

Tata Cleantech Capital

Green Hydrogen

October 2023

Tata Cleantech Capital: Introduction

TATA CAPITAL
Count on us

First of its kind Private Sector Green Investment Bank

Business activities

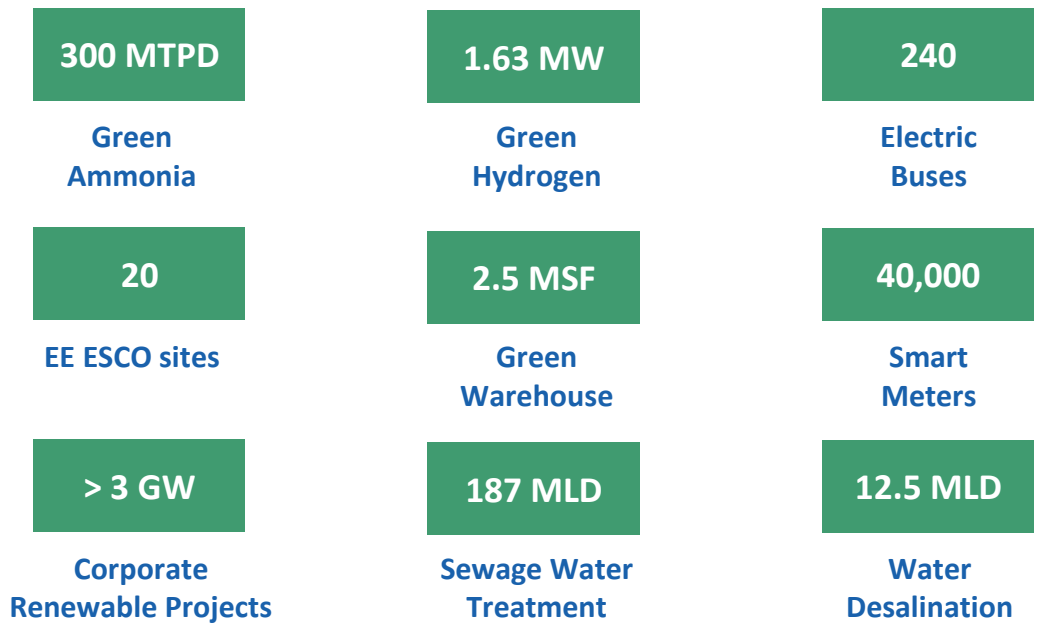
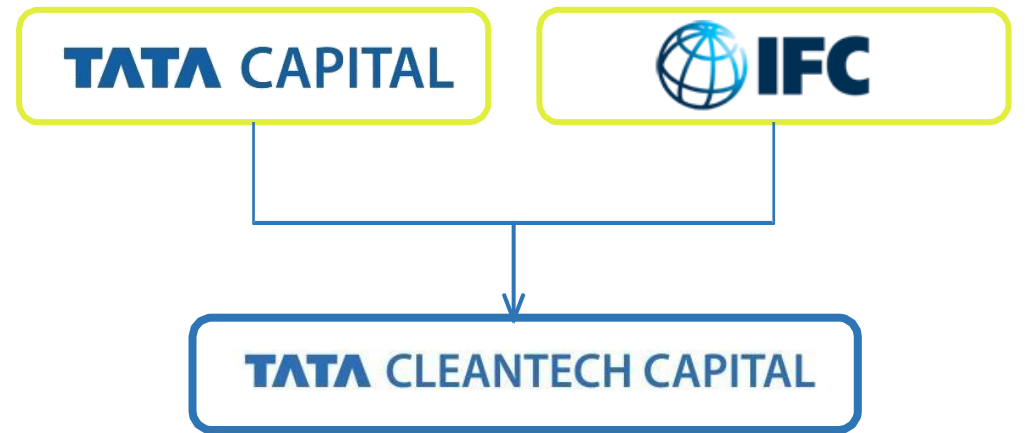
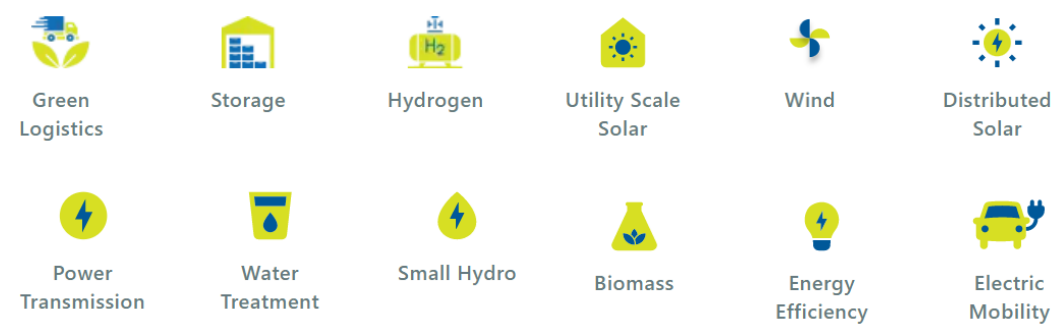


