



First-Generation Green H2 Project Development & Funding 2023-25



# Building India's Hydrogen Economy

Proposed 25/25 Development Plan for National Green H2 Projects, Hubs



Council of Scientific and Industrial Research  
National Chemical Laboratory



THE ENERGY AND  
RESOURCES INSTITUTE



WRI INDIA



# Hydrogen in India 2022

~ 7 MMT (grey)

- 6.7 MMT of H<sub>2</sub> consumed annually
  - All of it grey - coal/gas/naphtha
  - 54% used in petroleum refining
  - Rest - fertilizer production.
  - 12 MMT H<sub>2</sub> by 2030
- India imports 85% oil, 53% gas
- Grid Power –70% thermal
- 2030 'target' 5 MMT of GH<sub>2</sub>



# Hydrogen in India / GH2 prospects

- Refineries
- Fertilizer/ $\text{NH}_3$
- Steel
- Cement
- Transport



# National Green Hydrogen Mission

- PM Modi announces National Hydrogen Mission on Independence Day (August 2021)
- GHCO\* - Green Hydrogen Consumption Obligation in fertilizer production and petroleum refining, like RPO
- GH2 is \$4-5/kg → \$1-2/kg by 2030
- India to be 'world's biggest GH2 hub' (PM Modi at UNGA)
- Concrete steps/budgets for GH2/green steel a gap in Budget 2022
- PLIs: ₹6k crore each for electrolyzer & GH2 PLIs, "out of ₹20k NGHM"?\*

\* WIP / proposed



# National Green Hydrogen Mission – Power Policy 2022

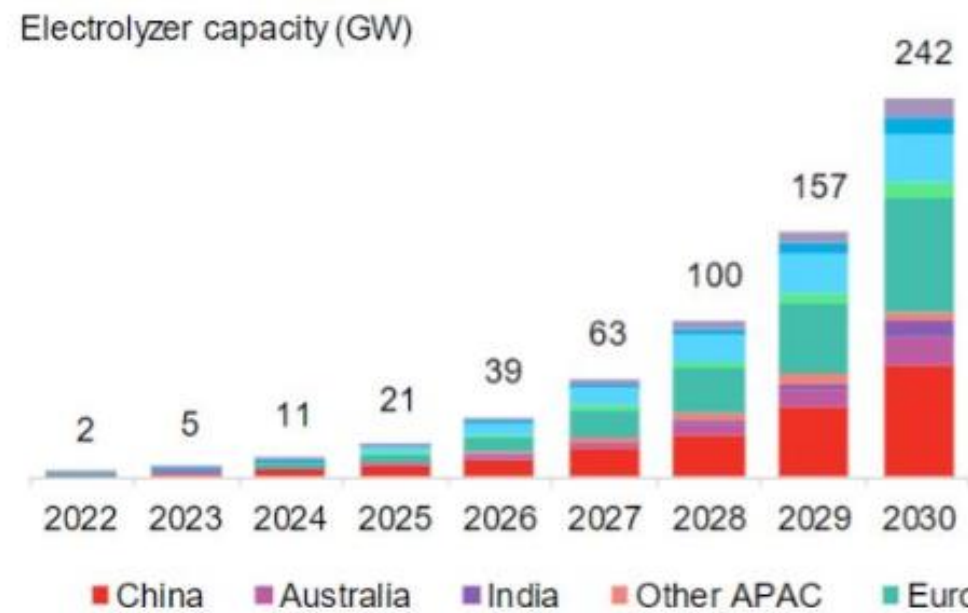
- H<sub>2</sub> & NH<sub>3</sub> is “green” if produced with RE / banked RE.
- Banking of <30 days for RE used for making G-H<sub>2</sub>/NH<sub>3</sub>
- Waiver of inter-state transmission charges for 25 yrs, for producers of G-H<sub>2</sub>/NH<sub>3</sub> (projects starting by June 2025)
- Land to be allowed in RE parks, for G-H<sub>2</sub>/NH<sub>3</sub> production
- RE for G-H<sub>2</sub>/NH<sub>3</sub> to be counted toward RPO compliance



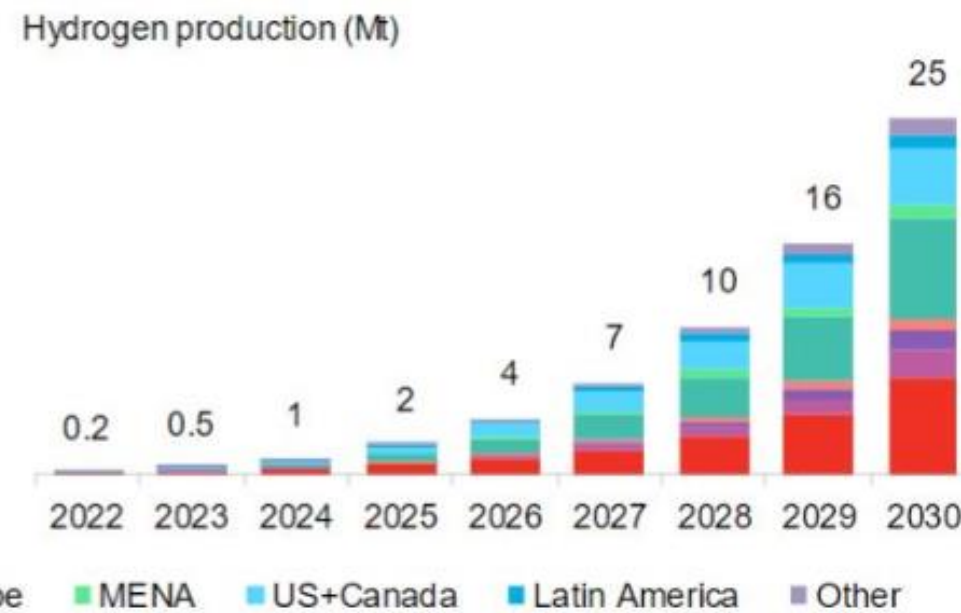
# World: Green Hydrogen headed for ‘hockey stick growth’

