Green Hydrogen: India's perspective

Ministry of New & Renewable Energy

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Introduction of Hydrogen

First element in periodic table

Lightest Element (lighter than air)

Colorless

Odorless

Highly Inflammable

Abundantly available

Versatile Industrial usage

Low Density

Long thought as a future source of energy

India's Hydrogen Journey

1976 – Hydrogen Energy Task Force (HETF)

1983 – Technical Advisory Committee on Hydrogen Energy (TACHE);

2003 – National Hydrogen Energy Board (NHEB) under MNRE steering group of NHEB

2006- National Hydrogen Road Map Green Initiative for Future Transport (GIFT)

2016- Renew of existing policies

2023 – **National Green Hydrogen Mission**

India’s Energy Transition Goals announced at CoP-26

Non-fossil energy capacity to reach 500 GW by 2030

50% of energy through RE by 2030

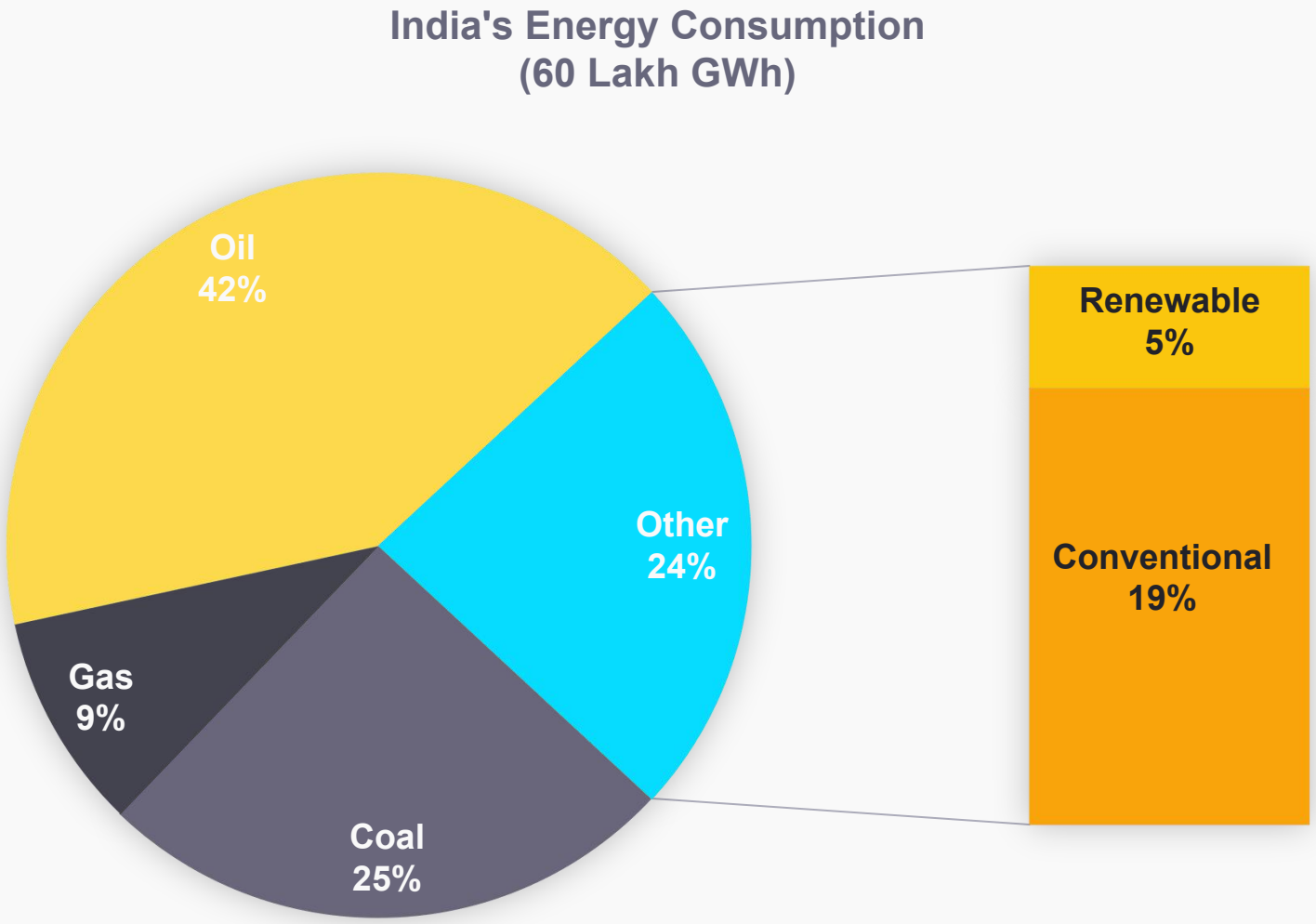
Emissions intensity of GDP to reduce by 45% by 2030 (vs. 2005)