Key highlights

Leading climate transition in India since 2014

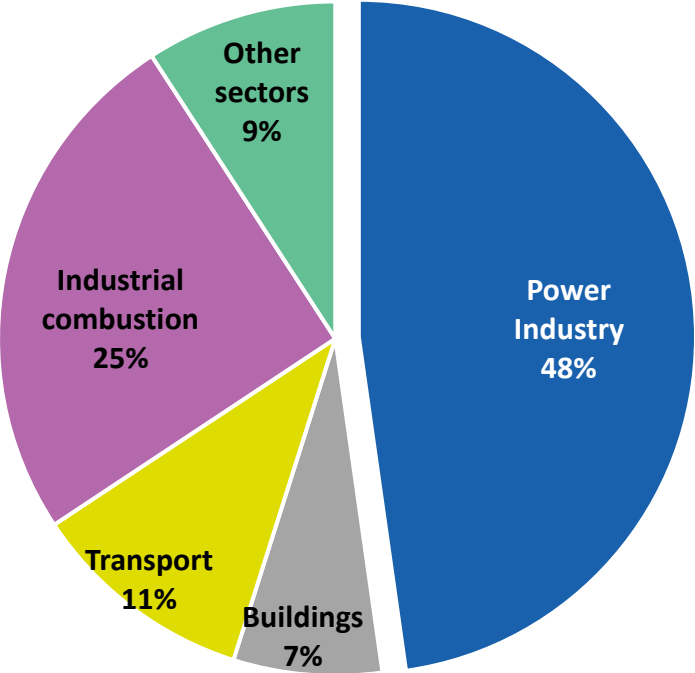


All figures as of Mar-23



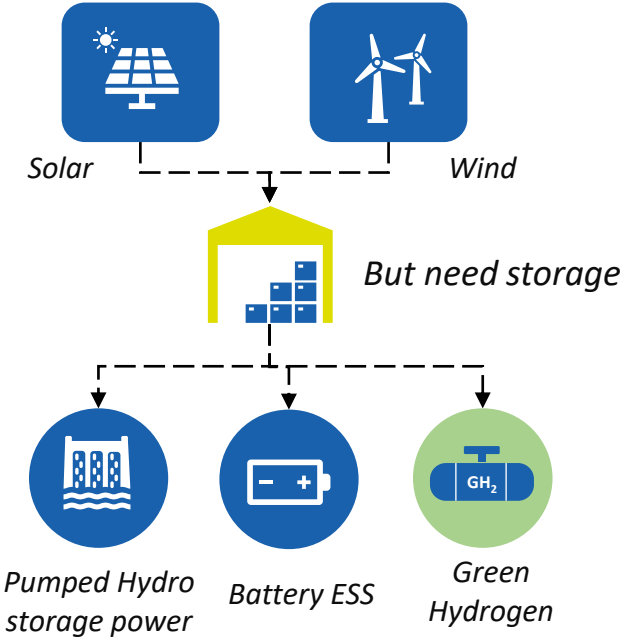
Decarbonization is need of the hour

Sectors contribution to India's emission



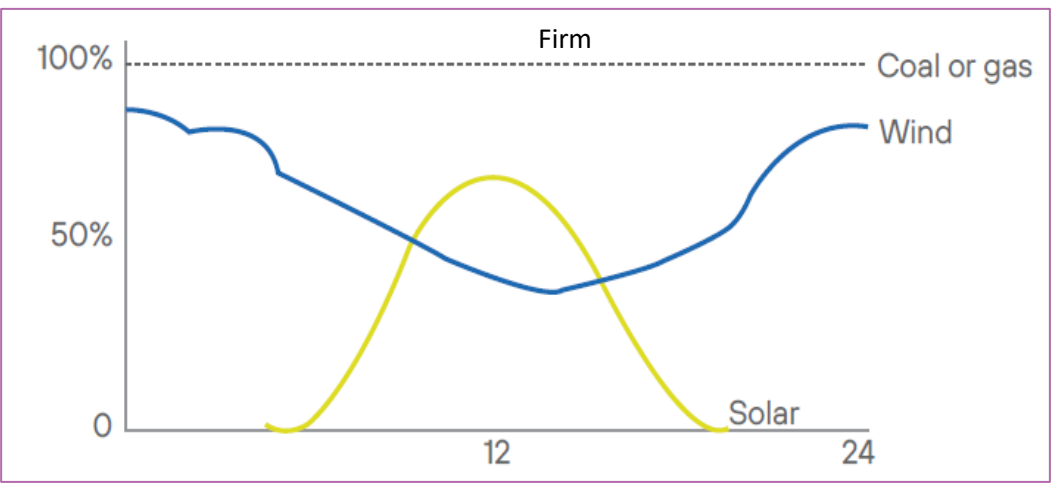
Source: Council on Energy, Environment and Water