**Global electrolyzer capacity set to grow from 2 GW now to 242 GW (\$130B worth) by 2030 \***

**Cumulative electrolyzer capacity**



**Green hydrogen production**



\* Data & projections: Bloomberg NEF

# National 25/25 Green H2 Development Plan – 25 H2 hubs + projects by 2025

First-Generation National Green H2 Projects to accelerate commercialisation, learning rates, induce demand at critical scale

Scalable, Co-located National Green H2 Hubs, Projects using RE-Electrolysis, Gasification across RE-rich coastal states

**18 GH2 Bharat Hubs (with RE-Electrolysis)**  
Industrial, Heavy-Duty Transport Offtake, each potentially scalable to GW capacity

**7 Green H2 Bharat Cities - Waste-to-H2 Municipal Projects (with Gasification)**  
Local Industrial, Municipal Transport Fleets

**25 National Green H2 Bharat Projects by 2025**  
150 MW Installed Electrolyser Capacity  
Green H2 Use in Industrial, Heavy Duty Transport  
Future Coastal Shipping, Land Transport (Liquid, Gas)

## Five Key Enablers



National Green H2 Dev Corp (NHDC) & Public-Private Taskforce



State Green H2 Plans, Nodal Office



Project Dev SPVs, Consortia



Public Funding/ Infra, National Innovation Status



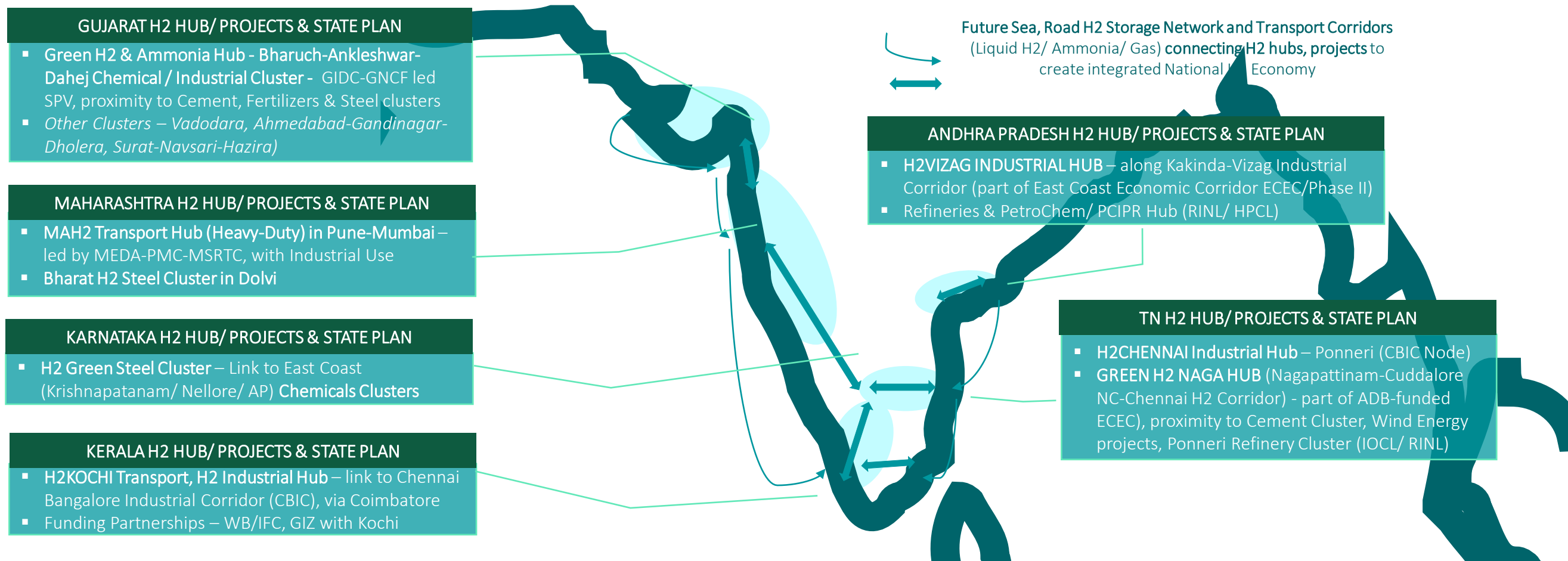
National Testing/ Certification, Standards, Skilling

# First-Generation National Projects (Phase I) – 18 Green H2 Hubs, 7 H2 Cities

26K+ tonnes Green H2 Induced Demand pa. with USD 360 mn Public Spend over 3 years, 2.6 Mmt CO2 reduction in a decade

Twelve 10-MW Green H2 Industrial Hubs– USD 240 mn public finance (USD 120mn Electrolyser CAPEX*+ USD 36mn pa OPEX price subsidy @USD 2/kg) for 18,000 tonnes pa	
Three 5-MW Green H2 Transport Hubs– USD 30 mn public finance (USD 15mn Electrolyser CAPEX Support + USD 4.5 mn pa OPEX price subsidy @ USD 2/kg) for 2250 tonnes pa	
Three 5-MW H2-CGD Network Hubs – USD 30 mn public finance (USD 15mn Electrolyser CAPEX Support + USD 4.5 mn pa OPEX price subsidy @ USD 2/kg) for 2250 tonnes pa	
Seven Distributed Waste-to-H2 Projects – USD 56 mn public finance (USD 35mn for 25% Capex Support^ + USD 7 mn pa OPEX price subsidy @ USD 2/kg) for 3500 tonnes pa	
PHASE I	150 MW Green H2 production capacity by 2025; 26,000 tonnes pa. industrial offtake; scalable
PHASE II	500 MW+ Green H2 production capacity

*\*est. USD 1mn per MW Electrolyser + BoP costs (based on Electrolyser tech chosen at project-level); ^est. USD 20 mn for 30 tonnes/day Waste-to-H2 plant*