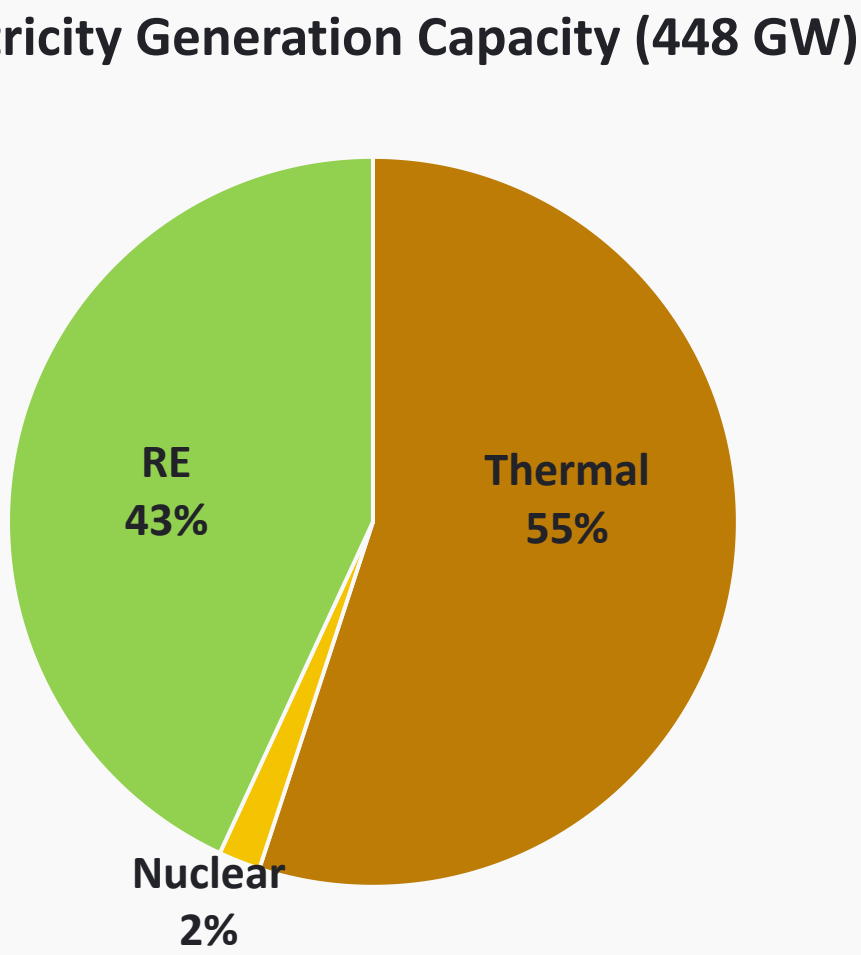
Projected carbon emissions to reduce by 1 billion tonnes from now to 2030