RE power to decarbonise fossil-based generation



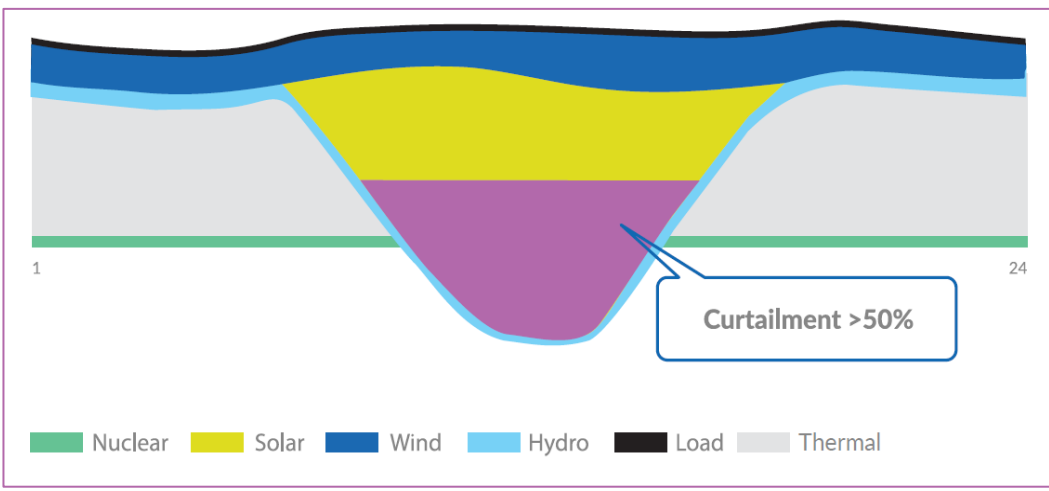
Decarbonization of power requires solution to integrate the carbon free infirm power

Solar and wind power are infirm



Source: TCCL research

Projected load curve and possible curtailment by 2030



Source: SECI estimates for 450 GW renewable without Energy Storage System

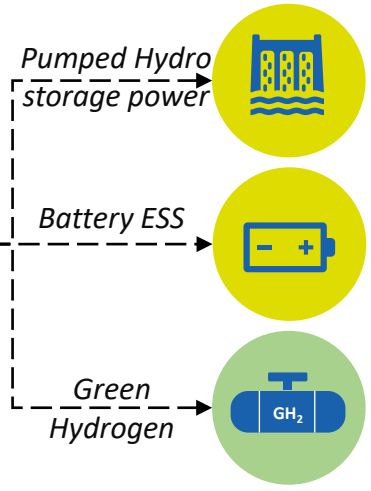
CEA estimates by 2030

435 GW

Solar & Wind capacity

60 GW

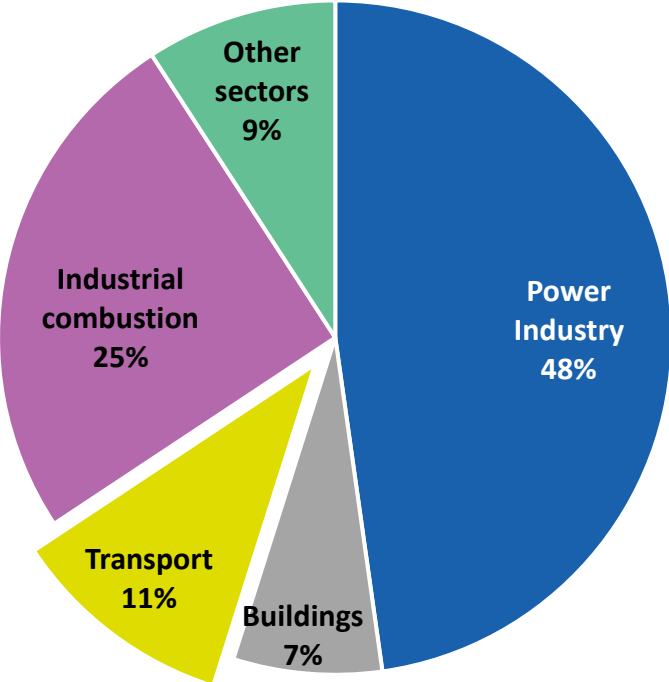
Storage capacity



- Limited potential of Pumped storage hydropower
- Dependence on imports for battery raw materials
- Rely for long term storage needs

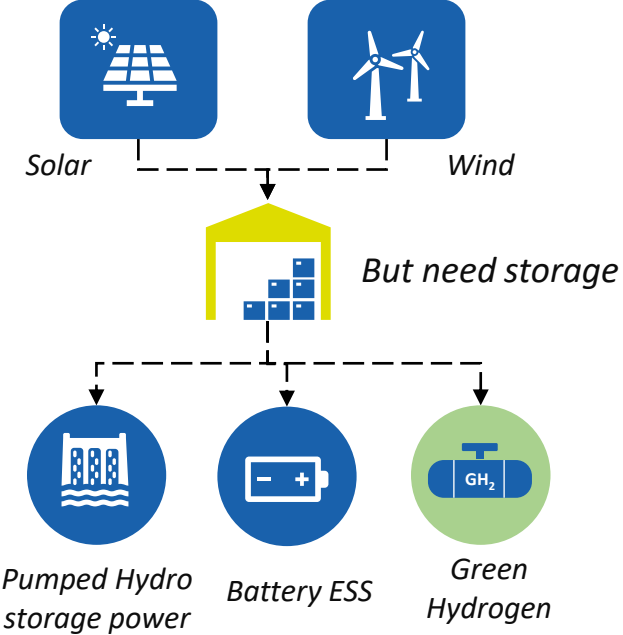
Decarbonization is need of the hour

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RE power to decarbonise fossil-based generation



