



India – Green Hydrogen Potential

– A closer look at financing opportunities in green hydrogen

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Green Hydrogen | Outline

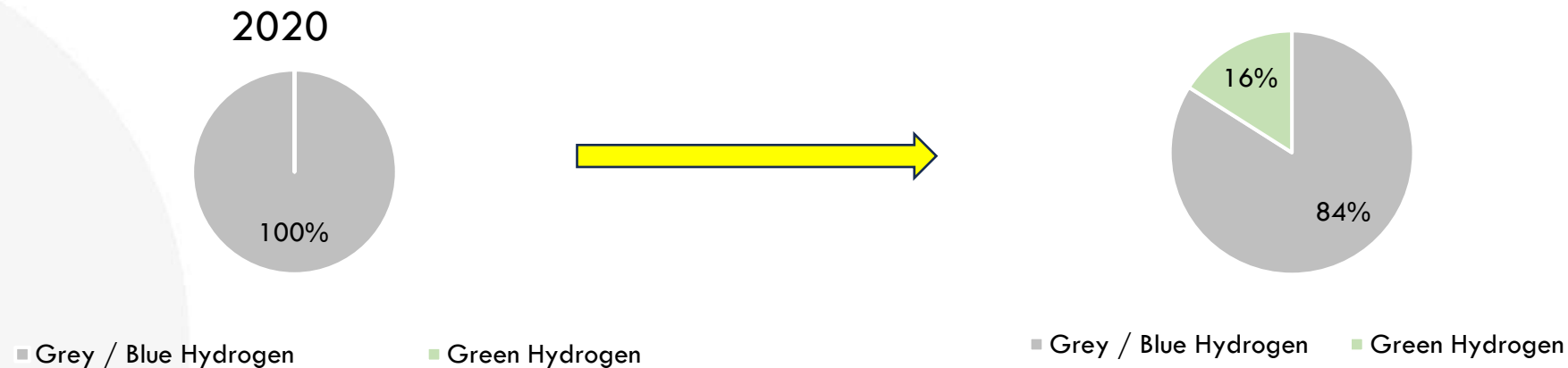
- Hydrogen is classified as below:

Grey Hydrogen
Produced from natural gas

Blue Hydrogen
Produced from natural gas with carbon capture and storage (CCS).

Green Hydrogen
Produced using clean energy sources via electrolysis of water

- Total H₂ demand in India in FY 2020 was about 6 MMT; which is expected to increase to 11 MMT by FY 2030



- National green hydrogen mission (NGHM) aims to develop **green hydrogen production capacity** of about **5 MMT** per annum with an associated **RE** capacity addition of about **125 GW by 2030** to meet additional demand
- Major** demand for H₂ till 2030 is likely from sectors where it is consumed 'in-situ'. Subsequent demand increase is likely after technological development in logistics related to storage & transportation of H₂

Green Hydrogen | Funding Requirement

Pathway to National Hydrogen Mission Target ~US\$100 Bn in Investments (~ US\$ 70 Bn in Debt) required