Achieve the target of net-zero by 2070

Renewable energy deployment is central to achieving these goals

Energy Mix





Share of RE in India's Energy Mix has been increasing

National Green Hydrogen Mission

At least
5 MMT
GH_2 Annual Production

60-100 GW
Electrolyser
Capacity

125 GW RE
Capacity for
GH2 Generation

50 MMT
Emissions
Averted

INR 1 Lakh Crore
(USD 12.5 Billion)
Import Savings

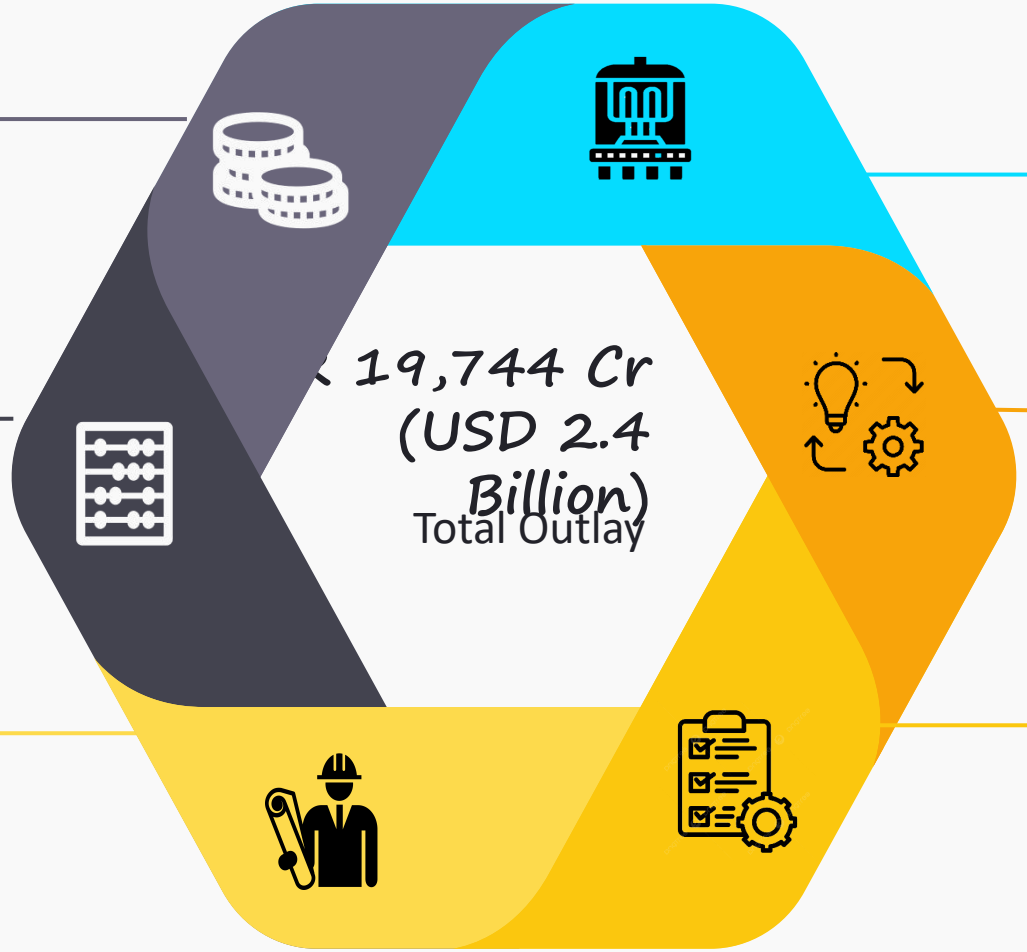
INR 8 Lakh Crores
(USD 100 Billion)
Investment