Need green transportation and logistics based out of electricity and fuel cells



Battery EV



Fuel cell car



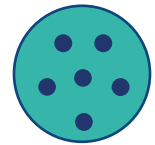
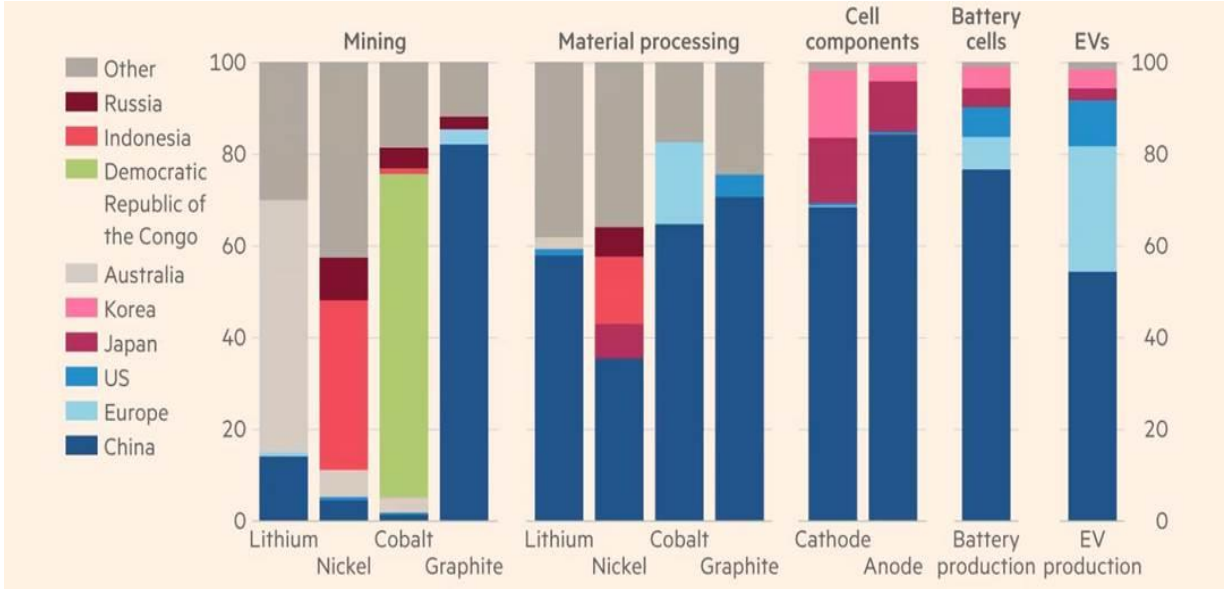
Battery provides a short-term decarbonization solution for transport

