qualify for incentives under the state specific PLI scheme.

support required through competitive auction) and Mode 2 (Aggregating demand and incentivising bidders with lowest cost of Green Ammonia/ Green Hydrogen production, through competitive auction), to attract investment in Green Hydrogen production.

- **Incentive Structure:** Incentives could be linked with competitive auctions and provided in INR/kg of hydrogen production, limited to a specified number of years ('n'). The duration can be based on market maturity and sector support requirements.
- **Project Limits:** States may limit the total number of projects eligible for incentives under the state specific PLI scheme.

1. The first tender for setting up Production Facilities for Green Hydrogen under SIGHT Scheme (Mode-1-Tranche-I) was launched on 10 July 2023, with 410,000 MT/annum of Green Hydrogen Production through Technology Agnostic Pathways and 40,000 MT Green Hydrogen Production through Biomass based Pathways. Out of the outlay of INR 13,055 Crore, INR 3055 Crore was awarded as support for three years for 412,000 Tonnes of GH2 production per annum, to 10 companies- 410,000 Tonnes awarded to Electrolysis Pathway, 2,000 Tonnes awarded to Biomass Pathway.
2. The second tender for setting up Production Facilities for Green Hydrogen under SIGHT Scheme (Mode-1-Tranche-II) was launched on 11 July 2024, with 410,000 MT/annum of Green Hydrogen Production through Technology Agnostic Pathways and 40,000 MT Green Hydrogen Production through Biomass based Pathways.

Tax Exemptions

- **Land Tax:**
 - **Waivers or Concessional Rates:** States may offer waivers or concessional rates on land tax, land use conversion charges, and stamp duty for land acquisition related to Green Hydrogen production projects or electrolyser manufacturing facilities.
 - **Duration and Structure:** Exemptions could be defined in terms of percentage (%) of individual components within the land tax, for a specific number of years ('n').
- **State Goods and Services Tax (SGST) Waiver:**
 - **Reimbursement or Exemption:** States may provide reimbursement or exemption on Net/Gross SGST, defined as a percentage (%) reimbursement/exemption for a specific number of years ('n').
 - **Ceiling Limit:** States may set a ceiling limit/cap on the maximum reimbursement/exemption, based on a percentage (%) of Fixed Capital Investment (FCI).

Electricity Charges Waiver

The waiver/concession and provisions for Electricity Charges that may be provided by states should be standardised³¹ and rationalised with Green Open Access Rules. Such rationalisation shall provide alignment with the National policy. The illustrations in Appendices section provide insights into the various electricity charges applicable under Green Open Access Rules for STU connected projects.

- **Intra-State Transmission System (InSTS) Charge:**

- **Waivers or Concessional Rates:** States may provide waivers or concessional rates on transmission charges to encourage the development of Green Hydrogen production and electrolyser manufacturing facilities. The InSTS charges, revised periodically by the state regulator, are charged on an INR/MW basis.
- **Duration and Structure:** The waiver/concession could be given as a percentage (%) exemption from this charge for a specific number of years ('n').

- **Wheeling Charge:**

- **Waivers or Concessional Rates:** States may offer waivers or concessional rates on wheeling charges for using the distribution network, encouraging the establishment of Green Hydrogen production and electrolyser manufacturing facilities. The wheeling charges, revised periodically by the state regulator, are charged on an INR/MW basis.
- **Duration and Structure:** The waiver/concession could be given as a percentage (%) exemption from this charge for a specific number of years ('n').

- **Cross-Subsidy Surcharge:**

- **Waivers or Concessional Rates:** States may provide waivers or concessions on cross-subsidy surcharges to support the setup of Green Hydrogen production and electrolyser manufacturing facilities. The surcharge is charged on an INR/kWh basis and revised periodically by the state regulator.
- **Duration and Structure:** The waiver/concession could be given as a percentage (%) exemption from this charge for a specific number of years ('n').

- **Additional Surcharge:**

- **Waivers or Concessional Rates:** States may offer waivers or concessions on additional surcharges to promote the growth of Green Hydrogen production and electrolyser manufacturing. The surcharge is charged on an INR/kWh basis and revised periodically by the state regulator.
- **Duration and Structure:** The waiver/concession could be given as a percentage (%) exemption from this charge for a specific number of years ('n').

- **Electricity Duty:**

- **Waivers or Concessional Rates:** States may provide waivers or concessions on electricity duty to make Green Hydrogen production and electrolyser manufacturing more competitive. The duty is charged on an INR/kWh basis and revised periodically by the state regulator.
- **Duration and Structure:** The waiver/concession could be given as a percentage (%) exemption from this charge for a specific number of years ('n').

- **Electricity Banking Provision and Charges:**

- **Banking Permissions:** States may allow electricity banking for Green Hydrogen production and electrolyser manufacturing, following standardised banking charges, durations, and compensation mechanisms.
- **Monthly Banking:** Banking may be permitted on a monthly basis with charges applied for the utilisation of banked energy within the same month. Permitted quantum of banked energy could be up to 30% of total monthly electricity consumption.
- **Banking Charges and Withdrawals:** States may specify banking charges as a percentage (%) of energy banked or in INR/kWh. They may also set terms for withdrawing banked energy based on Time of Day (ToD), with specific charges for peak and off-peak hours. Compensation for unutilised banked energy could be provided as a percentage (%) of total energy banked or in INR/kWh.
- **Settlement Mechanism:** States may count banking on a daily basis for monthly accounting and issue model illustrations for settlement mechanisms under different scenarios. A timeline for providing incentives related to banking may also be set, with provisions adjusted as per state-specific requirements.

Capital Allowance on Equipment and Machinery

- **Tax Relief on Plant and Machinery Assets:** States may offer capital allowances on equipment and machinery for Green Hydrogen production and electrolyser manufacturing. These allowances serve as tax reliefs that businesses can claim against taxable profits for assets acquired for setting up Green Hydrogen production units or electrolyser manufacturing units, or both.
- **Allowance Structure:** The capital allowance could be provided as a percentage (%) of the expenditure on

equipment and assets in INR. This relief aims to reduce the initial capital burden on businesses, encouraging investment in Green Hydrogen infrastructure.

- **Duration and Limits:** States may specify a limit on the number of years ('n') during which such capital allowances are provided, ensuring a balanced approach that supports market growth while managing fiscal impacts.



³¹ WEF_Green_Hydrogen_Enabling_Measures_Roadmap_for_Adoption_in_India_2024.pdf (weforum.org), Accessed on 17 July 2024.

Capital Subsidy

Capital Subsidy for Green Hydrogen Production and Electrolyser Manufacturing:

- **Capital Subsidy Mechanism:** States may provide capital subsidies to support Green Hydrogen production and electrolyser manufacturing. The state government may set guidelines on eligible capital investment covered under the subsidy mechanism and determine the maximum quantum of incentives per project or based on eligible capital investment.
- **Incentive Structure:** The subsidy could be provided as a percentage (%) of the capital investment in INR, reducing the financial burden on developers and encouraging the establishment of Green Hydrogen facilities.
- **Guidance for Capital Subsidy:**
 - **Permissible Incentive Disbursement Period:** States may outline the structure for disbursing the capital subsidy, specifying whether it will be provided pre-commissioning or post-commissioning of the project. A defined period ('n' number of years) for disbursement may also be set.
 - **Ceiling Limits:** States may set a ceiling limit on the capital subsidy in INR per project/plant, ensuring a balanced allocation of resources.
 - **Application Timelines:** Clear timelines for applying for incentives may be specified to guide potential developers through the process efficiently.
- **Additional Multipliers and Boosters for providing capital subsidy:**
 - **Capacity Utilisation and Local Employment:** Subsidies can be enhanced with multipliers and boosters, such as capacity utilisation, local employment generation, and the use of local content in inputs and raw materials.

- **Incentive Add-Ons:** States may offer additional incentives beyond the capital subsidy for achieving specific milestones or criteria, further promoting local economic benefits and sustainable practices.

Promotion of Green Hydrogen Hubs and Industrial Clusters

- **Special Economic Zones (SEZs):**
 - **Incentivising SEZs:** States may incentivise Green Hydrogen production or electrolyser manufacturing by setting up SEZs or allocating SEZ status. This includes facilitating infrastructure like access to land, water, transmission networks, and roads, and providing regulatory exemptions to attract investment.
 - **Direct Incentives:** States may offer direct incentives as a percentage (%) of CAPEX or through grants, with a ceiling limit in INR per hub/park/cluster.

