The Potential Role of Hydrogen in India – ‘Harnessing the Hype’

TERI Report Launch Event

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A pathway for scaling-up low carbon hydrogen across the economy

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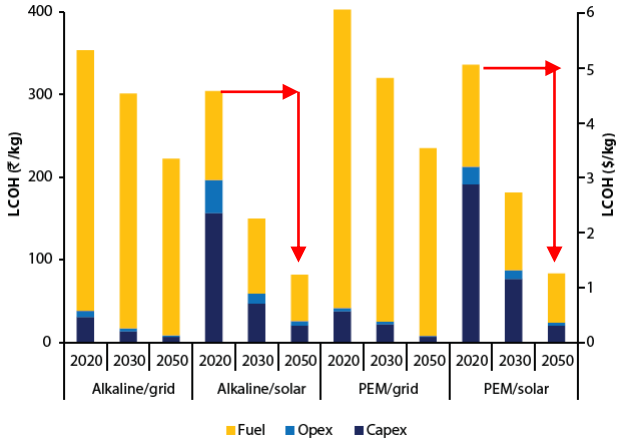
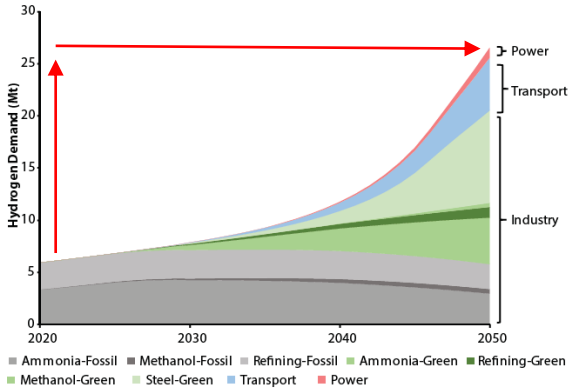
Key Message 1: A Virtuous Circle For Hydrogen Technology Is Emerging

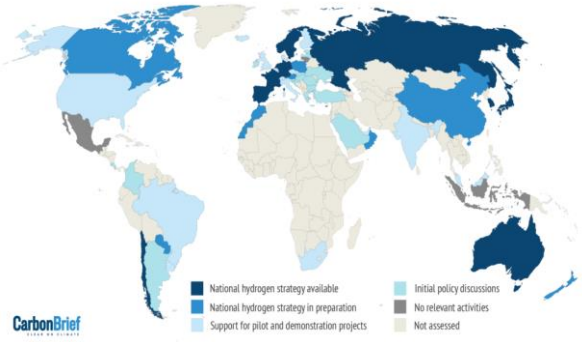
Falling Costs



Increasing Demand



Strengthening Policy



Key Message 2: Demand Can Grow Fivefold by 2050, But Supportive Policy Is Still Required to Derive The Full Benefits