National Green Hydrogen Mission

INR 17,490 Cr
(USD 2.1 Billion)
SIGHT

INR 1066 Cr
(USD 175 Million)
Pilot Projects

INR 353 Cr
(USD 46 Million)
Other Components

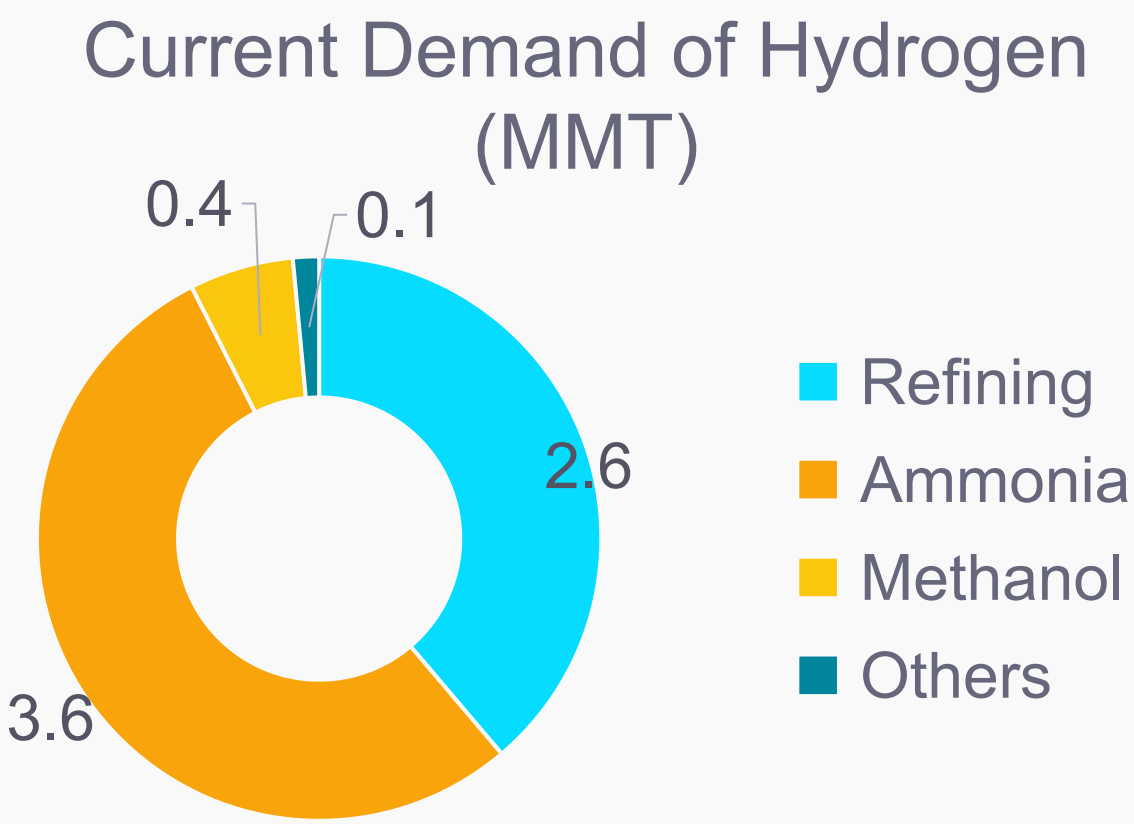


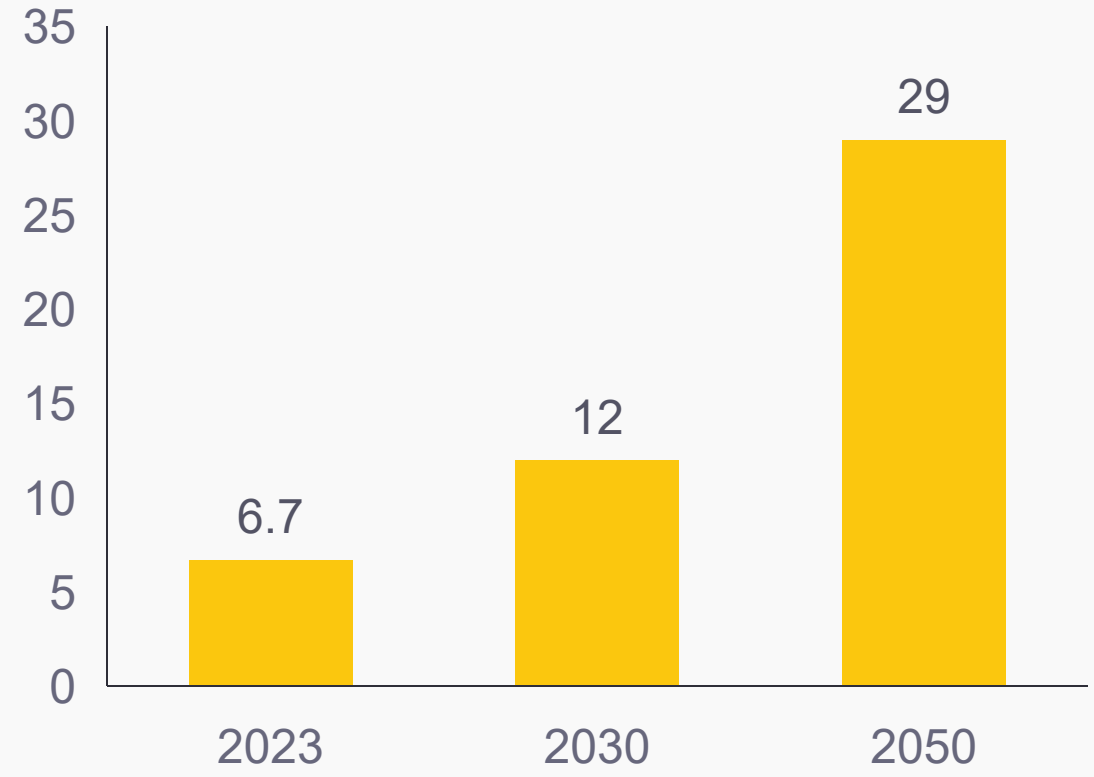
INR 400 Cr
(USD 50 Million)
Hubs and other Emerging Technologies

INR 400 Cr
(USD 50 Million)
R&D

INR 35 Cr
(USD 4 Million)
Skill Development

Hydrogen Demand in India





SIGHT Programme

Electrolyser	**Tranche I**	1500 MW per annum (8 companies)
	Tranche II	1500 MW per annum (11 companies)
	Total: 3000 MW	
Green Hydrogen	Mode 1	**Tranche I:** 4,12,000 TPA of Green Hydrogen(10 companies)
		Tranche II: 4,50,000 TPA of Green Hydrogen (Tender is live)
	Mode 2	**Mode 2A (Green Ammonia for fertilizers- Aggregation mode)** 7,39,000 TPA (Tender is live)
		Mode 2B (Green Hydrogen for refineries - Aggregation mode) 2,00,000 TPA

Timeline of Scheme Launched

Jan 2023

Launched National Green Hydrogen Mission

Jun 2023

1. SIGHT Green Hydrogen Mode 1
2. SIGHT Electrolyser Manufacturing

Aug 2023

Launch of Green Hydrogen Standard for India

Jan 2024

1. SIGHT GH2 Aggregation Mode 2A
2. SIGHT Green Ammonia Aggregation Mode 2B
3. Tender Awarded for Electrolyser & GH2 under Tranche I

Feb 2024

Scheme Guidelines
1. Shipping Sector
2. Steel Sector
3. Transport Sector

Mar 2024

Scheme Guidelines
1. R &D
2. Hydrogen Hubs
3. Skill Development
4. SIGHT Green Hydrogen Mode 1 Tranche - II