Competitive Bidding Mechanism

- **Procurement of Green Hydrogen:**
 - **Implementation of Competitive Bidding:** States may prepare and implement a competitive bidding mechanism for the procurement of Green Hydrogen and its derivatives to ensure cost efficiency and transparency. This mechanism may include awarding criteria based on INR/kg of Green Hydrogen production or INR/MW of electrolyser manufacturing capacity, referring to guidelines from the Solar Energy Corporation of India (SECI) for implementation under the SIGHT Scheme.

Incentivising Decentralised Green Hydrogen Production and Consumption

- **Decentralised Production Models:**
 - **Innovative Models:** States may introduce innovative models to source Green Hydrogen through decentralised renewable energy, such as rooftop solar and small/micro hydel plants. This reduces transportation requirements and optimises the use of local resources.
 - **Biomass-Based Hydrogen Production:** Encourage the development of biomass-based hydrogen production systems.
 - **Modular Electrolysers:** Promote the use of modular electrolysers connected to rooftop solar or other decentralised renewable energy plants, preferably using treated industrial or municipal wastewater.

There are some other aspects of support which the States may provide indirectly to reduce risks and scale up the Green Hydrogen market:

1. Access to Low-Cost Financing

- a. **Concessional Finance and Green Bonds through Collaboration with Development Banks and Institutions:** States may identify innovative financing mechanisms and collaborate with Development Banks and Multilateral or Bilateral Institutions to create green bonds or provide access to concessional finance, ensuring affordable funding for Green Hydrogen projects and electrolyser manufacturing. World bank has recently announced a funding support of USD 1.5 Billion for Green Hydrogen sector in India.
- b. **Risk Sharing Facility through Partnerships with Financial Institutions:** States may establish partnerships with Multilateral Development Banks and Financial Institutions to create risk-sharing facilities for developers of Green Hydrogen projects or electrolyser manufacturing units, reducing financial risks and encouraging investment.

2. Green Certification

- a. **Incentivising Certification Agencies:** States may incentivise certification agencies within the state for certifying Green Hydrogen production and building capacity to prevent greenwashing.

3. Unlocking Private Sector Investment:

- a. **Public-Private Partnerships and SPVs:** States may create additional provisions to unlock private sector investment through Public-Private Partnerships, Special Purpose Vehicles (SPVs), and Viability Gap Funding (VGF) facilities to make initial projects viable for developers.

Source: Clean Energy Finance and Investment Roadmap of India | OECD, Accessed on 8th August, 2024.



6.5 Demand Creation measures

Creating demand for Green Hydrogen is pivotal for its market expansion and transition from grey hydrogen. States have a critical role in creating and sustaining this demand and may provide adequate provisions for the same as follows:

Green Hydrogen Consumption to create market certainty

- **Traditional Sectors:** States may encourage the use of Green Hydrogen in sectors traditionally reliant on grey hydrogen, such as fertiliser production, oil refineries, and steel production through Demand Aggregation model as implemented under the SIGHT Scheme.

1. Under the demand aggregation model, the first tender for **Selection of Green Ammonia Producers for Production and Supply of Green Ammonia under SIGHT Scheme (Mode-2A-Tranche-I)** was launched on 7 June 2024, with bidding for total available capacity of 7,39,000 MT per annum of Green Ammonia to a total of 14 procurers. SECI has provided location-wise and required supply-wise breakup of the tendered capacity for the supply of Green Ammonia to these 14 units. The last bid submission date against the tender is 3 September 2024.
2. The Government of India has also rolled out scheme guidelines for SIGHT Scheme (Mode 2B) for **selection of Green Hydrogen Producers for Production and Supply of Green Hydrogen under a demand aggregation model, specifically for Oil and Gas companies.** The implementing agencies nominated by Ministry of Petroleum and Natural Gas (MoPNG) are Oil and Gas Companies and Centre for High Technologies (CHT). The implementing agencies will aggregate demand and call for bids for production and supply of Green Hydrogen at lowest cost for a single refinery or multiple refineries, through a competitive selection process with incentives being fixed.

- **New Potential Sectors:** States may also provide guidance for emerging sectors like heavy transportation, synthetic fuel production, and other areas where Green Hydrogen can significantly reduce carbon emissions.
- **Designated Consumer Category:** States may follow the mandate, if any, from Central Ministry on 'Designated Consumer Category' covering several sectors as per the assessment of hydrogen demand. This obligation may be set as a percentage (%) of total hydrogen consumption (in kg) in specific sectors. It may also include Green Hydrogen blending in other fuels, set as a percentage (%) of Green Hydrogen blending (based on volume) in natural gas pipelines.

Dedicated Agency for Assessment

- States may assign a Nodal Agency to assess and cater to the demand for Green Hydrogen. This agency will work in coordination with the state regulator to ensure a focused approach towards market development and regulatory oversight. The nodal agency may identify potential demand centres and coordinate the development of Green Hydrogen production, storage, and transportation facilities near these centres.

Capturing International Green Hydrogen market through export

- **Competitive Production:** States can focus on producing Green Hydrogen that is competitive in the international market regarding cost and safety standards.
- **Trade Partnerships:** States may develop international trade partnerships to facilitate Green Hydrogen export.
- **Capital Incentives:** States can boost exports by providing capital incentives linked to the percentage of Green Hydrogen exported out of total production by each production unit. The incentives could be in percentage (%) of total capital incentives for a range of export in percentage (%). E.g., 2% for 25% export; 3% for 50% Export; 4% for 75% Export.

- **Export Targets:** States may set targets to achieve a certain percentage of Green Hydrogen export from India, enhancing their presence in the international Green Hydrogen market.



6.6 Infrastructure Development

Support for infrastructure development is a cornerstone for the successful deployment of Green Hydrogen Projects. States may provide following provisions in their policy to support development of Green Hydrogen infrastructure:

Establishment of Green Hydrogen Production Hubs

- States may provide support for the establishment of Green Hydrogen production hubs through clear guidelines on land and water allocation, grid infrastructure connectivity provisions and incentives like subsidies and tax benefits and streamlined regulatory processes.

Under the NGHM, the Government of India launched the scheme of Setting up Hydrogen Hubs on 15 March 2024 and has allocated INR 200 Crore with implementing timeline till 2025-26 for promoting cluster-based production and end-use of Green Hydrogen. Following are some of the key aspects of the scheme:

- Mandate for setting up of 2 hubs with 0.1 MMTPA capacity each
- MNRE to be the Implementing Agency (IA) to invite proposals
- Evaluation to be undertaken by the Project Appraisal Committee (PAC)
- 80% weightage for assessment criteria and 20% weightage for DPR presented before the PAC

Storage and Transportation Infrastructure

- Specifying requirement of funds for Green Hydrogen Value Chain:** The states may specify the investment needs and quantum of investment that the states could allocate to support the development of robust storage and transportation infrastructure for Green Hydrogen.
- Technical Specifications:** The states may also issue technical specifications for the infrastructure components which may cover pipelines, storage tanks and refuelling stations, to ensure efficient and safe distribution.
- Collaborating with existing entities:** States may also issue guidance on collaborating with entities with existing operations in pipelines, storage and refuelling stations and create avenues for Public Private Partnerships to leverage additional resources and expertise. The

incentives to develop the storage and infrastructure may be as following:

- Pipelines:** Percentage (%) of capital investment as subsidy with a ceiling limit in terms of INR/km of pipeline development, with further ceiling on total pipeline length in km. The states may also provide percentage (%) interest subsidy on term loan with a ceiling limit on the length of pipeline.
- Bunkers for Storage:** land allocation by port authorities for setting up bunkers at ports for the export of Green Hydrogen or its derivatives.
- Facilitation of approvals and clearances for bulk storage and development of pipelines.
- R&D support for innovation in storage and transportation through pipeline for Green Hydrogen and its derivatives.

- Gaseous Hydrogen Storage:** Typically stored at 200 to 700 bar with energy requirements for compression between 1.5 to 3 kWh/kg
- Liquid Hydrogen Storage:** Stored at -235oC with energy requirements for liquefaction between 10 to 15 kWh/kg

Existing natural gas pipelines can be used to transport hydrogen, but there are significant challenges and modifications required to ensure safety and efficiency.