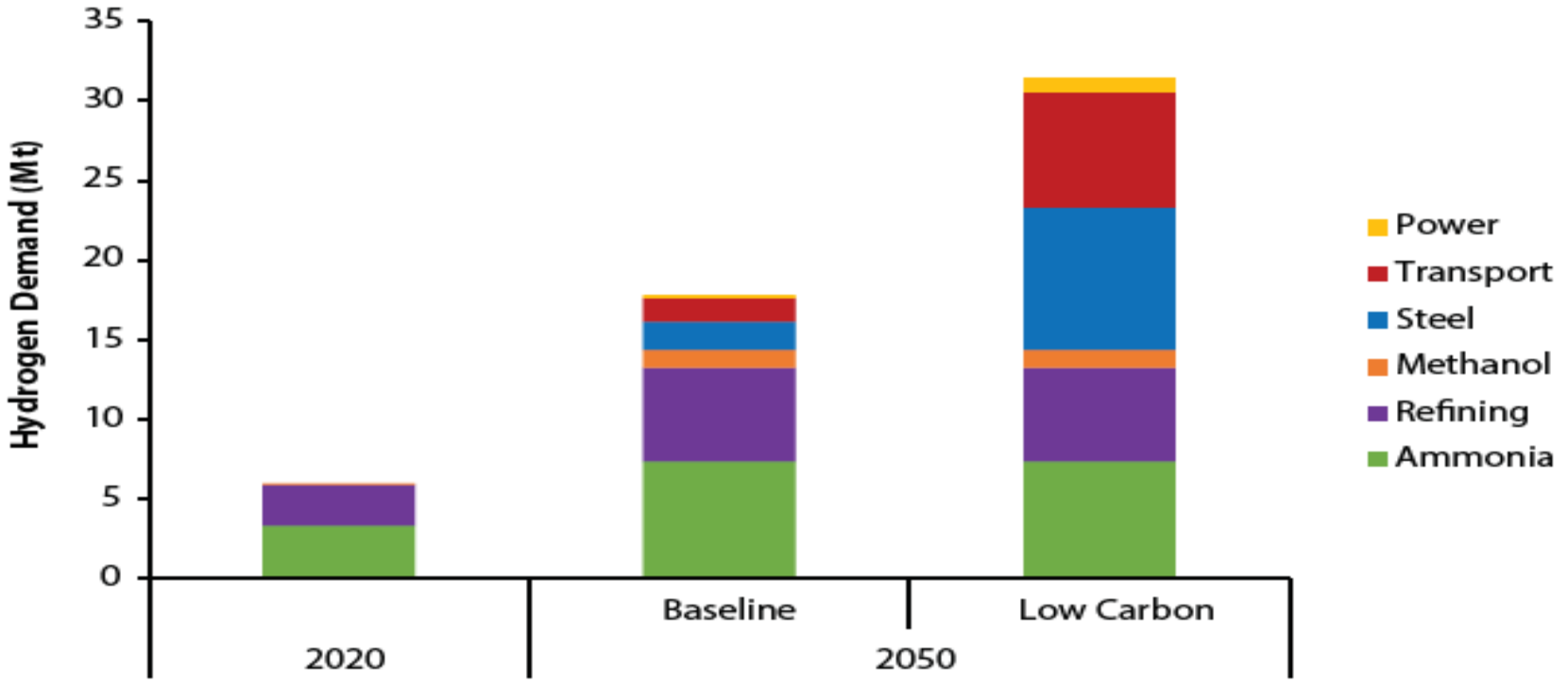