Jul 2024

Scheme Guidelines
1. Testing facilities, infrastructure, and institutional
2. SIGHT Green Hydrogen Production- Tranche-II
3. Tender floated of 4.5 Lakhs TPA GH2 production
4. Tender floated for 7.39 Lakhs TPA Production and Supply of Green Ammonia

Aug 24

Tender awarded for Electrolyser under Tranche-II

Sep 2024

Draft Green Hydrogen Certification Scheme of India

Green Hydrogen Standard of India

"**Green Hydrogen**" shall mean Hydrogen Produced using Renewable Energy, including, but not limited to, production through:

1. **Electrolysis**
2. **Conversion of biomass**

Emissions shall not be greater than
2 kg CO_2 eq/kg H_2

NGHM Workforce

Role of Empowered Group

- Overall monitoring and guidance

Role of Advisory Group

- Advise
- Recommend
- Assist EG

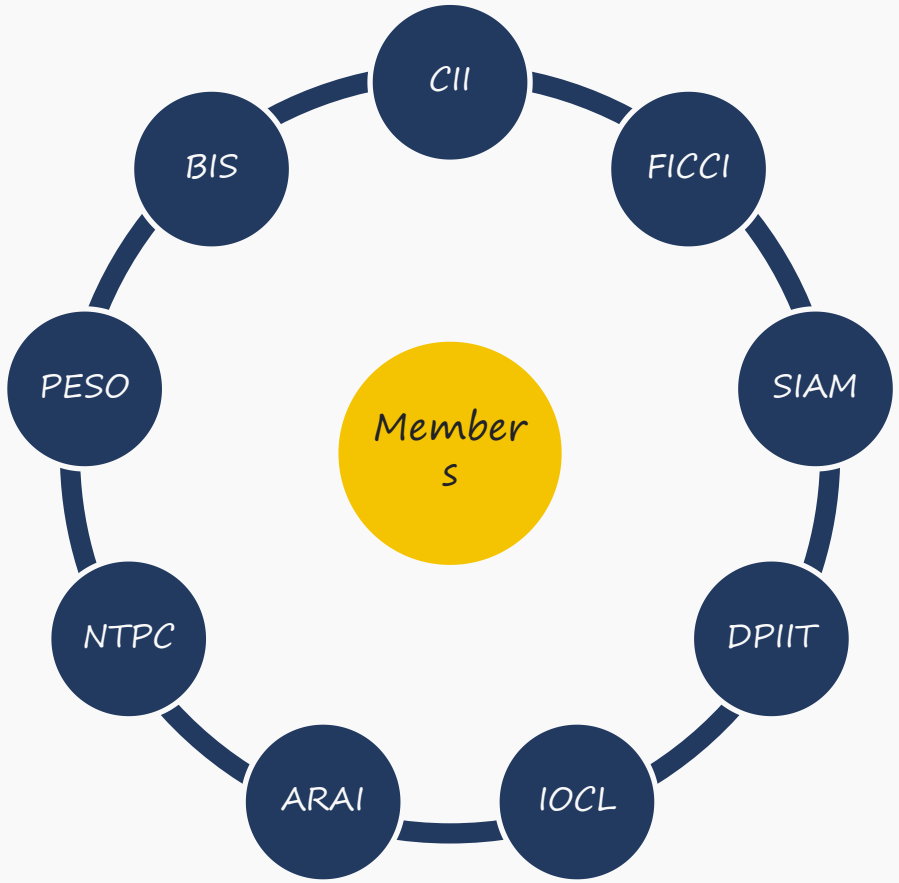
Role of Mission Secretariat

- Develop Strategic plans
- Stakeholder Interaction
- Keep Database
- Oversee progress
- Provide guidance

Regulations, Codes and Standards

Three Sub-Groups

- Sub-Group I: Hydrogen Production and Use
- Sub-Group II: Storage & Transportation of Hydrogen
- Sub-Group III: Hydrogen-Fuelled Mobility Applications
  - Aviation Sub-Group
  - Shipping Sub-Group



152 Standards Recommended
81 Published

Pilots Project Schemes for Transport Sector

INR 496 Cr (USD 60 Million)

Budget FY 2025-26

Component of the Scheme:

- ***Component A:***
  - ✓ Bus & Truck with Fuel Cell/Internal Combustion engine-based propulsion technology.
  - ✓ Four-wheeler vehicles with Fuel Cell/Internal Combustion engine-based propulsion technology.
- ***Component B:***
  - ✓ Development/selection/validation of technologies for supporting infrastructure like Hydrogen refuelling stations.