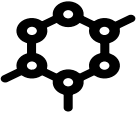






# Five Key Enablers - National 25/25 H2 Development Plan

Accelerating H2 commercialisation – priority actions

## KEY GOVT ACTIONS

## KEY INDUSTRY ACTIONS

 <p>National H2 Dev Corp (NHDC), Public-Private Bharat H2 Taskforce</p>	<p><b>NHDC as Public-Private, Non-Profit; National H2 Development Roadmap &amp; Implementation</b>          10% equity Central Govt, State Govts, Industry Champions (akin to NPCI)  <b>Align Commercialisation Plan, 2030 Mission Document to National RE, EV Plans</b></p>	
 <p>State Green H2 Plans, Projects Nodal Office</p>	<p><b>State Green H2 Policy and Hub Dev Plans</b>          Nodal Office, CMO support for First-Gen H2 Projects</p>	<p><b>Industrial ‘Producers-Offtakers’ Matching</b>          State-Level Champions, Govt identify first-gen Green H2 hubs/projects at local level</p>
 <p>Project Dev - SPVs, Consortia</p>	<p><b>‘National’ Status, Incentives for 25 H2 Hubs, Projects</b>          Guaranteed Offtake (public and private); Value Chain Focus across Production, Storage, Uses; State Govt Support</p>	<p><b>Project Consortia/ SPV Formation</b>          Industry Champions lead on Project Scoping, Pre-Feasibility - with Industrial Dev, Energy Departments</p>
 <p>Public Funding, National Infra Innovation Project status</p>	<p><b>3-yr USD 360 mn, ‘Green H2 Project Dev’ Public Funding</b>          Tax Incentives, VGF, USD 2/kg price support for 25 First-Generation projects</p>	<p><b>Investments into First-Gen National Projects</b>          Electrolysers, Components, BoP, Storage, RE-Integration, Transport, Compression/Liquification &amp; Dispensing</p>
 <p>National Standards, Testing/ Certification, Skilling</p>	<p><b>Green H2 Safety Certification &amp; Testing Agency</b>          Production, Storage &amp; Transport (LH2, Gas), Compression/Liquification, Dispensing, Handling/Training – First-Gen National H2 Projects for improving ‘learning rates’; Project Risk Assurance/ Insurance (link to technical standards)</p>	

# Proposed USD 360 mn National Green H2 Public Spend over 3-years

How does it compare with global jurisdictions

USD 360 mn Public Spend for CAPEX (Electrolyser, BoP), Green H2 Pricing Support (USD 2/kg) next 3 years (2023-25) enables **national innovation and learning**.

GREEN H2 PUBLIC FUNDING – HUBS/ LARGE PROJECTS	
JAPAN	USD 19 BN
GERMANY	USD 10 BN
FRANCE	USD 8.2 BN
UNITED STATES/ USA	USD 8 BN
KOREA	USD 2.4 BN
AUSTRALIA	USD 1.4 BN

- Public funding of first-gen projects critical for **1) inducing Green H2 demand, 2) create matching supply-side linkages** – enable national hydrogen economy.
- Domestic manufacturing (Make-in-India)** ambition for Electrolysers, Balance-of-Plant (BoP), Storage/ Transport (Liquid, Gas H2) and Dispensing Equipment.
- Global climate finance/ funds, sovereign green bond allocation to be dedicated for 25/25 National Green H2 Commercialisation & Hub Dev Plan.**

India public funding commitments for Green-H2 Industrial Decarbonisation Project Development should be increased progressively, target **USD 1 bn National Green H2 Decarbonisation Funding, post first-phase (first-gen)** i.e. within 2025-30 period

First-Generation  
**25/25 National  
 Green H2 Project  
 Development Plan**

**25 National Green H2 Hubs<sup>^</sup>**

12 Industrial Hubs (across  
 Chem/Fert, Steel, Refineries), 3  
 Transport Hubs, 3 CGD Networks, 7  
 Municipal Projects

**150 MW Electrolyser Capacity<sup>^</sup>**

**USD 360 mn, 3-year Public  
 Finance Support**

**NHDC, Bharat H2 Taskforce**

Project Dev National Learning  
 Metrics, Milestones Sharing



**40MW National Green Chem Hubs**

Four 10MW Green H2, NH3/Fert. Hubs  
 Ankleshwar-Bharuch-Dahej/GUJ\*  
 Pune-NhavaSheva/ MAH  
 Nellore OR Vizag/ AP  
 Chennai/ TN



**40MW H2 Bharat Steel Plants**

Four 10MW GreenH2 Steel Plants  
 Bellary/KAR\*  
 Hazira/ GUJ  
 Dolvi/ MAH  
 Vizag/ AP



**40MW H2 Refineries**

Four 10MW GreenH2 Refineries  
 Jamnagar or Vadodara/GUJ  
 Mumbai/MAH  
 Kochi/KER  
 Vizag/ AP



**15MW Green Transport Hub\***

Three 5MW Heavy-Duty Transport  
 MAH2 Mumbai-Pune/MAH\*  
 KochiH2-Coimbatore/KER-TN  
 Vizag/ AP



**15MW H2-CGD Networks\***

Three 5MW H2-CGD Networks  
 Indore CGD/ MP\*  
 Pune CGD OR Nagpur CGD/ MAH  
 Vadodara CGD/ GUJ



**Waste-to-H2 City Projects**

Seven Municipal Projects  
 Pune\*, Nagpur, Mumbai, Delhi,  
 Bangalore, Chennai, Ahmedabad



**H2 Storage & Transport Supply Chain Network**

Storage-Transport-Regeneration Network at Ports - sea,  
 land transport corridors (in Phase II)

*\*indicative project SPV structures; project locations in following slides, SPV contracting and pre-feasibility to include RE-Integration, transmission  
<sup>^</sup>over and above individual private sector project development and investments*

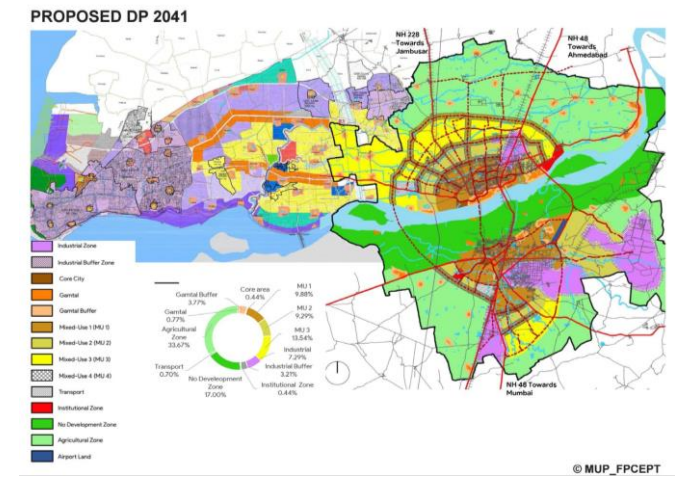
# A. 10 MW GUJ GREEN CHEM HUB - INDUSTRIAL GREEN H2 & NH3

H2 replacement by Chem/ Fert Industrial Units in Bharuch-Ankleshwar-Dahej – Production-Storage-Use SPV