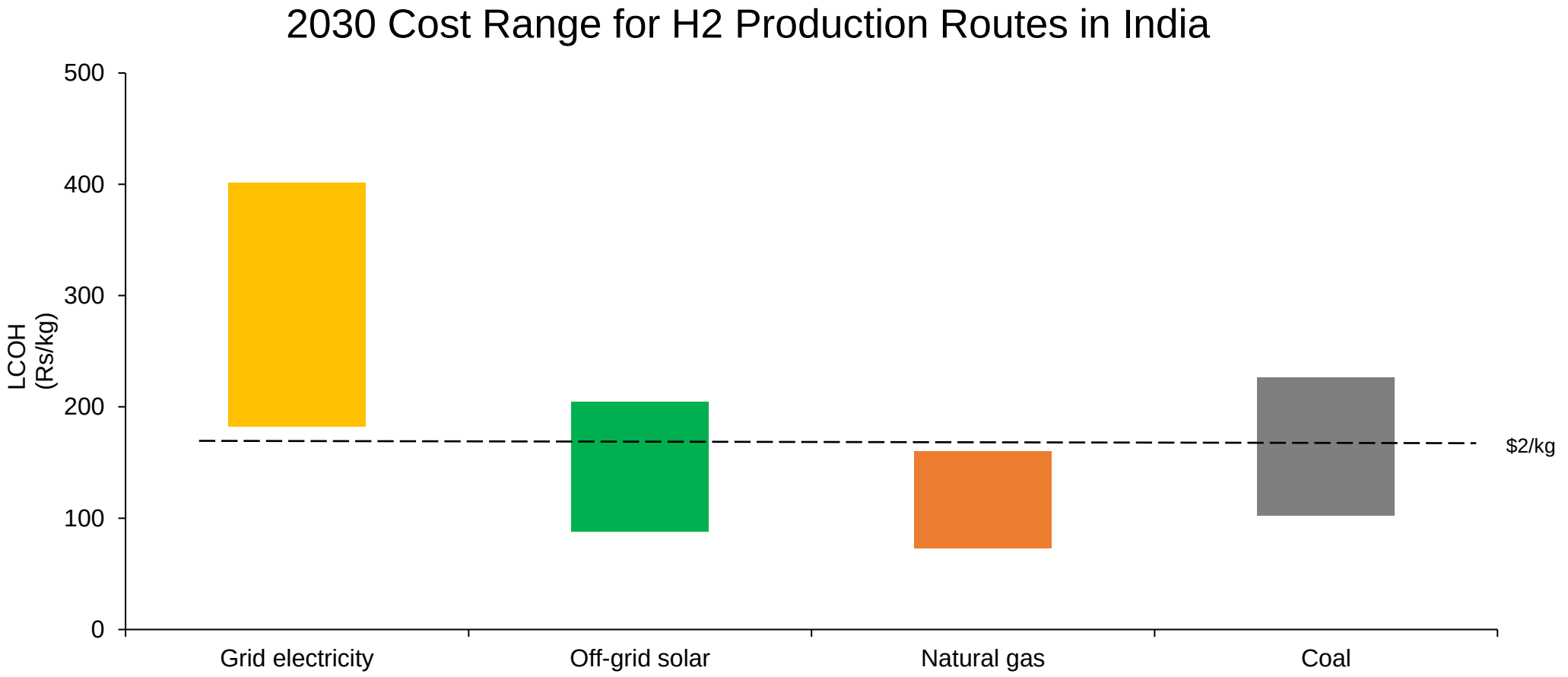