Status

- RfP issued by ARAI on 19th February 2024
- 13 bids received; 7 technically qualified bidders are under commercial evaluation
- 40 recommended

Pilots Project Schemes for Shipping Sector

INR 150 Cr (USD 14 Million)

Budget
FY 2025-26

Components of the Scheme:

- INR 800 Crores (USD 9.8 Million) allocated for Retrofitting of Existing Vessels
- INR 350 Crores (USD 4.2 Million) allocated for Creation of Bunkers and Refuelling Facilities

Status

- Shipping Corporation of India has carried out feasibility study for retrofitting work in Vessels:
- Engine
- Aux System (as per guidelines of IMO)
- Retrofitting of two 4 Stroke Engine vessel
- E-Tender issued on 10th July 2024 for selection of designer for conversion of 120T BP AHTS vessel(s)

Pilots Project Schemes for Steel Sector

INR 455 Cr (USD 55 Million)

Budget FY 2029-30

Components of the Scheme:

- Use of 100% Hydrogen in DRI process using vertical shaft/kiln.
- Use of Hydrogen blending in Blast Furnace, as per limits prescribed.
- Integration of GH2 in vertical Shaft process.

Status

- RfP issued on 11th June 2024;
- 5 Bids received and are under evaluation

Research and Development Scheme

INR 400 Cr (USD 50 Million)

Budget FY 2025-26

Components of the Scheme:

- Mission Mode Projects: 2022-2027
- Grand Challenge Projects: 2022-2030
- Blue Sky Projects: 2022-2035

Status

- RoadMap notified in October 2023
- 400+ proposals received;
- Shortlisted proposals are undergoing evaluation by sub-committee

Hydrogen Hubs Scheme

INR 200 Cr (USD 25 Million)

Budget FY 2025-26

Components of the Scheme:

- Infrastructure development for complete Hydrogen value chain including Production, Storage, Transport and Utilization

Status

- Call for Proposal (CfP) issued on 20th August 2024.

Skill Development Scheme

INR 35 Cr (USD 4.2 Million)

Budget FY 2029-30

Components of the Scheme:

- Short Term Training (STT): 200 – 600 hours
- Recognition of Prior Learning (RPL): 30 – 132 hours
- Creation of Centre of Excellence (CoE)
- Curriculum based long duration training at Schools, ITIs, Polytechnics and HEIs

- 29 QP's Developed
- 15 QP's in process
- 24 Handbook Published
- 43 Master Trainers
- 67 Trainers

Testing facilities, Infrastructure, and Institutional support

INR 200 Cr (USD 25 Million)

Budget FY 2025-26

Components of the Scheme:

- Development of New Testing Centres.
- Upgradation of existing Infrastructure

Status

- Call for Proposal (CfP) issued on 16th March 2024 by NISE..

Whole of Government Approach

Ministry of New & Renewable Energy

- Waiver of ALMM/ RLMM for RE developers in SEZ / EOU;
- List of Approvals Identified;
- 152 recommendations on standards made; 73 Standard Published

Ministry of Power

- ISTS charges waived for GH2 and Ammonia projects to 2030;
- Banking of RE for 30 days permitted;
- Connectivity approvals at generation end on priority basis

Ministry of Ports, Shipping and Waterways

- Kandla, Paradip and Tuticorin ports identified to be developed as GH2 hubs

Ministry of Commerce

- Duty benefits allowed on Captive Power plants in SEZ.
- Similar Benefits for EoU and EPCG under process.