Electrification of vehicles has its own challenges

1. Dependency on Imports for battery components

2. Charging challenges & range anxiety

Facilities and raw materials are based out of India



Capacity fade due to fast charging



Overcharging & deep discharges

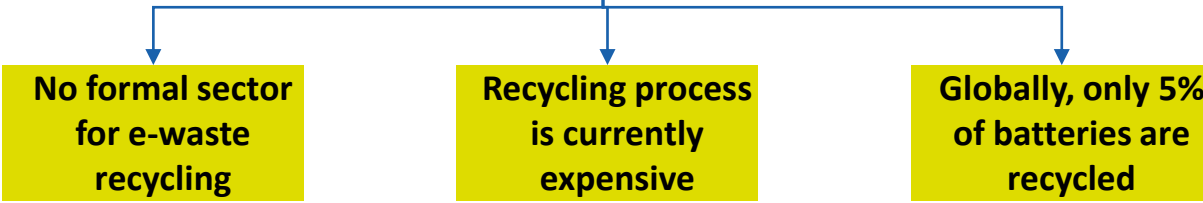


True range vs claimed range



Charging facilities during long route

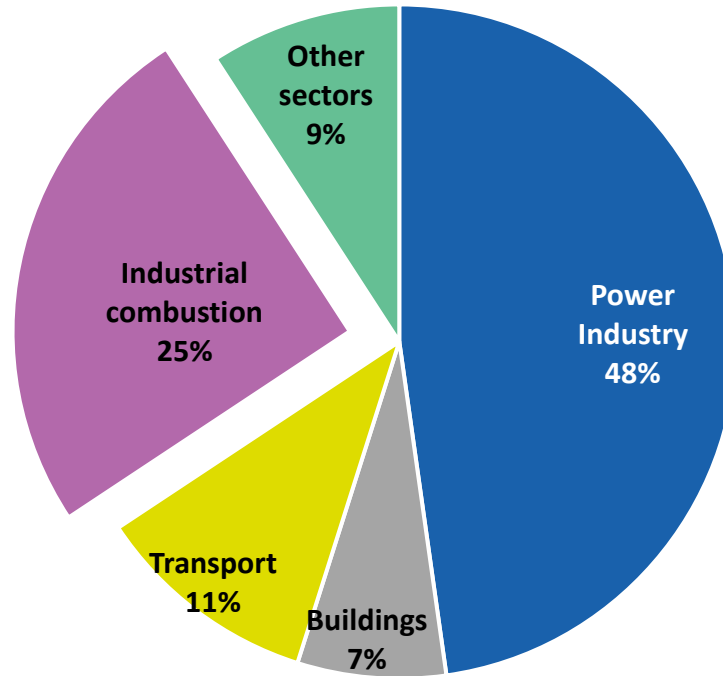
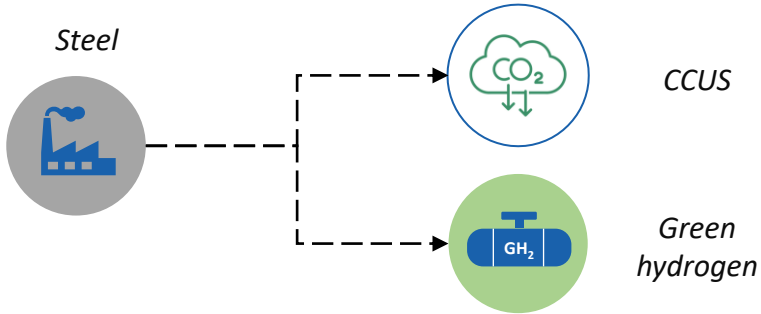
3. Need E-waste management



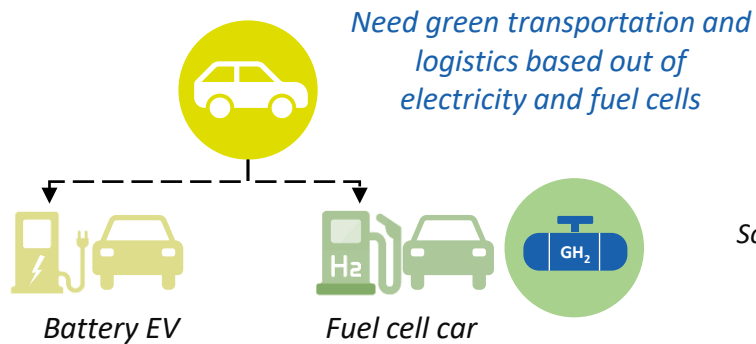
Source: IEA

Decarbonization is need of the hour

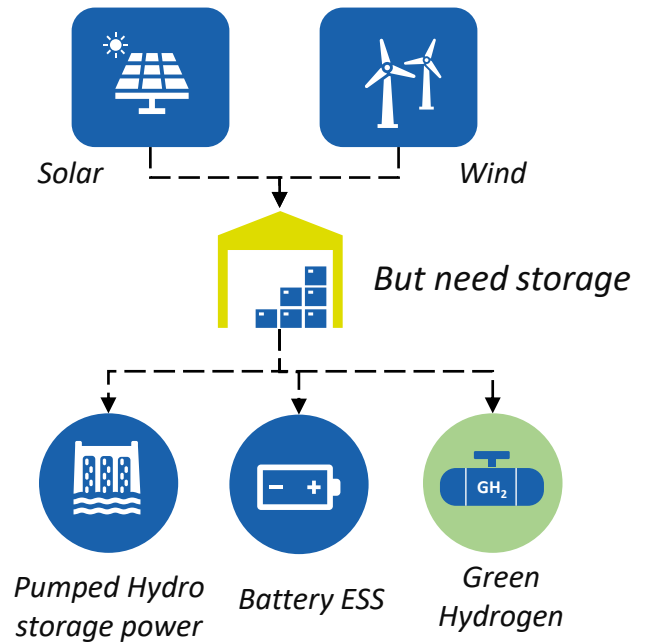
Sectors contribution to India's emission