**Decarbonize Industrial Chemical /Fertilizer Hub (replace Grey H2) with USD 20 mn public finance (USD 10 mn CAPEX (Electrolyser + BoP), USD 3 mn pa OPEX Green H2 price subsidy @USD 2/kg), delivering 1500 tonnes/annum, saving 15,000 tonnes CO2/annum over 3 years - with Govt of Gujarat support**

## GUJARAT GREEN CHEM HUB / INDUSTRIAL GREEN H2 AND AMMONIA – PUBLIC-PRIVATE PARTNERSHIP/ SPV

- Decarbonize Chemical/Fertilizer Industrial Units, with GIDC (Ankleshwar Industry Association, AIA) – with Green H2 infra, offtake and production master dev plan, to reduce emissions, improve AQI (136)
- BAUDA Industrial Decarbonisation Economic Research and Demand Projection study to be undertaken, as part of pre-feasibility and chemical/fertilizer decarbonisation study
- Decarbonizing targets/metrics of participating units, through GIDC, and provide incentives to units that opt-in
- State Green H2 and Ammonia Plan – align to State Industrial Decarbonisation and RE-EV-H2 plan
- Target 10MW Electrolyser Capacity, scalable to 20 MW – Joint SPV Ownership by Producers, Offtakers with Pricing Subsidies; potential to scale up to cater to industrial clusters in Vadodara, Surat-Hazira-Navsari, replicable format for 12 national clusters



### GUJARAT GREEN CHEM H2 & AMMONIA HUB – STATE GOVT PARTICIPANTS



### GUJARAT GREEN CHEM H2 & AMMONIA HUB – INDUSTRY PARTICIPANTS



### DEMAND SIDE ACTORS - INDUSTRIAL/ CHEMICALS OFFTAKERS

- FERTILIZER/ GREEN AMMONIA - IFFCO, Deepak Nitrate/ Fert & Chem, Guj NarmadaVal Fert & Chem(GNFC), UPL
- GREEN H2/CHEMICAL INDUSTRY - Kanoria Chem, Khaitan Chem, Rallis, SRF, Atul, Arihant Chem, Bharat Rasayan

### SUPPLY SIDE ACTORS - RE-H2, AMMONIA PRODUCTION-STORAGE

- RE PLAYERS - Borosil Renewables, ONGC Solar, Azure Solar, Rallis Solar, KP Solar, Tata Solar
- STORAGE PLAYERS – Chart Industries

\*names are indicative and for reference only

# B. 10 MW H2BHARAT STEEL PROJECTS

H2Bharat Steel Production – H2-DRI/ EAF, DirectH2-BFs in Integrated Steel Plants (Karnataka, Gujarat, Maharashtra)

**Decarbonize Steel (replace Grey H2) with USD 20 mn public finance support (USD 10 mn CAPEX (Electrolyser + BoP) and USD 3 mn pa OPEX Green H2 price subsidy @USD 2/kg) for 1500 tonnes H2 per annum, saving 15,000 tonnes CO2 per annum over three years, replace Coking Coal imports**

## H2BHARAT STEEL PROJECTS

- H2Bharat Steel Cluster Development & Research Institute – affiliated to School of Mines, Dhanbad/ IIT-Mumbai/IIT-Chennai, with support from Indian Steel Association (ISA), Steel Majors (JSW, Tata Steel, SAIL, ArcelorMittal, Rashtriya Ispat), Ministry of Steel
- Four National H2Bharat Steel Demonstration plants – JSW, SAIL, RINL, Tata Steel, AM – identified as First Generation Green H2 projects, supported by incentives, pricing support/subsidies for 3-year Green H2Bharat Steel support plan
- Progress of all four plants, H2Bharat Steel outputs reviewed annually, by NHDC, H2 Bharat Taskforce; eligible for production-incentives
- Resource/investments to be incurred by Finalized Majors Steel Players, eligible for incentives (production/investment-linked, price subsidies), estimated to be located in Karnataka, Maharashtra and Gujarat

### H2BHARAT STEEL PROJECTS – GOVT PARTICIPANTS



### H2BHARAT STEEL PROJECTS – INDUSTRY PARTICIPANTS



*\*names are indicative and for reference only*

# C. 10 MW H2BHARAT REFINERY HUBS

H2Bharat Refineries – Green H2/ Ammonia Use-Production in Integrated Refineries (Guj, Maharashtra, AP, Kerala)

**Decarbonize Refineries (replace Grey H2) with USD 20 mn public finance support (USD 10 mn CAPEX (Electrolyser + BoP) and USD 3 mn pa OPEX Green H2/ Ammonia price subsidy @USD 2/kg) for 1500 tonnes H2 per annum, saving 15,000 tonnes CO2 per annum over three years**

## H2BHARAT REFINERY PROJECTS

- Decarbonize Identified Refinery Units, with MoPNG – with Green H2/Ammonia infra, offtake and production master dev plan, to reduce emissions
- Refinery Decarbonisation Economic Research and Demand Projection study to be undertaken, as part of pre-feasibility and refinery decarbonisation study; track decarbonizing targets/metrics of participating units, through GIDC, and provide incentives to units that opt-in
- Target 10MW Electrolyser Capacity, scalable to 20 MW – Joint SPV Ownership by Producers, Offtakers with Pricing Subsidies; potential to scale up to cater to refineries, replicable format across all refineries over time
- Four National H2Bharat Refinery plants – RIL, Nayara, ONGC, BPCL, HPCL, IOCL – identified as First Generation Green H2/Ammonia projects, supported by incentives, pricing support/subsidies for 3-year Green H2Bharat Refinery support plan
- Progress of all four plants, H2Bharat Refinery outputs reviewed annually, by NHDC, H2 Bharat Taskforce; eligible for production-incentives
- Resource/investments to be incurred by Finalized Majors Refiners, estimated to be located in Gujarat, Maharashtra, Kerala and Andhra Pradesh.