DPIIT

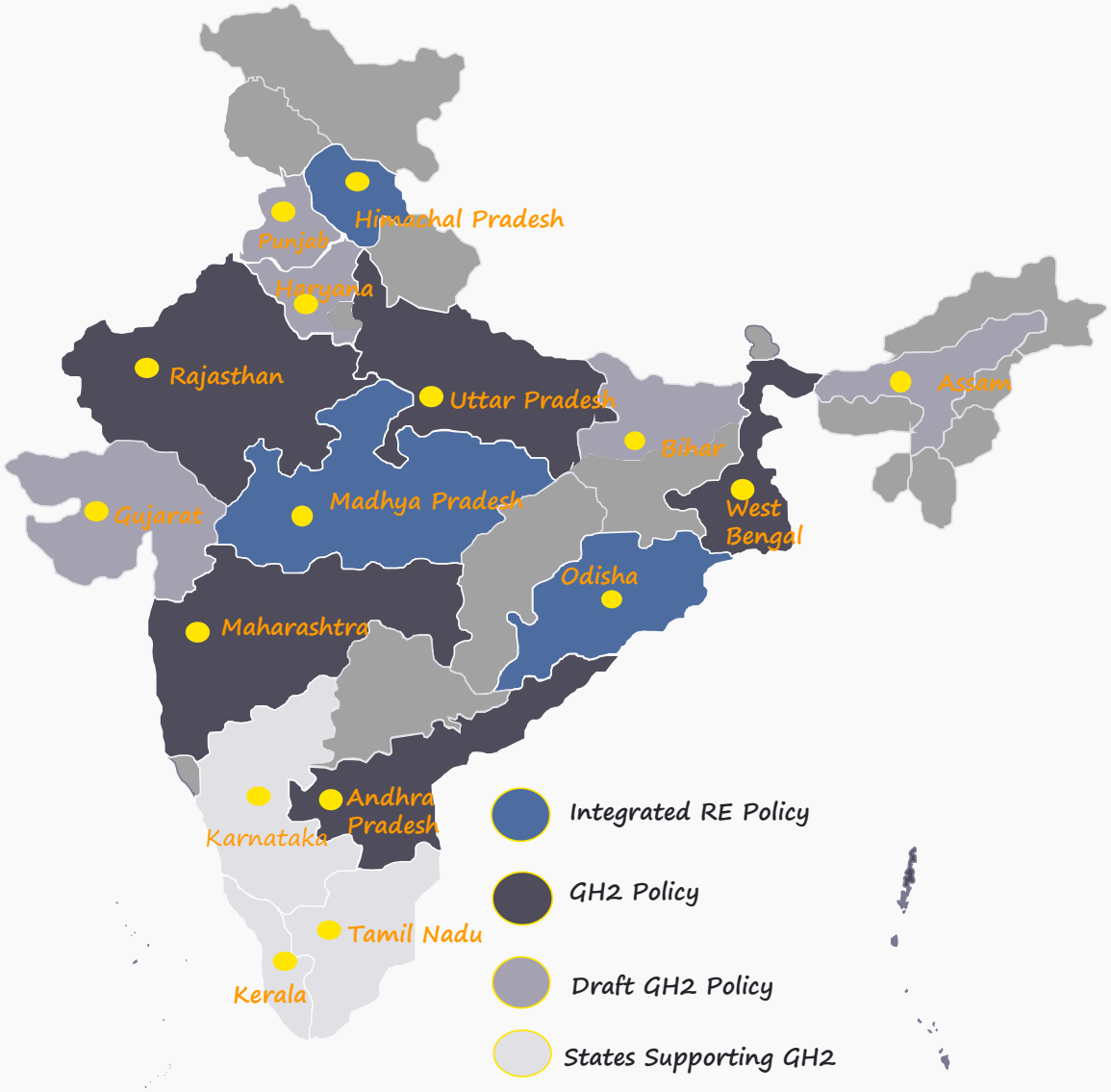
- National Single Window Portal for clearances;
- Separate page for GH2 and Electrolyser manufacturing projects

Ministry of Environment, Forests and Climate Change

- Environmental Clearance exempted for standalone GH/GA plants

Support from States

GH2 Policy	States Name	Nos. of States
States with GH2 Policy	Rajasthan, Uttar Pradesh, Maharashtra, West Bengal & Andhra Pradesh	5
States with Draft GH2 Policy	Assam, Bihar, Punjab, Haryana & Gujarat	5
States with GH2 in existing RE Policy	Odisha, Madhya Pradesh & Himachal Pradesh	3
States Supporting GH2 Production	Kerala, Karnataka & Tamil Nadu	3