Source: Council on Energy, Environment and Water

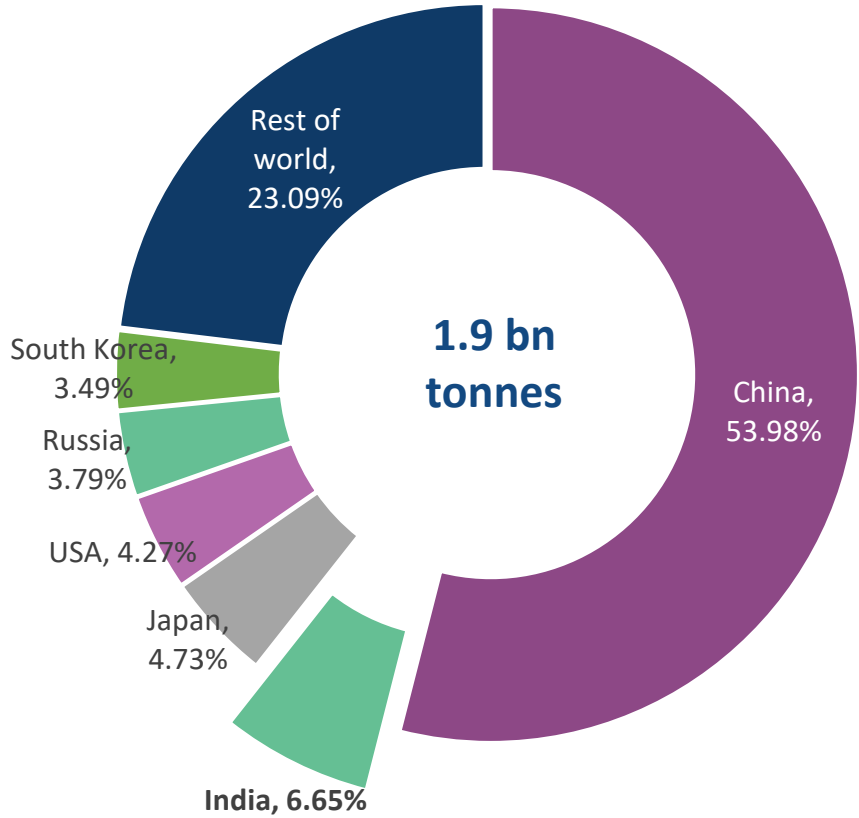


RE power to decarbonise fossil-based generation

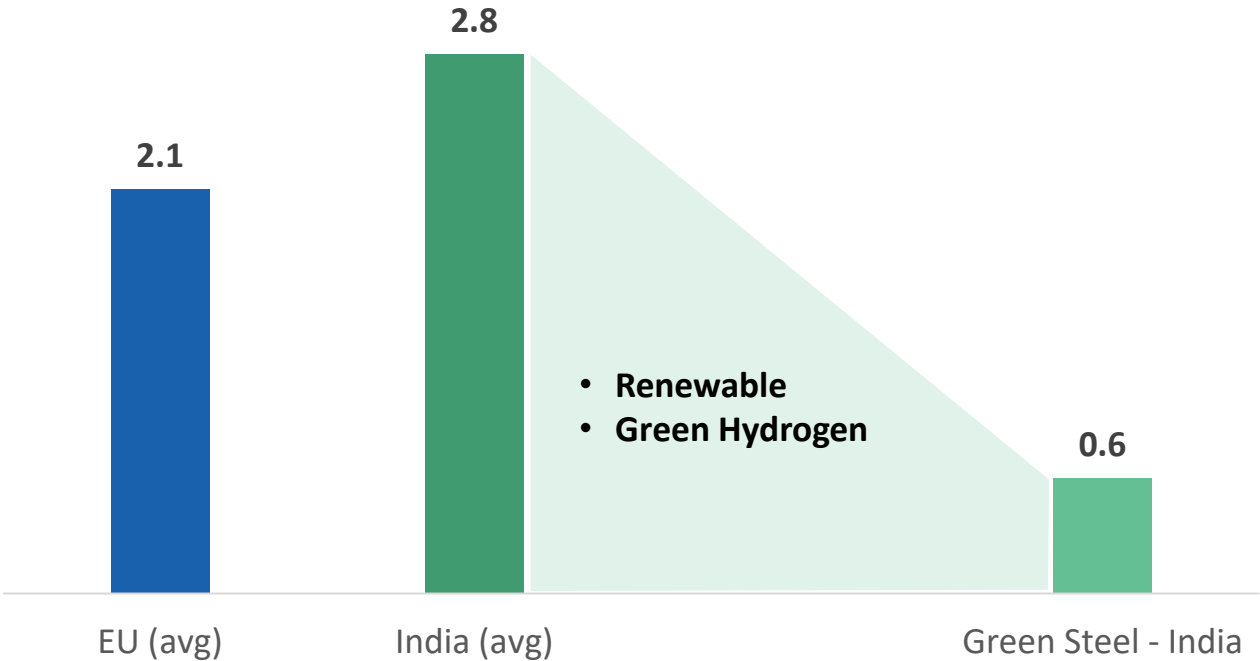


Usage of renewable power and green hydrogen is the key for steel going forward

Global production of steel, 2022