### H2BHARAT REFINERY PROJECTS – GOVT PARTICIPANTS



### H2BHARAT REFINERY PROJECTS – INDUSTRY PARTICIPANTS

*\*names are indicative and for reference only*

# D. 5 MW MAH2 GREEN TRANSPORT HUB

Green H2 Offtake - Heavy-Duty Truck, Forklift Fleets (Public-Private) – 5 MW H2 Production-Storage-Use SPV

**Decarbonize 150-strong Heavy-Transport Fleet to cut vehicular emissions,– with USD 10 mn public finance support (USD 5 mn CAPEX (Electrolyser + BoP) and USD 1.5 mn OPEX Green H2 price subsidy USD 2/kg) for 750 tonnes pa, for 3 years - with support from Govt of Maharashtra**

- MAH2 TRANSPORT WORKGROUP – PUBLIC-PRIVATE PARTNERSHIP**
- Pune H2 Cluster Development & Research Institute – affiliated to NCL, MEDA (akin to Automotive Cluster Dev and Research Institute)
  - Engineering Research and Skills/Capacity Dev, and Zero-Emission Transport (FCEV+EVs) – with IIT-Mumbai, MIDC-units in Mumbai-Pune region
  - H2 Storage & Handling/Skilling CoE (Liquid H2, Compressed Gas) – with Safety/Certification Unit – NCL (proposed)
  - Add Heavy-Duty FCEVs Trucking to State EV Policy – akin to California Zero Emission Vehicles (ZEV) policy; RE-EV-H2 inclusion in State Clean Air Programme – to cut emissions
  - State Green H2 Plan – align to State Industrial Decarbonisation and RE-EV-H2 plan, replicable across industrial clusters - Economic Research and Projections/ State Targets
  - Target expansion to 10 MW – Joint SPV Ownership by Producers and Users/ Offtakers, with Green H2 Price Subsidies; potential to scale up to cater to industrial clusters + heavy-duty transport in Navi Mumbai, Mumbai, Nhava Sheva

### MAH2 WORKGROUP – STATE GOVT PARTICIPANTS



### DEMAND SIDE ACTORS – HEAVY DUTY TRANSPORT

- HEAVY DUTY TRANSPORT OEMs/ FLEETS - Tata Group, Mahindra, KPIT, Toyota Kirloskar, Bosch

### MAH2 WORKGROUP – INDUSTRY PARTICIPANTS



### SUPPLY SIDE ACTORS - RE-H2, PRODUCTION

- RE PLAYERS - Maha GenCo, Mytrah, Powercon, JSW Energy

*\*names are indicative and for reference only*

# E. 5 MW GREEN H2 - CGD BLENDING PROJECT

5-15% H2 Blending in CGD Network – with existing CGD pipeline infrastructure - 5 MW H2 Production-Storage-Use SPV

H2-Blending in CGD Network (5-15%), with USD 10 mn public finance support (USD 5 mn CAPEX (Electrolyser + BoP), USD 1.5 mn Green H2 OPEX price subsidy (USD 2/kg) for 750 tonnes pa, for 3 years

- GREEN H2 BLENDING IN CGD NETWORKS – PUBLIC-PRIVATE PARTNERSHIP**
- Scaling up GAIL Indore Pilot – current pilot at Indore with GAIL (1% blending/ 100 kg/day to be scale subsequently to 5-15%)
  - Target 5 MW Electrolyser Capacity expansion to 10 MW – by CGD Operators, Incentives to purchase from co-located Green H2 production facilities (captive, RE players)
  - Expand H2 Blending in CGD Network to at least 3 CGD Networks within 3 years

## BHARAT H2-CGD BLENDING PROJECT – GOVT PARTICIPANTS



## BHARAT H2-CGD BLENDING PROJECT – INDUSTRY PARTICIPANTS



*\*names are indicative and for reference only*



# F. NATIONAL 'GREEN H2CITIES' – MUNICIPAL WASTE-TO-H2 PROJECTS

Ahmedabad, Pune, Mumbai, Nagpur, Kochi, Bangalore, Indore - Waste-to-H2 plants, guaranteed waste feedstock and offtake

**GREEN H2CITIES** (Clean H2 classification with Waste-to-H2 plants) with **USD 8 mn/city or USD 56 mn public finance support** across 7 cities for 3-years (USD 5 mn CAPEX @ 25% 30-tonnes/day waste processing plant; USD 1 mn pa price subsidy per city), with guaranteed offtake of 500 tonnes pa

## NATIONAL GREEN H2CITIES INITIATIVE – PUBLIC-CIVIC/PRIVATE COLLABORATION IN IDENTIFIED CITIES

- Distributed Green H2 production at city-level for public awareness and support, initiative on addressing Clean Air issue
- 2-3 Use-Cases to be identified, executed with Municipal Bodies – showcased as part of National Green H2Cities Programme during G20 Presidency 2023
- Safety certifications/ testing from central/technical agency, prior to use
- Programme to be reviewed and incentivised – recognition of municipalities that achieve/cross Green H2 production and use in respective municipalities
- Oversight by Ministry of Urban Affairs (MUA) - with city/municipal stakeholders, civil society, industry champions at local level