Challenges with Existing Pipelines

- Hydrogen Embrittlement:** Hydrogen is the smallest molecule and can penetrate steel alloys used in pipelines, causing embrittlement. This makes the metal more prone to cracking and corrosion.
- Leakage:** Hydrogen molecules are more likely to leak from valves, seals, and other connection points due to their small size.
- Pressure:** Hydrogen is transported at higher pressures than natural gas, which puts additional stress on the pipelines.

Modifications Needed

- Material Upgrades:** Pipelines may need to be made from or lined with materials that are resistant to hydrogen embrittlement, such as certain stainless steels or composite materials.
- Seals and Valves:** Upgrading seals and valves to prevent hydrogen leakage is crucial. This might involve using materials like Teflon or other advanced polymers.
- Monitoring and Maintenance:** Enhanced monitoring systems to detect leaks and regular maintenance schedules to check for embrittlement and other issues.

Specifications for Hydrogen Pipelines

- Material:** Stainless steel or composite materials that resist hydrogen embrittlement.
- Pressure Rating:** Pipelines must be rated for higher pressures to safely transport hydrogen.
- Seals and Valves:** Use of advanced materials like Teflon for seals and valves to prevent leaks.
- Coatings:** Internal coatings to reduce hydrogen permeation and protect the pipeline material.

While existing pipelines can be adapted to carry hydrogen, significant modifications are necessary to address the unique challenges posed by hydrogen's properties. This includes upgrading materials, seals, and valves, as well as implementing rigorous monitoring and maintenance protocols.

Transporting compressed hydrogen via pipeline can be the most competitive option in terms of cost, adding only about USD 0.4-0.5/kg H₂ for a 3 000 km distance with a new 48-inch diameter pipeline (75-100% design capacity). This cost can be even lower if repurposed pipelines are available. However, the feasibility of this type of infrastructure can have technical and geopolitical challenges.

Source: *Global Hydrogen Review, IEA 2023*

Development of RE Generation Capacity for Green Hydrogen Production

- The states may specify incentives as per State's Renewable Energy Policy for the development of RE generation capacity, specifically for Green Hydrogen projects. The states may also facilitate round-the-clock (RTC) RE generation through

hybrid RE, battery storage and pumped hydro, for providing reliable power supply to production units of Green Hydrogen and its derivatives. Additional incentives of land allocation for RE generation to produce Green Hydrogen could be provided with ceiling limit for:

- Area of land (acres) per MW
- Maximum RE Power (MW) per kilo Ton of Green Hydrogen produced

For producing 1KTPA of Green Hydrogen,

- installed solar capacity required would be around 30 MW, assuming 20% capacity factor for solar and 50kWh of input energy required for 1 kg of Green Hydrogen production.
- installed wind power capacity required would be around 16.5 MW, assuming 35% capacity factor for wind and 50 kWh of input energy required for 1 kg of Green Hydrogen production.



- Integration with Renewable Energy and Grid Infrastructure:** The states may include guidance on facilitating the integration of renewable energy sources to Green Hydrogen production units through existing grid infrastructure as per follows:
 - The states may support the co-location of Green Hydrogen production facilities with renewable energy generation plants and enhance grid capacity to manage additional load.
 - The states may provide the Green Hydrogen projects or electrolyser manufacturing units a priority access to transmission infrastructure.
 - The states may set maximum timeline for providing technical feasibility report of power evacuation through transmission network from the date of receipt of application.
 - The states may undertake

strengthening of upstream transmission system through state TRANSCOM or DISCOM by upgrading existing transmission system and building new infrastructure.

- The central government guidance for Open Access approval could be adhered to, with a maximum number of days (15 days or deemed approved) for Open Access approval for the Green Hydrogen projects or electrolyser manufacturing units or both from the date of application submission.
- The States may incentivise the RESCO companies to set up RE power plants and provide round-the-clock (RTC) clean electricity to Green Hydrogen Production or Electrolyser manufacturing units.

Land Allocation and Costs

- Government Land:** The states may give provisions for land allocation of government lands at concessional or competitive rates.
- Land Banks:** States may identify and ensure land parcels are available near to the ports for export oriented Green Hydrogen/Green Ammonia Production Facilities.
- Private Land:** The states may define clear guidelines for land acquisition processes for acquisition of private land to simplify and expedite land allocation to accelerate project development. The states may provide standard land lease rates for Green Hydrogen production projects and RE projects in terms of INR/Acre/Year.

A 1 GW electrolysis plant could occupy about 42 acres of land. With an energy input of 50kWh/kg of Green Hydrogen production, such a facility can produce around 175,000 Tonnes of Green Hydrogen annually



Water Availability and Costs

- **Sources of Water:** The states may identify, prioritise and secure sources such as desalinated seawater, treated wastewater, or other non-potable water sources for use in Green Hydrogen projects, ensuring sustainable water availability for Green Hydrogen production.
- **Subsidy for Water:** The states may specify the measures to manage water costs effectively, including any subsidies for water procurement in terms of percentage (%) of INR/Litre for specific number of years ('n'), ensuring minimum environmental impact and avoidance of competition for freshwater resources.

1 KG of Green Hydrogen Production requires 9 Litres of Deionized water and total of 18-20 Litres of water per kg of Green Hydrogen for purification and process cooling.

Source: RMI

6.7 Research and Development Support

Research and Development (R&D) support measures are vital for advancing Green Hydrogen technologies and ensuring their successful integration into the energy sector³². Some of the provisions that the States may include in the policy are:

Allocation of funds for Pilot Projects

- **Funding on project basis:** States may allocate funds to set up Pilot Projects in Green Hydrogen production, storage, transportation and consumption in terms INR/project with a ceiling limit on total investment per project. The States may allocate a lump-sum amount for pilot projects and allocate portion of it to respective areas of intervention.
- **Funding for Startups:** The state may also allocate funds for startups in the Green Hydrogen sector in terms of INR per annum for a specific number of years ('n').

In February 2024, under NGHM, scheme guidelines for implementation of pilot projects for use of Green Hydrogen for three sectors were announced.

- Shipping:** With a total outlay of INR 115 Crore and timeline of implementation till 2025-26, the scheme envisages pilots in two areas:
 - Retrofitting of vessels to run on Green Hydrogen or Derived Fuels (Scheme Implementing Agency- Shipping Corporation of India), and
 - Establishment of Bunkering and Refuelling Facility (Scheme Implementing Agency- Tuticorin port)
 - Ministry of Ports, Shipping and Waterways (MoPSW) has identified Kandla, Tuticorin and Paradip Ports for development as Green Hydrogen Hubs
- Steel:** With a total outlay of INR 455 Crores and timeline of implementation till 2029-30, the scheme envisages pilots of blending Green Hydrogen in Steel plants in through following methods:
 - Hydrogen injection (100%) in DRI plant
 - Hydrogen injection in existing blast furnace and existing DRI vertical shaft plant
 - MECON Limited under Ministry of Steel (MoS) is the Scheme Implementing Agency for both the tasks.
- Transport:** With a total outlay of INR 496 Crore and timeline of implementation till 2025-26, the scheme envisages pilots in the following areas:
 - Component A: Trucks/Buses/Four-Wheelers
 - i. Fuel Cell-based propulsion
 - ii. IC Engine-based propulsion
 - Component B: Hydrogen Refuelling Station
 - Automotive Research Association of India (ARAI) is the Scheme Implementing Agency for both the components.

³² Innovation and industrial policies for Green Hydrogen | OECD. Accessed on 9th August, 2024

Allocation of funding for R&D

- States may allocate funds for R&D across the Green Hydrogen value chain. This may include basic research, development of new technologies and scaling up of

pilot projects through investment in R&D in siting, electrolyser manufacturing and efficiency improvement, component manufacturing for electrolysers, storage and transportation.

Under the NGHM, Research and Development is a key focus, and a financial outlay of INR 400 Crore has been allocated. MNRE is the Scheme Implementing Agency for selection of projects which will receive the financial incentives, around following areas:

- High-efficiency, Low-cost Electrolysers
- Membranes, 3rd-gen electro-Catalysis
- Fuel Cells
- Low-cost storage and transportation
- Advanced Materials
- Green Steel, Hydrogen from Biomass
- Seawater Electrolysis via innovative chemistry

380 proposals have been received by MNRE and are under evaluation.