Renewable Energy Installations
Required

\$ 63.5B



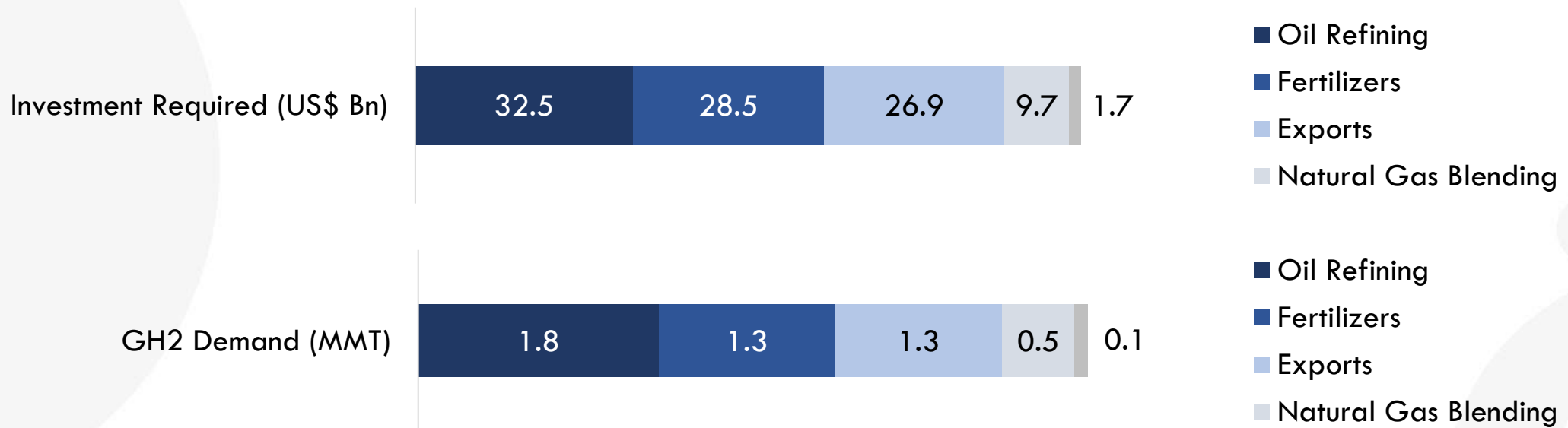
Electrolyser
Installations Required

\$ 27.1B



Ammonia storage and transportation
infrastructure Required

\$ 8.8B



GH₂ Financing | Challenges

- **Cost Parity vis-à-vis Grey H2:** cost of GH2 is about 2 time the cost of grey H2. In absence of price parity with grey H2, GH2 will be uncompetitive in the market without policy support.
- **Commercial Scale Projects are in Inception Stage:** Majority GH2 projects are small pilot scale. Limited history/experience of commercial scale projects in the world
- **Managing Multiple Projects:** GH2 projects are a bouquet of many interdependent projects, under separate management
 - RE Project
 - Transmission Project
 - Transportation & Storage Logistics
 - Electrolyser Manufacturing Project
- **Project Completion Risk:** Since multiple projects, and each element dependent on others, significant completion risk is anticipated
- **Limited Equipment Availability:** Currently, the **global commercial electrolyser manufacturing capacity is about 2-4 GW per annum**. To achieve GH2 goal India would require a cumulative electrolyser capacity of **20 GW by 2030**
- **Performance Risk :** Technology is in evolutionary phase; Lenders Risk mitigation could be through Performance Guarantee from technology/ equipment suppliers
- **Policy Challenges:** stable and continued policy support required

GH₂ Financing | Potential Mitigants

- **Forging Interdependencies between Stakeholders through:**

- Bringing different components under same management/control
- Multiple Project elements under single 'turnkey' LSTK contract
- Aligning ownership across various components
- Commercial risks optimally distributed to strong entities in the value chain

- **Offtake Arrangement:**

- Financially Strong Offtaker for initial phase till Price – Parity is achieved
- Tenor to cover deb repayment period
- 'Take or Pay' arrangement
- TRA Mechanism
- In Initial phase pricing based on 'assured return'

- **Completion Related Risks:**

- Selection of reliable technology/ equipment supplier
- LD/Performance Guarantee from EPC contractors

- **Operational Risks:**

- Assured supply of RE power and other feedstock
- Co-location production and/or in-situ consumption of GH₂
- Long term agreement with stable tariff/ price of power/ feedstock

- **Policy Related Risks:**

- Stable, Supportive policy regime
- Harmonisation of policies across the value chain
- Improving enforceability of commercial contracts

GH₂ Financing | Way Forward

- The initial set of hydrogen projects are expected to be funded primarily through the balance sheets of large, credit worthy players as witnessed in the case other emerging sectors viz Renewables.
- Given the higher risk perception at the initial stage, lenders are likely to demand various Sponsor comforts / guarantees; and higher pricing.
- As the infrastructure develops and the market become deeper and more liquid, non-recourse project financing will open up to many more projects.
- Project financing for hydrogen projects, is likely to become available, in stages, initially through:
 - Multilateral Financial Institutions;
 - Dedicated lines, Government Support/ funding
- Banks/ FIs gradually will fund after addressing the risks outlined earlier

THANK YOU