### GREEN H2CITIES INITIATIVE – GOVT PARTICIPANTS



### GREEN H2CITIES INITIATIVE – INDUSTRY PARTICIPANTS



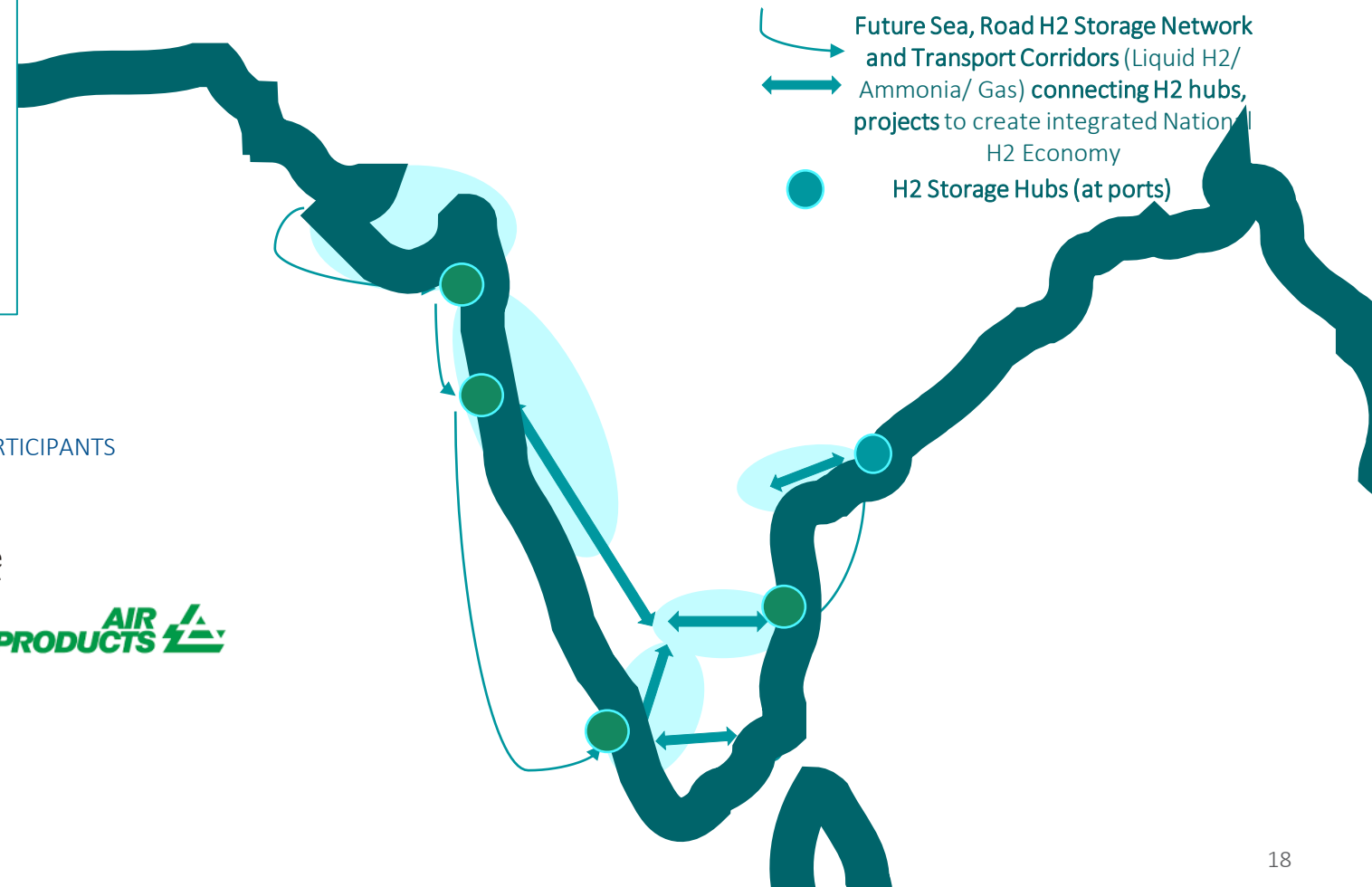
# G. NATIONAL H2 STORAGE & TRANSPORT – SUPPLY CHAIN NETWORK

Port-Linked H2 Storage, Transport and Re-Generation Network (to be taken up in Phase II)

**H2 STORAGE NODES AT KEY PORTS – connected BY SEA/LAND TRANSPORT CORRIDORS - WITH RE-GENERATION FACILITIES – flexible, national H2 supply chain and economy to cater to different H2 in its forms (Liquid H2, Compressed Gas, Ammonia, LOHC)**

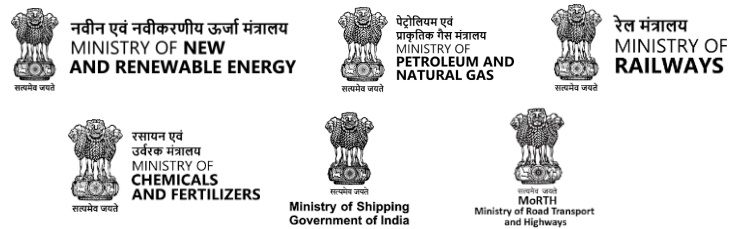
## NATIONAL H2 STORAGE – TRANSPORT – RE-GENERATION NETWORK

- National H2 Storage and Transport Network – plan for national H2 supply chain
- Allows for flexibility across different forms of H2 (compressed gas, liquid H2, ammonia, LoHC), and improved learning curves
- Create national H2 economy and market, enabling scale economics
- Storage/ transport facilities to be supported as National H2 Projects
- Coordination across multiple ministries/agencies – MNRE, Chemicals, Shipping, Road & Highways, Railways, MoPNG, Steel and Heavy Industries



Future Sea, Road H2 Storage Network and Transport Corridors (Liquid H2/ Ammonia/ Gas) connecting H2 hubs, projects to create integrated National H2 Economy  
 ● H2 Storage Hubs (at ports)

### H2 STORAGE & TRANSPORT – GOVT PARTICIPANTS



### H2 STORAGE & TRANSPORT – INDUSTRY PARTICIPANTS



\*names are indicative and for reference only

State-Level  
**Five National Green H2 Hubs**  
 (alternate structuring)

Multi-use/offtake SPVs

Co-located Production-Use

150 MW Electrolyser Capacity

USD 360 mn, 3-year Public Finance Support

Oversight by NHDC, Bharat H2 Taskforce & State-Level Green H2 Advisory Groups

**40 MW GREEN H2GUJ**

**National Chem-Steel-Refinery-CGD Hub**

Ankleshwar-Vadodara-Hazira (GUJ)

USD 78 mn public spend, c8000 tonnes pa Green H2 production & offtake, cut 8 Mmt CO2 in a decade



- 10MW Green H2, NH3/ Fertilizer Hub (Ankleshwar)
- 10MW GreenH2 Steel Plant (Hazira)
- 10MW GreenH2 Refinery (Vadodara)
- 5MW H2-CGD Networks (Vadodara)
- 5MW Heavy-Duty Transport/ Forklifts (Vadodara)
- Waste-to-H2 City (Vadodara/ Dahej/Hazira)