Setting up testing facilities

- States may allocate funds to invest in state-of-the-art testing facilities to ensure safety, efficiency and reliability of Green Hydrogen technologies. These facilities

would help the states in identifying gaps in existing facilities and create new ones. The funds could be allocated in INR per Testing Facility with a ceiling limit per project.

Following schemes are under development for setting up of testing facilities and creating National Centre for hydrogen Safety:

- Green Hydrogen Testing Schemes:** Establishment of Testing Infrastructure Facilities for GH2 quality, Testing of Equipment, etc.
- National Centre for Hydrogen Safety:**
 - RD&D on all safety-related aspects
 - Creation of knowledge repository on Hydrogen safety and Coordination and collaboration with all National and International institutions on H2 testing, standardisation and safety

Centre of Excellence

- States may allocate funds to establish Centre of Excellence to foster innovation, and domestic and international

collaboration in Green Hydrogen research. These centres would serve as hubs for knowledge exchange, policy development and technical expertise.

6.8 Monitoring and Evaluation

Effective monitoring and evaluation measures are essential for the development and implementation of Green Hydrogen initiatives. Some of the key components that States may adopt in their policy are as follows:

- Progress Tracking and Data Reporting:**

The state may establish a robust system for tracking the progress of Green Hydrogen projects, including key performance indicators (KPIs) and milestones. This system should complement and contribute to national progress tracking portal (National Green Hydrogen Mission Portal), ensuring alignment with broader national goals and facilitating data sharing and transparency. The system could be an online portal for state specific data collection and may track various parameters for Green Hydrogen sector within the state like:

- Number of projects
- Total installed capacity of Green Hydrogen production
- Total installed capacity of electrolyser manufacturing
- Total quantum of investment in Green Hydrogen sector
- Total production of Green Hydrogen or its derivatives

- Tracking of timelines from application to COD of projects
- Employment generation
- Total installed capacity of RE tagged with Green Hydrogen production
- Any other parameter that states find relevant

- Periodic Reviews and Adjustments:** The state may conduct periodic reviews of Green Hydrogen policy and projects to assess their effectiveness and identify areas for improvement. These reviews should be based on comprehensive data analysis and stakeholder feedback, allowing for timely adjustments to policies and strategies to ensure continuous improvement and alignment with evolving industry needs.

- Independent evaluations and audits:** The state may engage independent evaluators to conduct regular assessments and audits of Green Hydrogen projects. This would provide an unbiased evaluation of project outcomes, ensure accountability and enhance the credibility of the state's Green Hydrogen initiatives.

- Benchmarking and Certification:** The states may implement a benchmarking and certification process to help standardise the evaluation of Green Hydrogen projects. This would ensure that the projects meet global standards and contribute to mutual recognition of standards and certification schemes.



6.9 Capacity building and skill development

In order to continuously develop the Green Hydrogen sector, there will be need of additional skills and capacity amongst the stakeholders. The States may support in developing skills and capacity building through the following measures:

- **Training programs:** The states may establish comprehensive training programs to equip workforce with the necessary skills for Green Hydrogen technologies. These programs could cover various aspects, including hydrogen production, storage, distribution and safety protocols ensuring a well-rounded and skilled workforce.

- **Academic collaborations:** The states may also issue guidance on fostering collaborations between academic institutions and industry to develop specialised curricula and research programs focused on Green Hydrogen. This includes creating internships, scholarships and joint research initiatives to bridge the gap between theoretical knowledge and practical application.
- **Public awareness and outreach:** The state may conduct public awareness campaigns and outreach programs to educate the community about the benefits and opportunities in the Green Hydrogen sector. This would help build a broader understanding and support for Green Hydrogen initiatives, encouraging more individuals to pursue careers in this emerging field.

The Government of India has focused on skill development component to ensure availability of skilled workforce in the sector and has allocated an outlay of INR 35 Crore till 2029-30. Following are the key highlights of the same:

- National Skill Development Corporation (NSDC) is the Scheme Implementing Agency
- **Guidelines for Skill development under the National Green Hydrogen Mission** were notified on 16 March 2024.
- Skill Gap Analysis for GH2 ecosystem completed by Ministry of Skill Development and Entrepreneurship (MSDE)
- 26 Qualification packs developed. More being developed by Skill Council for Green Jobs, Hydrocarbon Sector Skill Council, Power Sector Skill Council and Logistics Sector Skill Council.

6.10 Risk Management

Robust risk management strategies for state-specific Green Hydrogen policies are essential to mitigate potential hazards and ensure sustainable development. States may create and implement the risk management strategies including

comprehensive risk assessment (strategic, technological, operational/project level, financial and market), regulatory compliance, safety protocols, technological innovation monitoring, stakeholder engagement and emergency response, as part of their Green Hydrogen policy for Green Hydrogen production or electrolyser manufacturing or both.

6.11 Policy Governance Framework

Strong coordination amongst various state ministries and departments, industry, institutions and other stakeholders is the necessity of effective policy implementation for Green Hydrogen in states. States may create a flexible and result-oriented governance structure chaired by the Chief Secretary or other competent authority and comprising of secretaries/senior representatives from various state ministries like industry and commerce, chemicals and fertilisers, transport, steel, waterways, railways, port and shipping, scientific and industrial research, skill development and entrepreneurship, and experts from the industry. This governance structure shall be responsible for overseeing policy implementation activities, provide guidance, continuously monitor progress, recommend policy amendments and interventions to be

made in alignment with the National Green Hydrogen Mission objectives and approve mid-course corrections, if required.

Cross-sectoral Coordination

Cross-sectoral coordination ensures successful implementation and scaling of Green Hydrogen initiatives. Some of the key measures that States may include in their policy are as follows:

- **Policy alignment across sectors:** States may issue guidance ensuring policy alignment across industry, commerce, energy, chemicals and fertilisers, transport, shipping and other relevant sectors with Green Hydrogen goals. This may include harmonising the regulations, standards and incentives to create a cohesive framework that supports the development and deployment of Green Hydrogen technologies.

Ministry of Ports, Shipping and Waterways has floated “Harit Sagar” Green Port Guidelines for decarbonisation of major ports in India. The guidelines emphasise on development of action plan by Ports to achieve the targets set for the Ports / Port Crafts in the “National Green Hydrogen Mission”, including creation of infrastructure at select Ports for storage, bunkering and refuelling of Green Hydrogen and its derivative, within the targeted timelines. The guidelines also focus on incentivising hydrogen fuel cell-based port vehicles and use of fuel cell technology for propulsion of port crafts.

- **Inter-ministerial governance mechanism:** The States may establish an inter-ministerial governance mechanism or committee to oversee and coordinate the implementation of Green Hydrogen initiatives. This body would facilitate communication and coordination between different government departments, ensuring that the efforts are synchronised, and obstacles are addressed efficiently.
- **Stakeholder Engagement:** The States may actively engage with stakeholders of the private sector, academia and civil society to gather inputs and build consensus on Green Hydrogen policies and projects. Regular consultations, workshops and public forums may be held to ensure that diverse perspectives are considered and that the policies are responsive to the needs of all stakeholders.

- **Learning from International Best Practices:** The States may continuously review and incorporate international best practices in Green Hydrogen policy and implementation. This may include benchmarking against leading global examples, adopting successful strategies and participating in international forums and collaborations to stay at the forefront of Green Hydrogen advancements.

- **Strategic Infrastructure Development:** States may consider utilising and expanding their existing transportation and energy distribution infrastructure and plan the necessary upgrades. This may include pipelines, storage and grid connectivity to support production, storage and distribution of Green Hydrogen effectively.

- **Economic Diversification and Resilience:** States may consider how Green Hydrogen can contribute to economic diversification, especially in regions dependent on traditional fossil fuels, and prepare the guidance on developing Green Hydrogen economy, which can create new

industries and jobs, enhancing economic resilience against market fluctuations and environmental regulations. States may also assess the capacity of MSME sector to identify and build capacity among the MSMEs for manufacturing of electrolyser component and equipment.

