How India Can Accelerate Towards Hydrogen Economy

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India’s Climate Related Commitments

- India will reach its non-fossil energy capacity to 500 GW by 2030
- India will meet 50 percent of its energy requirements from renewable energy by 2030
- India will reduce the total projected carbon emissions by one billion tonnes from now onwards till 2030
- By 2030, India will reduce the carbon intensity of its economy by less than 45 percent
- By the year 2070, India will achieve the target of Net Zero

Needs immediate actions by all stakeholders!

Indian Economy to grow: *So will be the demand for Energy*

- Indian Economy to grow to $10 Trillion by 2030, from the present $ 2.75 Trillion
- India's per capita energy consumption at 0.6 tonnes of oil equivalent (toe) compared to the global per capita average of 1.8 toe is almost one-third;

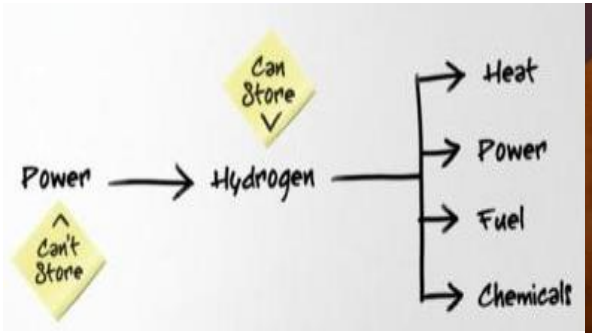
  - India will have to increase its per capita energy consumption by at least 2.5 times to enter the upper-middle income group
- Energy demand is set to increase at a rapid pace with rising income levels & growing aspirations of middle class

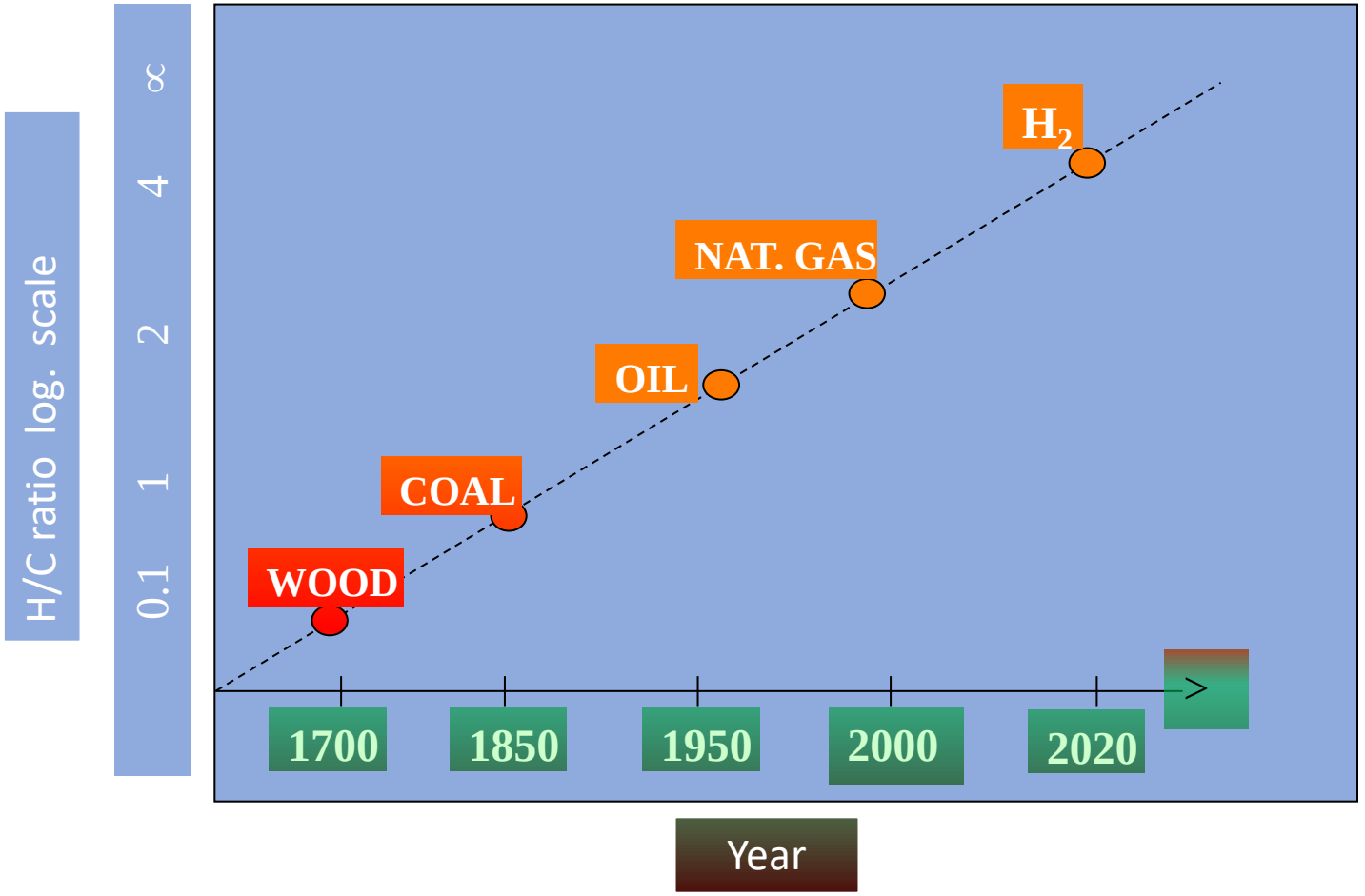
Need for reinventing the energy basket to provide energy for growth amidst climate commitments