Emission in tCO2/tonnes of crude steel

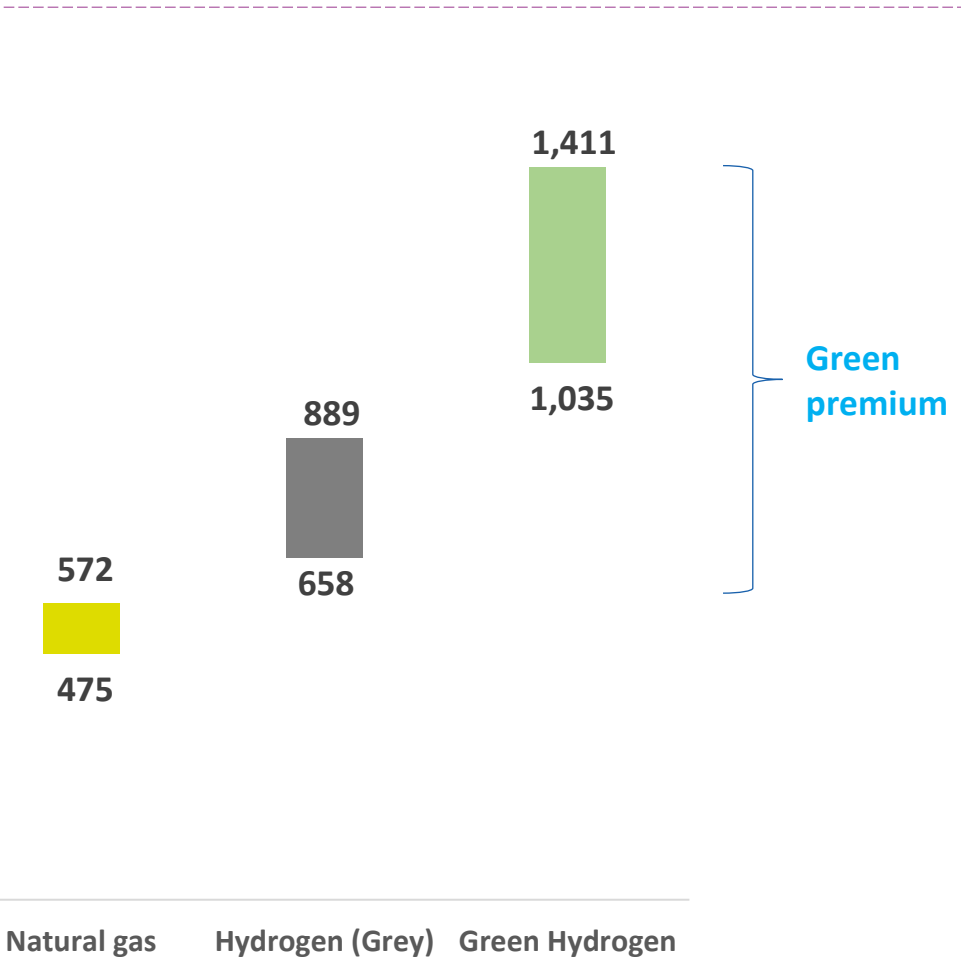


- More coal based & integrated production
- Higher mix of thermal power in Grid electricity

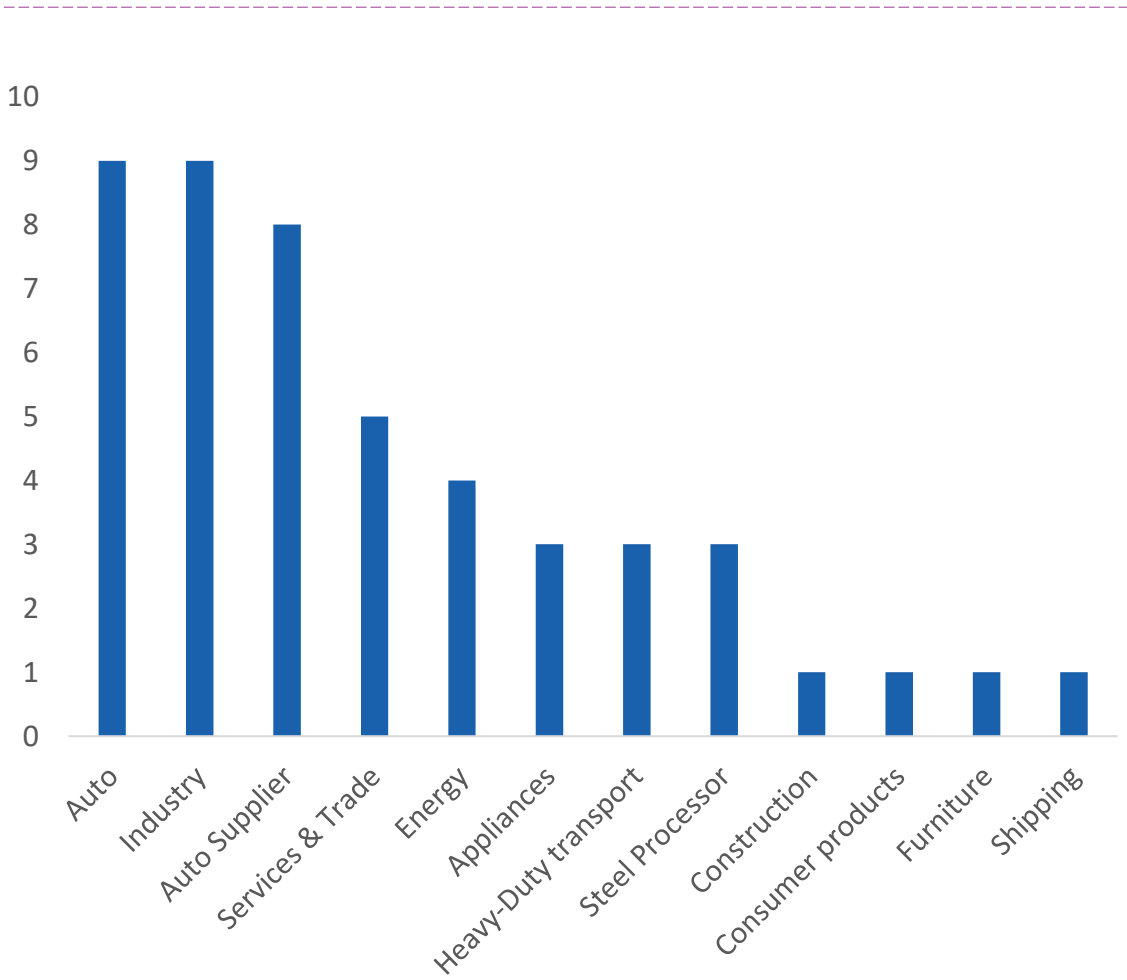
Source: BloombergNEF, Industry reports, TCCL research