6.12 Additional State-specific considerations

States may consider some additional state-specific considerations while formulating the policy for Green Hydrogen. These may include the following:

- **Local resource utilisation:** States may assess and leverage their unique natural resources, such as renewable energy potential (wind, solar, hydro), water availability, existing industrial infrastructure and ports availability for export. Utilising local resources can optimise costs and enhance the feasibility of Green Hydrogen projects.
- **Community Engagement:** States may create mechanisms to involve the local communities through transparent communication and active participation. Engaging stakeholders could ensure that the benefits of Green Hydrogen projects, such as job creation and economic development, are shared equitably. It may also help address concerns related to land and water use and social impacts.
- **Environmental Impact:** States may provide guidance on comprehensive environmental impact assessments to identify and mitigate potential negative effects on local ecosystems and biodiversity. States, through their guidance, may promote sustainable practices such as minimal disruptions to natural habitats and minimal impact to environmental resources to ensure that Green Hydrogen production aligns with broader environmental goals.



07

Implementation Guidance for Green Hydrogen Policy in States

The model comprehensive guidelines for state-level Green Hydrogen policy provides a strategic roadmap for unlocking the full potential of Green Hydrogen through proactive measures, targeted investments and continuous stakeholder engagement. By aligning the policy with broader national energy transition goals, this framework

supports decarbonisation efforts and stimulates economic growth, while enhancing energy security and promoting environmental sustainability. States may adopt the following implementation guidance for adopting model comprehensive guidelines for state-level Green Hydrogen policy formulation:



Align or Amend Existing Policies

Align or Amend Existing Policies

1

- **Identifying Policy Gaps:** Identify gaps in state-level Green Hydrogen policies.
- **Review and Assessment:** Thorough review and assessment to ensure policies support Green Hydrogen technologies.
- **Amending Policies:** Amending state policies to align with the NGHM.
- **Policy Harmonization:** Harmonize state and national policies, fostering a cohesive approach.

Leverage State-Specific Advantages

Strategic Assessment of Resources and Market Demand

2

- **Drafting Policies:** States are in the process drafting Green Hydrogen policies.
- **Comprehensive Analysis:** Essential to analyze state strengths, resources, and challenges for effective GH implementation.
- **Renewable Energy Assessment:** Evaluate renewable energy potential (solar, wind, hydro) and existing industrial base, infrastructure, and technology.
- **Economic and Sector Analysis:** Identify key sectors (transportation, industry, power generation) that could benefit from GH.

Draft the Policy

3

Develop a Comprehensive and Adaptive Framework basis Model Guidelines, Consultations and Industry Feedback

Engage Stakeholders and Streamline Processes

Ensure Inclusivity and Facilitate Implementation

4

- **Stakeholder Engagement:** Identify and involve diverse stakeholders (government, industry, research, community) for comprehensive strategies.
- **Inclusive Consultations:** Use consultations, workshops, and platforms for open dialogue and robust policies.
- **Streamlining Regulations:** Simplify regulatory frameworks and administrative procedures for swift project implementation.
- **Transparency and Efficiency:** Ensure transparency, accountability, and support to build trust and encourage participation.

Release the Final Policy

Launch with Broad Consensus and Support

5

- **Incorporating Feedback:** Incorporate feedback from all stakeholders (government, industry, researchers, community) to create a robust policy.
- **Collaborative Process:** Enhance policy effectiveness and foster ownership through a collaborative process.
- **Coordinated Communication:** Use public announcements, press conferences, and meetings to communicate the policy's objectives and benefits.
- **Clear Guidelines:** Ensure clear communication and provide guidelines to facilitate smooth policy rollout and build trust.



08 | Appendices

8.1 Sample Policy Text for States

8.1.1 Sample Guidance Box for State Strategy and Targets:

The rationale for adopting Green Hydrogen in the state is driven by the need to diversify the energy mix, reduce carbon emissions, and enhance energy security. With abundant renewable energy resources, including XX MW of solar and wind potential, and extensive land and water availability, the state is well-positioned to become a leader in Green Hydrogen production. Additionally, the presence of robust port infrastructure facilitates the export of Green Hydrogen, aligning with the state's strategic goal to tap into the global Green Hydrogen market. **By 2030, the state aims to produce XX MMTPA of Green Hydrogen**, integrating it into key sectors with targets of XX% in industrial processes, XX% in transportation, and XX% in power generation.

The state's Green Hydrogen **policy adopts a technology-agnostic approach**, supporting production through renewable electricity-based electrolysis and biomass reforming. All incentives, including subsidies and tax breaks, are applicable across these technologies, promoting innovation and flexibility in Green Hydrogen production methods. The implementation timeline for the Green Hydrogen policy **spans a minimum of 5 years**, with **periodic reviews every 2 years** to ensure effectiveness and relevance. The policy is designed to be adaptable, allowing for amendments based on technological advancements, market dynamics, and alignment with national and international goals.

To ensure continuous improvement, the state will establish a robust monitoring and

evaluation framework, with annual progress reports and bi-annual reviews. This mechanism will assess technological advancements, market trends, and policy impacts, enabling necessary adjustments to targets and strategies. The state has allocated a **financial outlay of INR XX crores over the next five years** for the implementation of the Green Hydrogen policy. This funding will support various initiatives, including infrastructure development, R&D, and capacity building, aligning with the financial commitments of the **National Green Hydrogen Mission**. The policy aims to attract additional investments through clear financial frameworks and incentives, fostering growth and innovation in the Green Hydrogen sector.



8.1.2 Sample Guidance Box for Regulatory Framework for Green Hydrogen in State

To effectively oversee the Green Hydrogen sector, the state government will designate a dedicated nodal agency responsible for ensuring alignment with the Central Regulatory Authority. This regulatory body will monitor and enforce compliance with safety, environmental, and operational standards specific to Green Hydrogen production, storage, and distribution. Additionally, it will facilitate approval and permitting processes for new projects, streamlining bureaucratic procedures to accelerate development and acting as a liaison between government agencies, industry players, and local communities.

The policy will consider comprehensive eligibility criteria for Green Hydrogen projects to ensure high standards of quality, safety, and efficiency. These criteria will include detailed technical specifications for production, storage, and distribution, covering aspects like electrolyser types, efficiency benchmarks, hydrogen purity, and equipment performance. Safety standards will incorporate protocols for handling and storing hydrogen, measures to prevent leaks and explosions, and emergency response plans. Adopting guidelines from certified agencies like BIS, PESO, MORTH, OISD, and PNGRB will ensure projects are safe and technologically advanced. Environmental and social criteria will also be included, requiring environmental impact assessments and ensuring positive contributions to local communities, such as creating xx jobs and fair land use compensation.

To streamline the approval process, the state government will establish a dedicated committee within the regulatory authority for the approval of Green Hydrogen projects. This committee, comprising experts in renewable energy, environmental science, engineering, finance, and regulatory affairs, will evaluate project proposals to ensure they meet established eligibility criteria. Additionally, creating a single-window clearance facility for permitting Green Hydrogen production or electrolyser manufacturing units will reduce construction periods by up to 50%, accelerating infrastructure deployment.



8.1.3 Sample Guidance Box for Financial Incentives and Support for Green Hydrogen in State

For a financially viable Green Hydrogen sector, the state government will provide financial incentives and support ensuring the Green Hydrogen market is well supported and attract developers to the state. The financial support will cover the following aspects:

- a. Production-linked incentives for electrolyser manufacturing in xx INR/kW of total electrolyser manufacturing capacity and for Green Hydrogen production in xx INR/kg for 'specified number of years ('n'). The duration shall be changed as per specific market needs.
- b. Tax exemptions/waivers will be provided for Land Tax and States Goods and Services Tax:
 - a. Land Tax: Waivers or concessional rates on land tax, land use conversion charges and stamp duty for land acquisition in terms of xx % of each component for a specific number of years ('n').
 - b. SGST: Reimbursement/exemption on Net/Gross SGST will be provided as xx % of total for a specific number of years ('n'), with a ceiling limit based on xx % of Fixed Capital Investment (FIC).
- c. Waiver /concession in Electricity Charges for electrolyser manufacturing and Green Hydrogen production units will be provided:
 - a. Intra State Transmission Charges (InSTS) Charges: Waiver/Concession in InSTS will be provided as xx % of total InSTS charges for specific number of years ('n').
 - b. Wheeling Charges: Waiver/Concession in Wheeling Charges will be provided as xx % of total Charges in INR/MW for specific number of years ('n').
 - c. Cross-Subsidy Surcharge: Waiver/Concession in Cross-Subsidy Surcharge will be provided as xx% of