Figure 4: Baseline and Low Carbon scenarios, 2020 and 2050

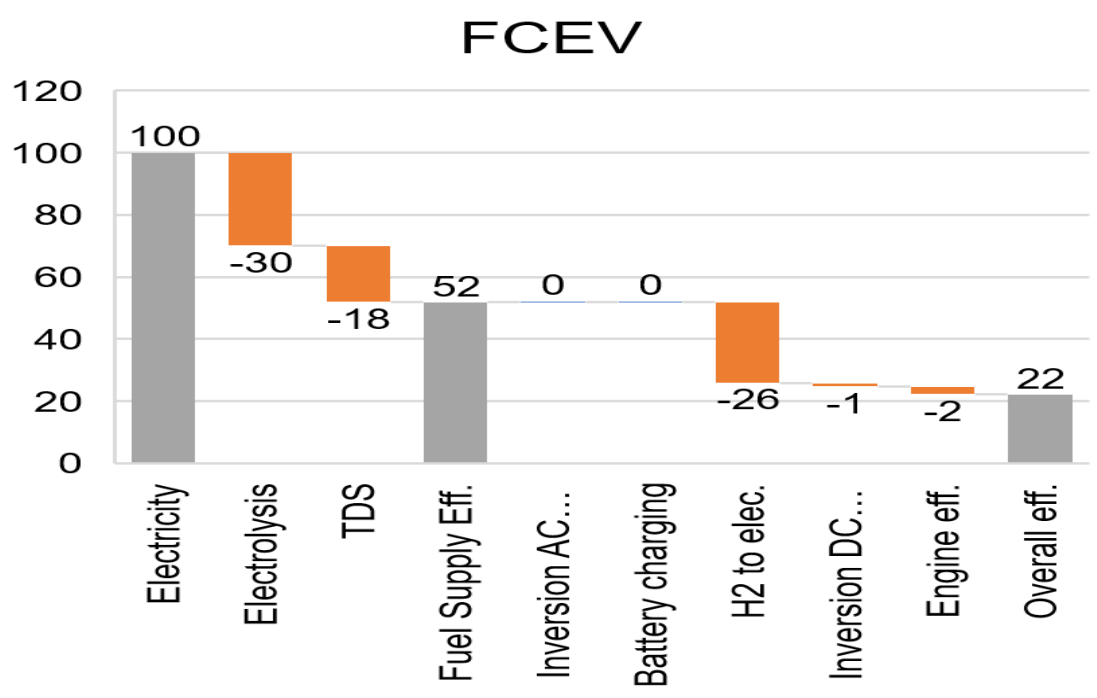
Source: TERI analysis

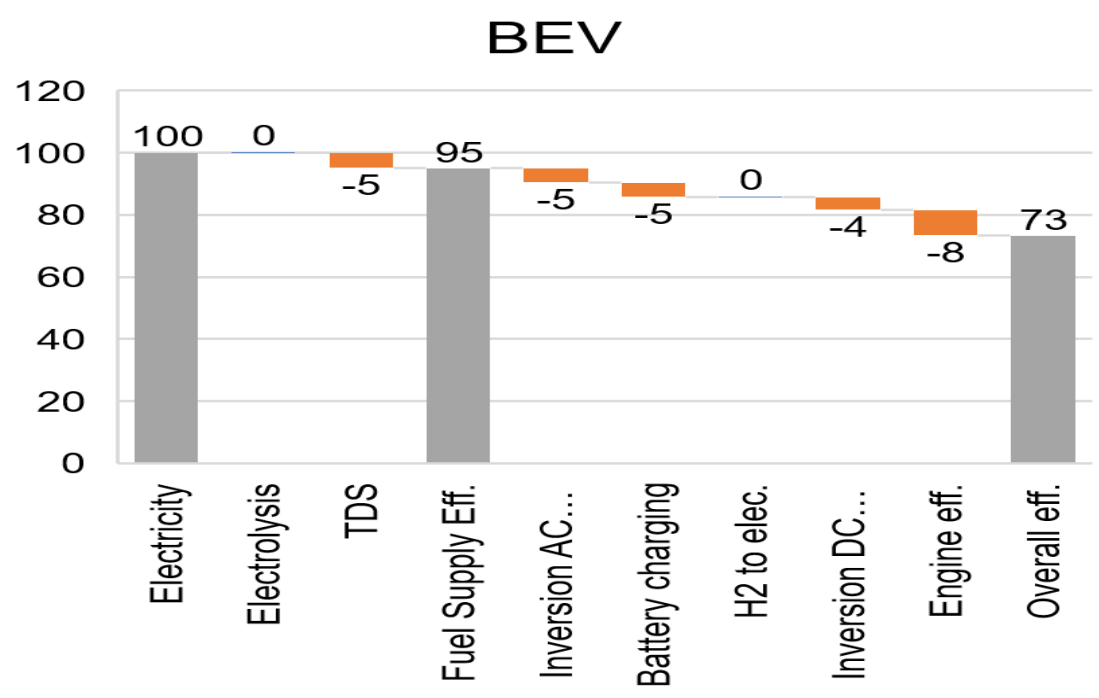
Note: Demand projections exclude potential use of hydrogen in shipping, aviation, and petrochemicals, which are not covered in this report.