Commercialization of green steel will be based on reduction of green premium

Levelized cost of steel, 2021 (\$/tonne)



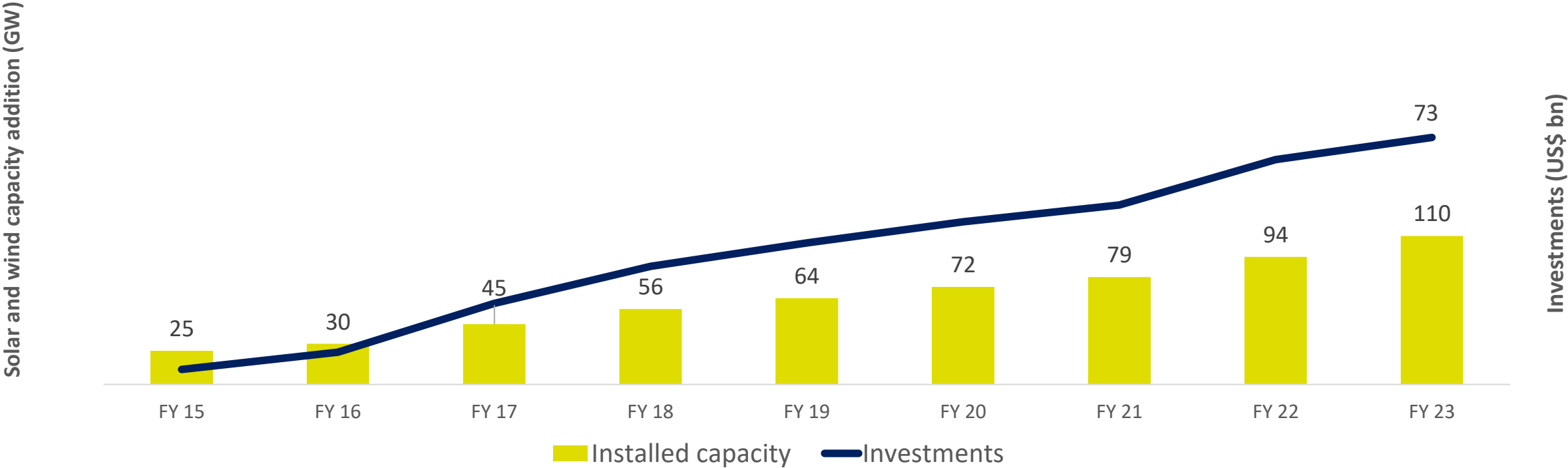
Number of Green steel supply agreement signed so far



Source: BNEF, Industry reports, TCCL research

History suggests that capital flow would not be a constraint if bankable business model is developed

Investments in last 8 years in Renewables (US\$ bn)



Source: CEA, MNRE and TCCL Research

Investment required in Green Hydrogen is estimated to be between US\$ 70 – 80 bn to meet government target by 2030

But the market needs orderly growth of Renewable energy

Power requirement for 5 MMT Green Hydrogen

~250 Billion Units

Equivalent to share of India's power demand in FY'23

~16.7%

Share of solar and wind generation in India in FY'23

~11.5%

Sufficient Solar and wind capacity addition to meet the increasing hydrogen demand

To scale up green hydrogen, learnings from solar & wind sector should be applied

Ensure bankability and avoid contract renegeing

Payment security mechanism



1

2

Practical bidding methodology



Avoid project postponements



Policy consistency

4

3



Manufacturing ecosystem

From electrolyser manufacturing to hydrogen storage and distribution

- Purchase obligation
- Contract for Difference
- Adequate Production Linked Incentive

Thank You