- total charge in INR/kWh for specific number of years ('n').
- d. Additional Surcharge: Waiver/Concession in Additional Surcharge will be provided as xx % of total additional surcharge in INR/kWh for specific number of years ('n').
 - e. Electricity Duty: Waiver/Concession in Electricity Duty will be provided as xx % of total electricity duty in INR/kWh for a specific number of years ('n').
 - f. Banking Provision and Charges:
 - i. Banking of electricity for Green Hydrogen production and electrolyser manufacturing will be allowed as per standardised banking charges, durations and compensation mechanisms, as provided in Central Open Access Rules.
 - ii. Monthly Banking: Banking will be permitted on a monthly basis and charges will be applied for the same month for utilisation of banked energy within the same month. Banking of energy will be allowed for a quantum of 30% of total monthly electricity consumption.
 - iii. Banking Charges and Withdrawals: Banking charges will be xx % of total energy banked OR xx INR/kWh for banked energy. The withdrawal of banked energy will be based on Time of Day (ToD) and ToD charges for peak and off-peak will be applicable during the time of withdrawal.
 - iv. Settlement Mechanism: Banking shall be counted on a daily basis for monthly accounting. Model illustrations for settlement mechanisms under different scenarios will be provided on 'SERC' portal. Any unutilised banked energy shall be compensated back to the consumer as % of total energy banked or in INR/kWh for total unutilised banked energy.
 - d. Capital Allowanced on equipment and Machinery: The producers of Green Hydrogen or manufacturers of Electrolysers will have the provision of availing capital allowances on equipment and machinery purchased to produce Green Hydrogen or manufacture electrolyser in the state as % of expenditure in INR. Capital Allowance will be provided for 'n' years.
 - e. Capital Subsidy: The Green Hydrogen production units and electrolyser manufacturing units will be provided a capital subsidy as xx % of total capital investment in INR. The capital subsidy will be disbursed in 'n' number of years, 'pre-' or 'post-' commissioning. The ceiling limit co capital subsidy per project will be INR/project. Application for availing incentives can be submitted after receiving all the clearances for the project.
 - a. Additional multiplier will be provided for maintaining capacity utilisation of the plant as xx % of total capital subsidy.
 - b. Additional booster will be provided for generating local employment and use of local content through inputs and raw materials as xx % of capital subsidy.
 - c. There are incentive add-ons beyond capital subsidy for achieving green certification of Green Hydrogen production facility or electrolyser manufacturing facility and certified sustainable practices.
 - f. Access to Low-Cost Financing and Risk-Sharing Facility: 'State' invites development organisations, multilateral and bilateral banks and institutions to provide products such as green bonds or concessional financing mechanisms to the developers in the state. 'State' also invites such organisations to create risk-sharing facilities in collaboration with the 'State' to reduce financial risks and encourage investments.
 - g. Promotion of Green Hydrogen Hubs and Industrial Clusters: 'State' will identify suitable land and designate new Special Economic Zones (SEZs) or allocate SEZ status to an existing zone for Green

Hydrogen production or electrolyser manufacturing or both within the state. The incentive being provided is grant as % of CAPEX, with a ceiling limit of INR xx per hub/cluster/park.

- h. Green Certification: 'State' will incentivise the certification agencies within the state to certify Green Hydrogen projects and for capacity building to prevent greenwashing.
- i. Unlocking Private Sector Investment: 'State' shall create additional provisions to unlock private sector investments. 'State' invites agencies to create Public-Private-Partnership (PPP) or Special Purpose Vehicles (SPVs) to support the initial projects within the states.

Incentivising Decentralised model for Green Hydrogen Production and Consumption: 'State' will introduce innovative models to source Green Hydrogen through decentralised renewable energy, such as rooftop solar, small/micro hydel plants, etc., to reduce transportation requirements and optimise the use of local resources. Biomass-based Green Hydrogen production will be encouraged and provided the same financial incentives as for Green Hydrogen production through electrolysis. Modular electrolysers connected to decentralised renewable energy generating stations and using treated industrial or municipal water will be promoted.



8.1.4 Sample Guidance Box for Demand Creation Measures for Green Hydrogen in State

To effectively create demand for Green Hydrogen, the state government will encourage the use of Green Hydrogen in sectors traditionally reliant on grey hydrogen, such as fertiliser production, oil refineries and steel production. The state government will also publish guidance on using Green Hydrogen in emerging sectors like heavy transportation, synthetic fuel production and other areas with significant potential of reducing carbon emissions.

The State Government will follow the mandate of Central Government on Designated Consumer Category covering several sectors as per the assessment of hydrogen demand. The obligation shall be set as xx % of total Hydrogen consumption (kg) in specific sectors. The obligation shall also include Green Hydrogen blending in other fuels, set as xx % of total volume blended in natural gas pipelines.

The State Government will create a dedicated nodal agency for assessment of demand for Green Hydrogen and will cater to the same through identification of demand centres and coordination of development of Green Hydrogen production, storage and transportation facilities near these demand centres.

The policy will consider capturing international demand for Green Hydrogen through exports and will promote competitive production of Green Hydrogen in comparison with international market with respect to cost and safety standards. State Government will develop trade partnerships with international sector stakeholders to facilitate Green Hydrogen export. There will be xx % of additional capital incentive for xx-zz % of Green Hydrogen exported by each production unit. The State Government will set targets to achieve certain percentage of Green Hydrogen Export from India, enhancing their presence in the international Green Hydrogen market.

8.1.5 Sample Guidance Box for Infrastructure Development Measures for Green Hydrogen in State

To successfully deploy Green Hydrogen projects, the state government will support infrastructure development for Green Hydrogen value chain. For this, the State Government will provide clear guidelines on land and water allocation, grid connectivity provisions and incentives like subsidies and tax benefits and streamlined regulatory processes to establish Green Hydrogen Production Hubs in the state.

The State Government will specify requirements of funds for development of Green Hydrogen value chain and shall allocate sufficient amount to support robust storage and transportation infrastructure for Green Hydrogen. The States will provide technical specifications for the infrastructure components which cover pipelines, storage tanks and refuelling stations to ensure efficient and safe distribution.

The State Government invites entities with existing operations in pipelines, storage tanks and refuelling stations to create avenues for PPP to leverage additional resources and expertise. The incentives to develop the infrastructure shall be following:

- Pipelines: Incentive will be provided as xx % of total capital investment in INR/km of pipeline development. Ceiling will be on maximum amount of incentive based on total xx km of pipeline. There is also interest subsidy on term loan for developing pipelines provided as xx % interest subsidy with a ceiling limit on total pipeline length in km.
- Bunkers for Storage: Land shall be allotted by Port Authorities for setting up bunkers at ports for export of Green Hydrogen and its derivatives. Special land lease rates shall be announced for this purpose.
- State Government shall provide facilitation of approvals and clearances for bulk storage setup and development of pipelines through the Nodal Agency.

- R&D support shall be provided by the State Government for innovation in storage and transportation through pipeline for Green Hydrogen and its Derivatives.

For Renewable Energy generation, specific to Green Hydrogen Production, the incentives will be as per State's Renewable Energy Policy. Additional incentives of land allocation shall be provided to the developers in xx Acres/MW, with ceiling limit of Maximum Land (Acres) and Maximum RE Power (MW) per Kilo Ton of Green Hydrogen Produced.

The State Government will also facilitate integration of renewable energy sources to Green Hydrogen production units through:

- Supporting co-location of Green Hydrogen production facilities with RE generation plants and enhance grid capacity to manage additional load.
- Green Hydrogen projects and electrolyser manufacturing units will be provided priority access to transmission infrastructure.
- Maximum 'n' number of days will be taken from the date of receipt of application to provide technical feasibility report of power evacuation through transmission infrastructure to the developer.
- The State Government will undertake strengthening of upstream transmission infrastructure through state TRANSCOM or DISCOM through upgradation of existing infrastructure or building new grid infrastructure.
- Open Access Approval shall be provided within 15 days from the date of submission of application, for both Green Hydrogen and electrolyser manufacturing units.

The State Government will also provide Land and Water Allocation as per the following:

- Government Land: Government Land shall be provided at concessional rates for setting up Green Hydrogen Production units or electrolyser manufacturing units.

- Private Land: Clear guidelines for land acquisition to accelerate project development shall be provided. Standard lease rates for land to be utilised in Green Hydrogen Production, RE Projects and Electrolyser manufacturing will be xx INR/Acre/Year.