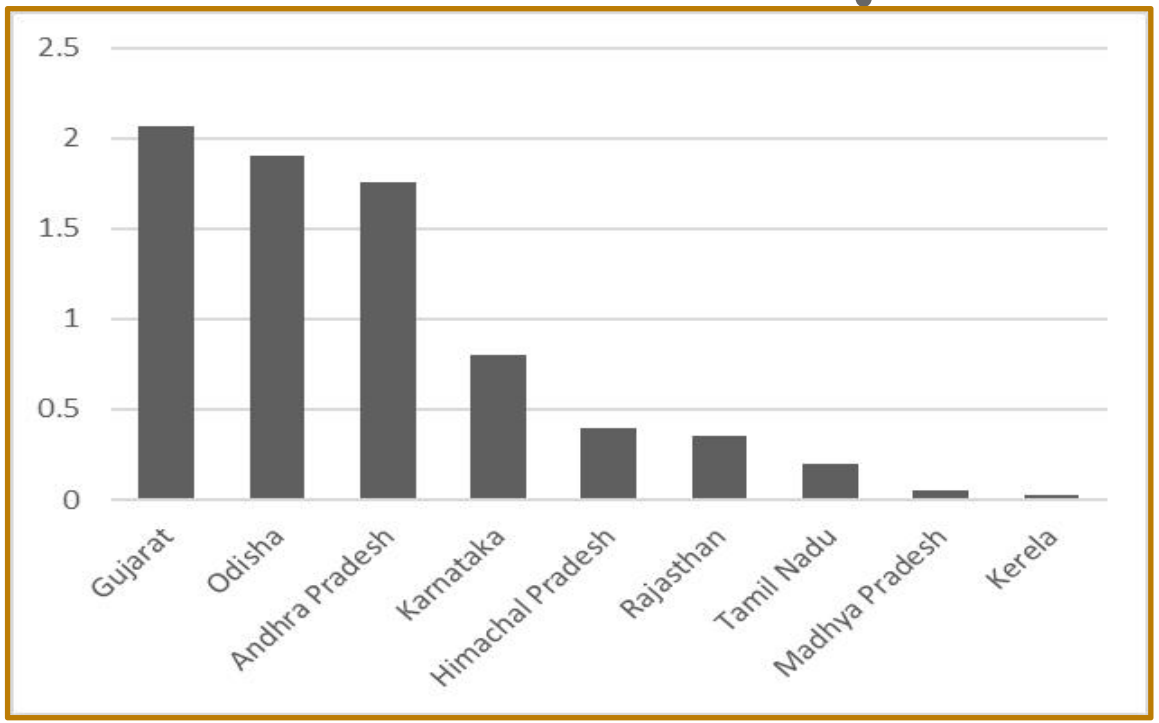
Article 6.2 : Cooperative Approaches

- **Objective**: Increasing climate ambition in a cooperative manner
- **Participants**: Countries which are parties to Paris Agreement
- **Trading Units**: Internationally Transferred Mitigation Outcomes (ITMOs)
- Allows countries to exchange mitigation outcomes bilaterally and to report their trade, and use them towards their Nationally Determined Contributions (NDCs)
- **Decentralized approach**: Participating countries to decide how the cooperation in achieving NDCs through the transfer of mitigation outcomes is to be designed
- Agreements being pursued with 10 countries

Details of Projects Announced

Green H2 & Ammonia

Project Capacity (MMTPA of GH2)



Electrolyser Manufacturing

- 24 Projects announced
- Ohmium has a 2000 MW operational capacity in Bengaluru
- John Cockeril-Greenko constructing a 1 GW plant in Tamil Nadu
- H2E Power constructing a 1 GW plant in Maharashtra
- GreenH Electrolysis has announced plans for 1 GW capacity in India
- 15 entities awarded capacities under SIGHT programme for Electrolyser manufacturing

Total Announced H_2 equivalent Capacity by 2030	7.67 MMT	Total No. of companies	17

India’s Competitive Advantage

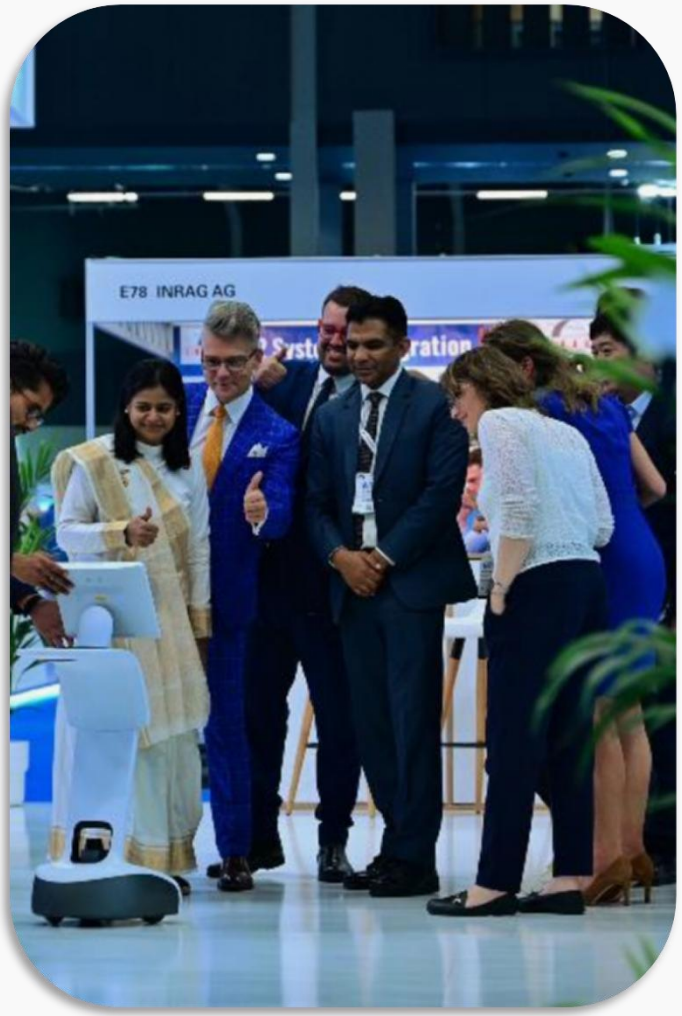
Outreach Activities

World Hydrogen Day- 8th Oct 2023

IPHE : 18th – 22nd March 2024

Workshop on Quality Control in GH2 : 8th May 2024

World Hydrogen Summit: 13th -15th May 2024 Rotterdam, The Netherland



National Workshop on Green Hydrogen : 6th June 2024