**30 MW GREEN H2KAR-AP**

**National Steel-Chem-CGD Hub**

Bellary-Nellore-Krishnapatnam (KAR-AP)

USD 68 mn public spend, c5000 tonnes pa Green H2 production & offtake , eliminate 5 Mmt CO2 in a decade



- 10MW GreenH2 Steel Plant (Bellary)
- 10MW Green H2, NH3 Hub (Nellore)
- 5MW H2-CGD Networks (Nellore)
- 5MW Heavy-Duty Transport/ Forklifts (Krishnapatanam)
- Waste-to-H2 City (Nellore)

**30 MW GREEN MAH2**

**National Steel–Refinery–Transport-CGD Hub**

Mumbai-Pune-Dolvi (MAH)

USD 68 mn public spend, c5000 tonnes pa Green H2 prodn & offtake, cut 5 Mmt CO2 in a decade



- 10MW GreenH2 Steel Plant (Dolvi)
- 10MW Green Refineries (Mumbai)
- 5MW H2-CGD Networks (Pune/Mumbai)
- 5MW Heavy-Duty Transport/ Forklifts (Nhava Sheva)
- Waste-to-H2 City Projects (Mumbai/ Pune)

**30 MW GREEN H2VIZAG**

**National Refinery-Steel-Transport-CGD Hub**

Vizag (AP)

USD 68 mn public spend, c5000 tonnes pa Green H2 prodn & offtake , cut 5 Mmt CO2 in a decade



- 10MW Green H2 Refinery (Vizag)
- 10 MW Green Steel (Vizag)
- 5MW H2-CGD Networks (Vizag)
- 5MW Heavy-Duty Transport (Vizag)
- Waste-to-H2 City Projects (Vizag)

**20 MW GREEN H2KOCHI**

**National Chem – Transport -CGD Hub**

Kochi (KER)

USD 45 mn public spend, 4000 tonnes pa Green H2 prodn & offtake, cut 4 Mmt CO2 in a decade



- 10MW Green H2 Refinery (Kochi)
- 5MW H2-CGD Networks (Kochi)
- 5MW Heavy-Duty Transport/ Forklifts (Kochi)
- Waste-to-H2 City Projects (Mumbai/ Kochi)

*\*indicative project SPV structures in following slides; project locations, SPV contracting & award to be done by NHDC, Bharat H2 Taskforce  
 ^over and above individual private sector project development and investments*

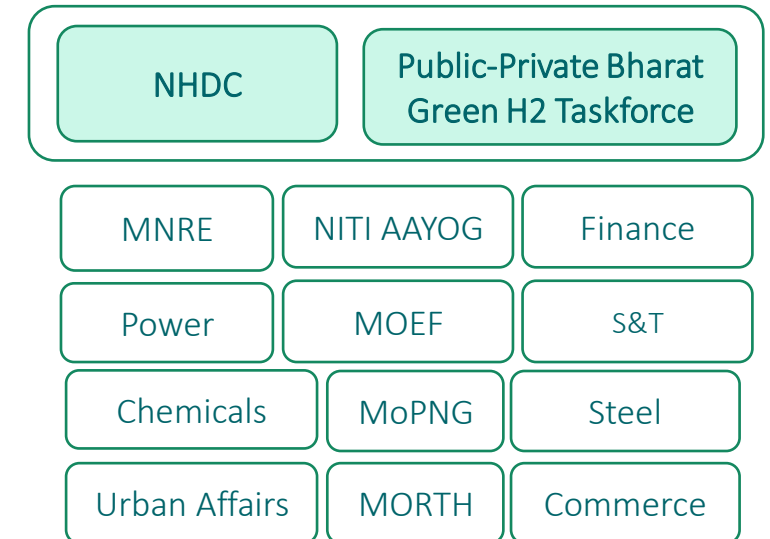
# Green H2 Hubs Development Framework – State Level

Develop Five National Green H2 Hubs with State-Industry Collaboration (CMO-IH2A)

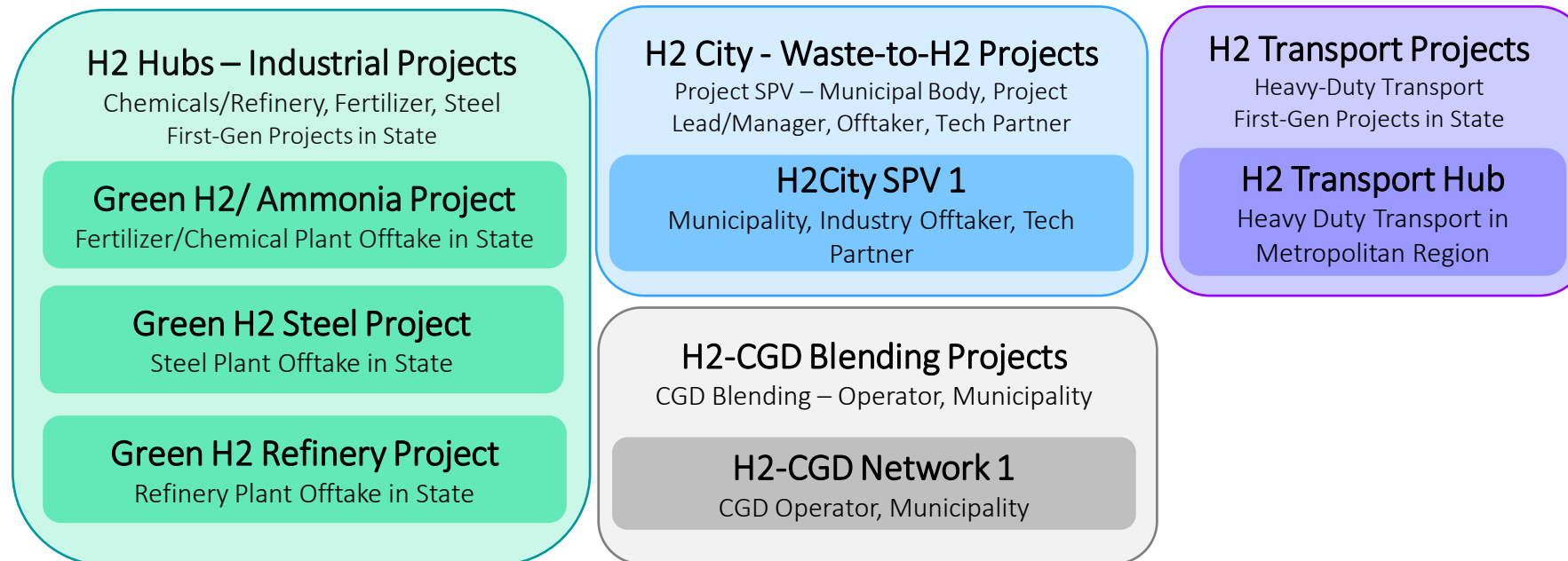
Draft State H2 Policy and H2 Hub Development Plan; oversee implementation with public-private advisory group