Sources of Water: Treated Wastewater/Desalinated water utilisation will be prioritised to be used in Green Hydrogen Projects and additional incentives in the form of subsidy shall be provided to use the same in terms of xx % of INR/Litre for specific number of years ('n'), ensuring minimum impact and avoidance of competition for freshwater resources.

8.1.6 Sample Guidance Box for Research and Development Support for Green Hydrogen in State

For a successful integration of Green Hydrogen technologies into the energy sector, the State Government will provide R&D support as given below:

- Pilot Projects: Pilot projects shall be provided funding support by a ceiling limit of INR xx/Project for specific number of years ('n'), depending on the final decision of the approval committee.
- Funding Startups: Funds shall be allocated for startups in Green Hydrogen sector in xx INR per year for specific number of years ('n').
- Funding for research and development of new technologies and scaling up pilot projects shall be provided by the State Government. The funds shall also be allocated to R&D in siting technologies, electrolyser manufacturing and efficiency improvement, component manufacturing for electrolysers, storage and transportation.
- Funds shall be allocated in xx INR/Year per facility for setting up state-of-the-art testing facilities to ensure safety, efficiency and reliability of Green Hydrogen technologies.

State Government shall allocate funding support for establishing Centre of Excellence to foster innovation and domestic and international collaboration in Green Hydrogen research and to serve as hubs for knowledge exchange policy development and technical expertise.

8.1.7 Sample Guidance Box for Monitoring and Evaluation Measures for Green Hydrogen in State

Development and implementation of Green Hydrogen initiatives require effective monitoring and evaluation measures. The State Government will establish a robust system for progress tracking of Green Hydrogen projects-production or electrolyser manufacturing. This system will track key Performance Indicators (KPIs) and milestones and will feed into the national progress tracking portal (National Green Hydrogen Mission Portal), ensuring alignment with broader national goals and facilitating data sharing and transparency. The system will be an online portal and will track state-specific parameters for Green Hydrogen sector covering:

- Number of Projects
- Total Installed Capacity of Green Hydrogen Production
- Total Installed Capacity of Electrolyser Manufacturing
- Total quantum of investment in Green Hydrogen Sector
- Total Production of Green Hydrogen or its Derivatives
- Tracking of timelines from application to Commercial Operation Date (COD) of projects
- Employment Generation
- Total Installed Capacity of RE tagged with Green Hydrogen Production
- Any other parameter that the State Government finds relevant

The State Government will conduct periodic reviews of Green Hydrogen policy and projects to assess their effectiveness and identify areas of improvement. The reviews will be based on comprehensive data analysis and stakeholder feedback and will undertake timely

adjustments to policy and strategies ensuring continuous improvement and alignment with evolving industry needs.

The State Government will undertake independent evaluation and audits of Green Hydrogen production and electrolyser manufacturing projects to provide unbiased evaluation of project outcomes, ensuring accountability and enhance credibility of the State's Green Hydrogen initiative.

The State shall implement a benchmarking and certification process to help standardise the evaluation of Green Hydrogen projects, ensuring that the projects meet global standards and contribute to mutual recognition of standards and certification schemes.

8.1.8 Sample Guidance Box for Capacity Building and Skill Development for Green Hydrogen in State

Continuously evolving skills and capacity amongst stakeholders is the basis to the consistently developing the Green Hydrogen sector. The State Government invites stakeholders from industry and academia to collaborate and support in formation of training programs to equip the workforce with the necessary skills for Green Hydrogen technologies, including all the aspects-production, storage, distribution and safety protocols, ensuring a well-rounded and skilled workforce.

The State Government also invites the stakeholders to collaborate and develop specialised curricula and research programs focused on Green Hydrogen, including internships, scholarships and joint research initiatives to bridge the gap between theoretical knowledge and practical applications.

The State Government will conduct public awareness campaigns and outreach programs to educate the community about the benefits and opportunities in the Green Hydrogen sector to help build broader understanding and support of Green Hydrogen initiatives.



8.1.9 Sample Guidance Box for Policy Governance Framework for Green Hydrogen in State

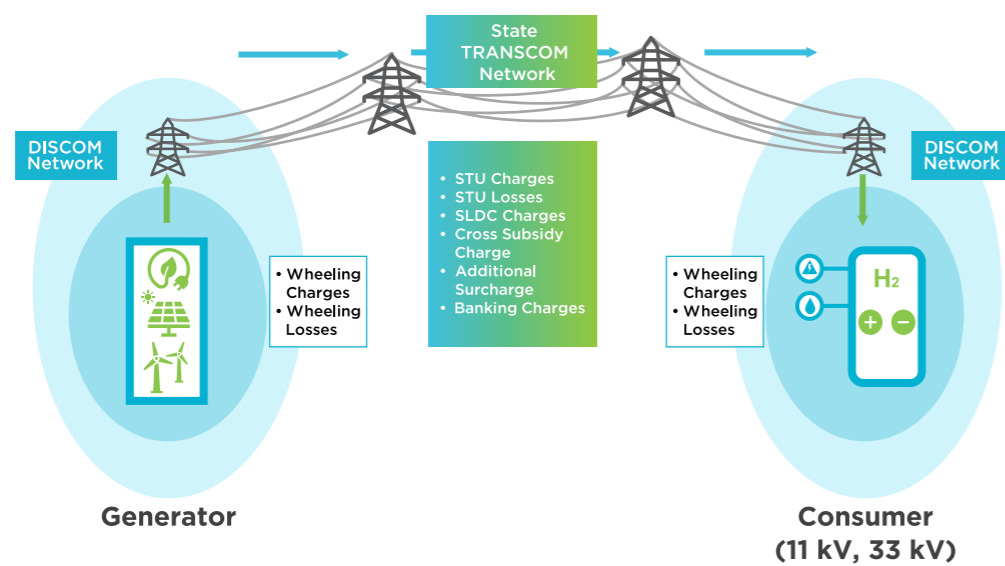
To ensure successful implementation and scaling of Green Hydrogen initiatives in State, the State Government will ensure cross-sectoral coordination and implement a policy governance framework for effective and result-oriented policy implementation. The State Government will formulate a governing body chaired by the Chief Secretary of the State, having members as secretaries/senior representatives from various state ministries like industry and commerce, chemicals and fertilisers, transport, steel, waterways, railways, port and shipping, scientific and industrial research, skill development and entrepreneurship, and experts from the industry.

The Governing Body will also be responsible for policy alignment with other sectors which complement the Green Hydrogen Sector, and will recommend actions including harmonising the regulations, standards and incentives to create a cohesive framework that supports the development and deployment of Green Hydrogen technologies.

The Governing Body will be responsible for stakeholder engagement within the state's Green Hydrogen ecosystem and shall hold regular consultations, workshops and public forums ensuring diverse perspective is captured for informed decision making on policy responsiveness. Continuous review and incorporation of international best practices in Green Hydrogen policy and implementation will be a core task of this governing body.

8.2 Illustration of various electricity charges to procure RE for Green Hydrogen Production

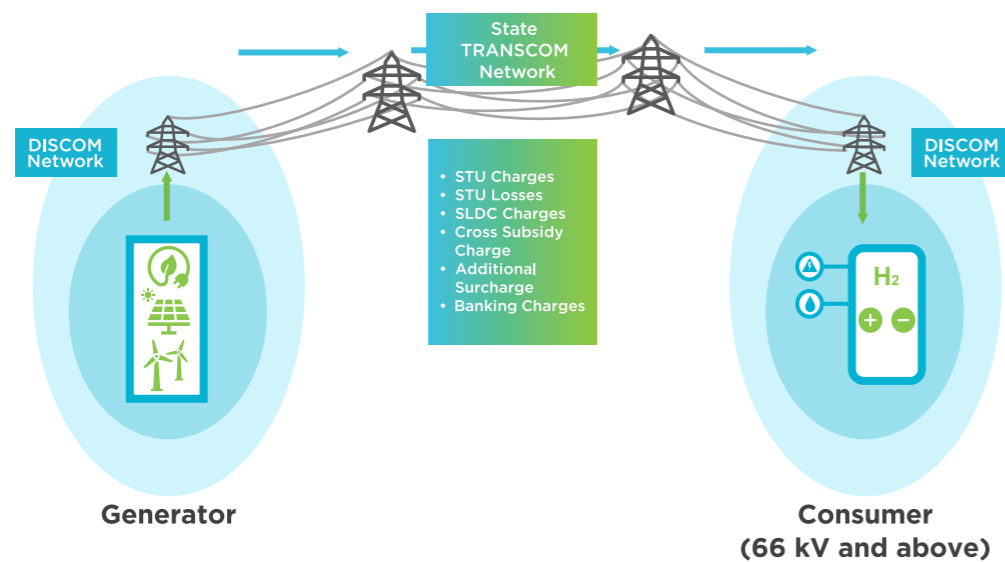
Third-Party Open Access (Consumer on 11, 33 kV Load)