Moving towards a carbon free future

Expected role of hydrogen

- Fuel for energy sector decarbonization
- Electrification of Mobility sector - Fuel cells
- Electrification of heat – Decentralized power generation
- Optimizing energy systems – energy carrier & storage medium





Hydrogen is the answer for meeting stringent environmental norms and mitigating climatic change without impacting the growth pace

Enablers for Hydrogen Market Creation

- Low cost Hydrogen Production: Focus on green hydrogen but produce low cost grey/preferably blue hydrogen in the interim till green hydrogen cost comes down

- Scale: Focus on sectors with large demand of hydrogen usage as feed stock and also for decarbonization needs in processes

- Create Infrastructure for storage, supply, distribution and supply: Hydrogen in CNG and dedicated hydrogen pipelines, tanks, tube trailers, refuelling stations etc.

- Reduce demand uncertainty: long term contracts for take off, policy mandates for reduced carbon footprints and gradual increase of green hydrogen usage

Hydrogen as enabler for Decarbonisation

Enable the renewable energy system → Decarbonize end uses

- Enable **large-scale renewables integration** and **power generation**

- **Distribute** energy across sectors and regions
- Act as a **buffer** toincrease system resilience

- Decarbonize **transportation**
- Decarbonize **industry energy** use
- Help decarbonize **building heating and power**
- Serve as **feedstock**, using captured carbon

Source- Hydrogen Council

Key focus areas

MAKE

Increased Low Cost Hydrogen Production

MOVE

More Efficient Hydrogen Transmission

USE

Low Cost Value added Applications

STORE

Improved Bulk Storage Technologies

Action Plan – Hydrogen Production

Short term

- **Initially equal focus should be on hydrogen production from fossil fuels for eventual transition from Grey/Brown to Blue Hydrogen**
- **Hydrogen production from Natural gas reforming with CCUS technologies be also taken up for production of low carbon blue hydrogen**
- **R&D activities may also include hydrogen production from biomass and coal gasification route with CCUS.**
- **R&D focus on improved efficiency and cost of electrolysis for reducing cost of Green Hydrogen & Green Ammonia**

Medium & Long term

- **Pilot projects for Green Hdrogen production from renewables and advance process should move towards commercialization. Achieving economies of scale to produce hydrogen through renewables route should be prioritized.**
- **Economy of scale to be achieved and cost of Hydrogen production to be competitive with alternate fuel.**

Need not focus on green Hydrogen but Piggyback on Blue hydrogen

Action Plan – Hydrogen Storage & Transmission

Short term

- **Blending Hydrogen in Natural Gas for transportation through existing natural gas pipelines**
- **Cylinders with storage upto 700 bars to be developed; PESO should grant approvals and develop standards**
- **Create infrastructure with grey and blue Hydrogen and not wait for widespread availability of green Hydrogen**

Medium & Long term

- **Ensuring future pipelines are compatible when used for transporting hydrogen**
- **Hydrogen can be converted to ammonia, it's easier to transport ammonia over long distances, and at consumption centre it can be reconverted back to hydrogen; To work on bringing down the cost of conversion and reconversion**
- **Fast track approvals for type IV Hydrogen cylinders & systems for Hydrogen transmission**

Action Plan – Regulatory

- **Adoption of already existing International standards for Hydrogen production, storage and transmission and avoiding reinventing the wheel**
- **Comprehensive Hydrogen demonstration programs by the Government agencies & PSUs in association with various Industries e.g. Hydrogen valleys, hubs and highways**
- **PESO to facilitate amendment of relevant policies/rules like Gas cylinder rules and Static & Mobile Pressure vessel rules for Hydrogen**
- **Promotion of Hydrogen in power to gas networks, implement incentive schemes regarding use of clean hydrogen (Green Credits) as an industrial feedstock, blending in transportation/cooking fuels, review gas pipeline regulations to consider including gaseous hydrogen, to create a 'market pull' for hydrogen economy**
- **FAME like benefits & tax incentives should be extended to hydrogen ICE & Fuel Cell vehicles in order to pave path for the faster deployment of hydrogen for mobility**

THANK YOU