Coordination with central agencies/ ministries



Five National Green H2 Hubs Planning and Implementation – Scalable, Multi-Use-Case Hubs



## Next Steps

1. NHDC, Public-Private Taskforce Formation – *collaboration with the govt (proposal)*
2. Public Finance Support for USD 360 mn 3-year Green H2 Dev Plan - *workshop/discussion planned*
3. Commitments from Industrial Offtakers, SPV/ Consortia Leads – *interest to join hub consortia, sign offtake agreements*
4. State Governments Support, Nodal H2 Officer in State – *proposals to with State Govts*
5. Pre-feasibility studies of first-generation projects – *in-principle funding support*

## KGH2 - Kochi Hub

- Hydrogen Valley –production, storage, transmission and end-use infra (GH2 gas and liquid) in 50-km radius cluster.
- Ph.1: Transport: GH2-ICE retrofitted fleets of 60 buses with infra
- Ph 2: Industrial demand: refineries, fertilizer and chemical plants.

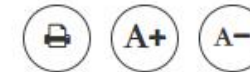
*“We are actively collaborating with industry and investors to replicate in Kerala the hydrogen valleys in Europe. The proposed Kochi Green Hydrogen Hub is significant for its scale and its focus on building hydrogen infrastructure.”*

*Dr K A Abraham,  
Chief Principal Secretary, Kerala*

# Kerala to spend \$575 mn to set up green hydrogen hub in Kochi with IH2A

*The green hydrogen hub will be evaluated by government, industry, and funding agencies*

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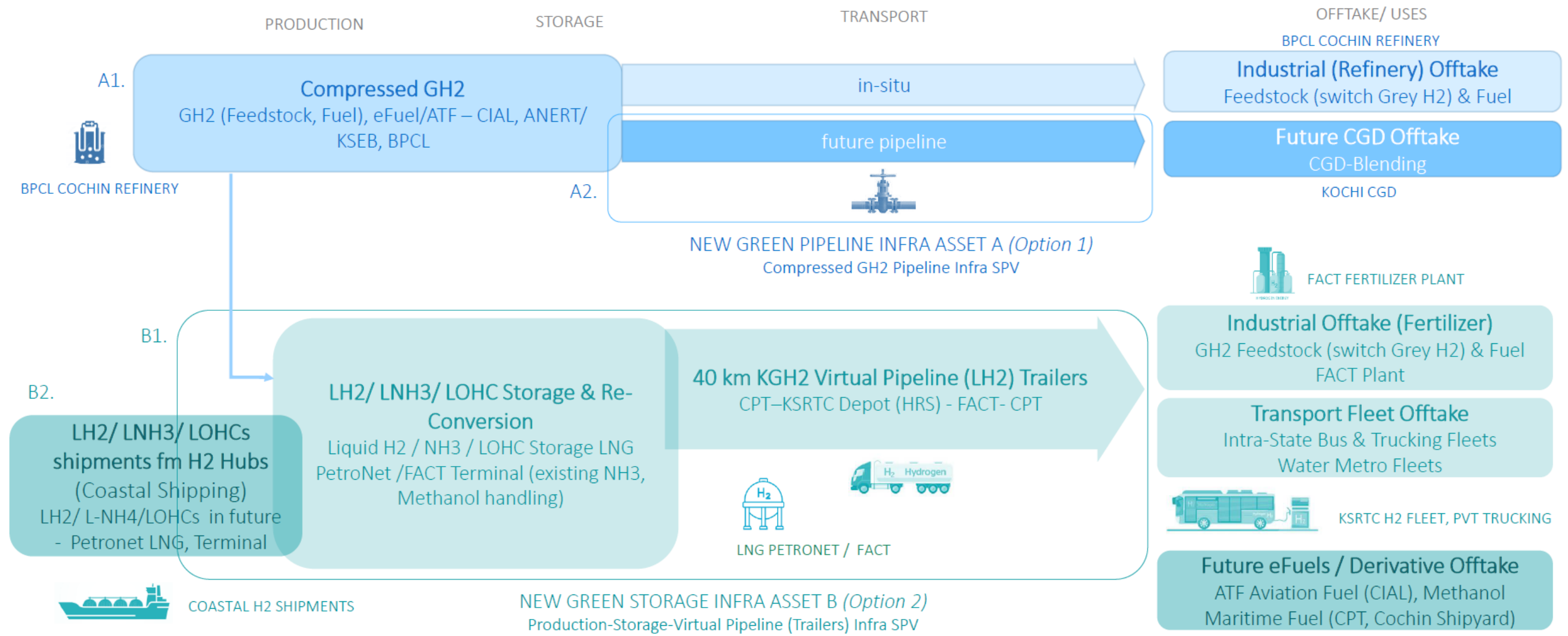


New Delhi: Delhi-based industry body, [India Hydrogen Alliance \(IH2A\)](#), and the Government of [Kerala](#) on Monday said they are jointly evaluating a proposal for building the Kochi [green hydrogen \(KGH2\)](#) hub with a potential capital expenditure of \$575 million.

According to the official press release, the plant will have a capacity of 60-tonnes per day (TPD) with a 150 MW electrolyser, storage and infrastructure hub and could achieve gigawatt-scale capacity.

The plan was shared by IH2A and the Kerala government after a consultation meeting between government, industry, and funding agencies.

# KGH2 – Kochi Green Hydrogen Hub



B1. LH2 Storage Infra integral for transport, fertilizer use    B2. Relevant in longer term, national plan for connected hubs

\*company names/entities mentioned are indicative only

 Thank you  