As seen in the picture above, for third-party open access for green power, where the buyer and seller undertake a long-term PPA, several charges are applicable. In case, the buyer is at 11kV or 33 kV load, the charges that have to

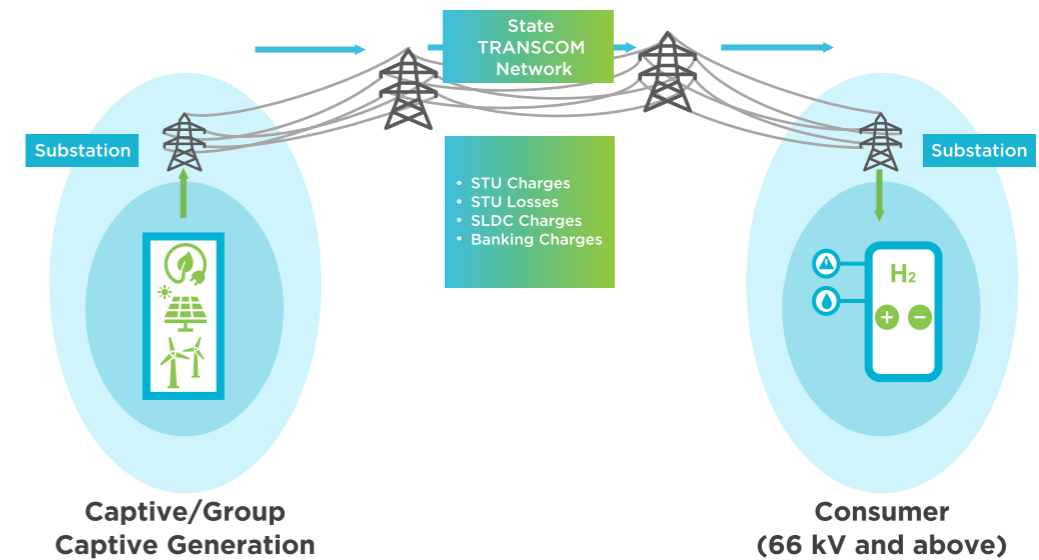
be paid are STU Charges and Losses, SLDC Charges, Cross Subsidy Surcharge, Additional Surcharge, Wheeling Charges and Losses and Banking Charges.

Third-Party Open Access (Consumer on 66 kV and above load)



As for the above illustration, if the consumer is at 66kV connection, Wheeling Charges and Losses are exempted. However, all other charges as mentioned above, are to be paid.

Captive/Group Captive Open Access



In case of captive/group captive generation, cross-subsidy charges and additional surcharge are exempted, while all other charges are to be paid. In case of 100% captive generation, no charge is to be paid.

Once gaps are identified, the guidelines facilitate the amendment of state policies to better align with the NGHM. This alignment is essential for creating a cohesive and supportive policy environment across the country. By harmonising state policies with national goals, the guidelines aim to foster a more integrated and efficient approach to Green Hydrogen development, ultimately contributing to India's broader sustainability and energy transition objectives.

8.3 Implementation Guidance for Green Hydrogen Policy in States

Align or Amend Existing Policies -Ensure Policy Coherence and Clarity: The model comprehensive guidelines serve as a crucial framework for identifying gaps in existing Green Hydrogen (GH) policies at the state level. By providing clear direction, these guidelines help states recognise areas where their current policies may fall short in supporting the objectives of the National Green Hydrogen Mission (NGHM). This process involves a thorough review and assessment of existing policies to ensure they are conducive to the development and adoption of Green Hydrogen technologies.

Leverage State-Specific Advantages- Strategic Assessment of Resources and Market Demand: Several States are in the process of drafting their Green Hydrogen policy. A comprehensive analysis of the state's unique strengths, resources, and challenges with respect to the Green Hydrogen sector is essential to ensuring effective implementation and maximising the benefits of Green Hydrogen for sustainable development.

The process begins with an assessment of the state's renewable energy potential, such as solar, wind, and hydro resources, which are critical for producing Green Hydrogen.

Additionally, it includes evaluating the existing industrial base, infrastructure, and technological capabilities that can support Green Hydrogen production and utilisation. Understanding the state's economic landscape and identifying key sectors that could benefit from Green Hydrogen, such as transportation, industry, and power generation, is also essential.

Draft the Policy- Develop a Comprehensive and Adaptive Framework basis model guidelines Consultations and industry feedback:

Drafting policies in alignment with the National Green Hydrogen Mission (NGHM) involves a multi-faceted approach to ensure that state and national objectives are harmonised. This process begins with a thorough review of the NGHM's goals and guidelines to understand the overarching framework and specific targets. Policymakers then assess existing state policies to identify areas that need modification or enhancement to support Green Hydrogen initiatives. This includes evaluating current regulations, incentives, and subsidies related to renewable energy and hydrogen production.

Once the assessment is complete, the next step is to draft new policies or amend existing ones to fill identified gaps. This involves setting clear objectives, defining roles and responsibilities, and establishing timelines for implementation. The policies should also include provisions for financial incentives, such as grants, tax breaks, and subsidies, to encourage investment in Green Hydrogen projects. Additionally, it is crucial to incorporate standards and safety regulations to ensure the safe production, storage, and transportation of Green Hydrogen. Engaging with stakeholders, including industry experts, researchers, and community representatives, is essential throughout this process to gather input and build consensus. By aligning state policies with the NGHM, the aim is to create a cohesive and supportive environment that accelerates the adoption of Green Hydrogen technologies and contributes to India's sustainable energy future.

Engage Stakeholders and Streamline Processes: Ensure Inclusivity and Facilitate Implementation:

Engaging stakeholders and streamlining processes are critical steps

to ensure the successful implementation of Green Hydrogen initiatives. This begins with identifying and involving a diverse range of stakeholders, including government agencies, industry leaders, research institutions, and community representatives. By fostering an inclusive approach, policymakers can gather a wide array of perspectives and expertise, which is essential for developing comprehensive and effective strategies. Regular consultations, workshops, and collaborative platforms can facilitate open dialogue and ensure that all voices are heard, leading to more robust and widely supported policies.

Streamlining processes involves simplifying regulatory frameworks and administrative procedures to facilitate the swift implementation of Green Hydrogen projects. This can include creating clear guidelines, reducing bureaucratic hurdles, and establishing dedicated support teams to assist stakeholders throughout the project lifecycle. Ensuring transparency and accountability in decision-making processes is also crucial to build trust and encourage active participation. By focusing on inclusivity and efficiency, the aim is to create a conducive environment for the rapid adoption and scaling of Green Hydrogen technologies, ultimately contributing to the broader goals of sustainability and energy transition.

Release the Final Policy- Launch with Broad Consensus and Support

Releasing the final policy with broad consensus and support is a crucial step in ensuring the successful implementation of Green Hydrogen initiatives. This process begins with a thorough review and incorporation of feedback from all stakeholders, including government agencies, industry leaders, researchers, and community representatives. By addressing their concerns and suggestions, policymakers can create a well-rounded and robust policy that reflects the collective vision and goals of all involved parties. This collaborative approach not only enhances the policy's effectiveness but also fosters a sense of ownership and commitment among stakeholders.

The launch of the final policy should be a

well-coordinated event that highlights the significance of the initiative and its potential impact on sustainable development. This can include public announcements, press conferences, and stakeholder meetings to communicate the policy's objectives, benefits, and implementation plans. Ensuring transparency and clarity in these communications is essential to build trust and confidence among the public and

private sectors. Additionally, providing detailed guidelines and support mechanisms for stakeholders will facilitate the smooth rollout of the policy. By achieving broad consensus and support, the final policy can pave the way for a cohesive and accelerated transition to Green Hydrogen, contributing to India's energy security and environmental sustainability goals.