Key Message 3: By 2030, Costs of "Green Hydrogen" From Renewables Will Fall More Than 50% and Will Start to Compete With Hydrogen From Fossil Fuels



Key Message 4: Hydrogen Is Not Always the Most Efficient Option, And Its Use Should Be Reserved For Cases Where No Alternatives Exist



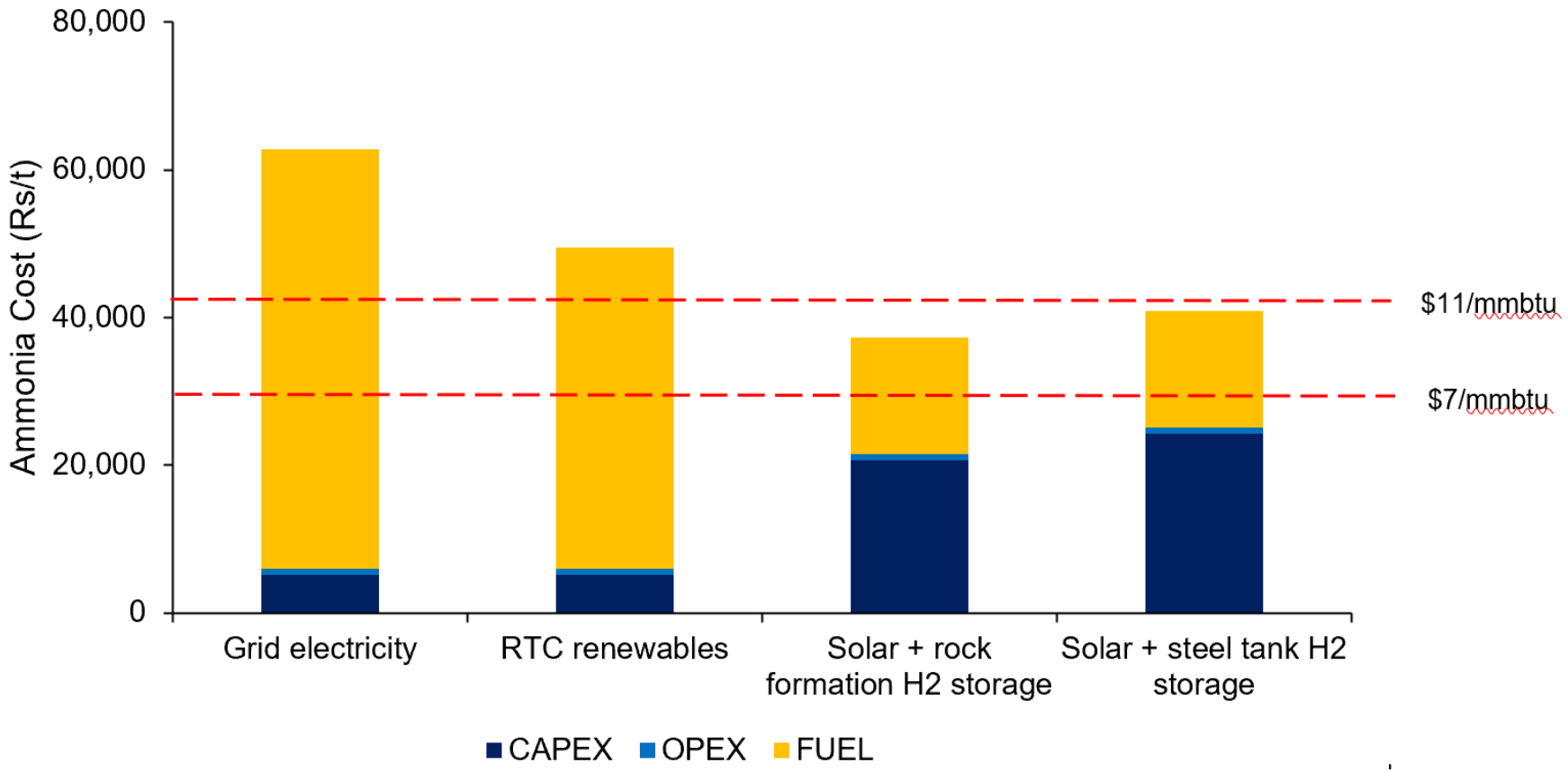


Total conversion efficiency

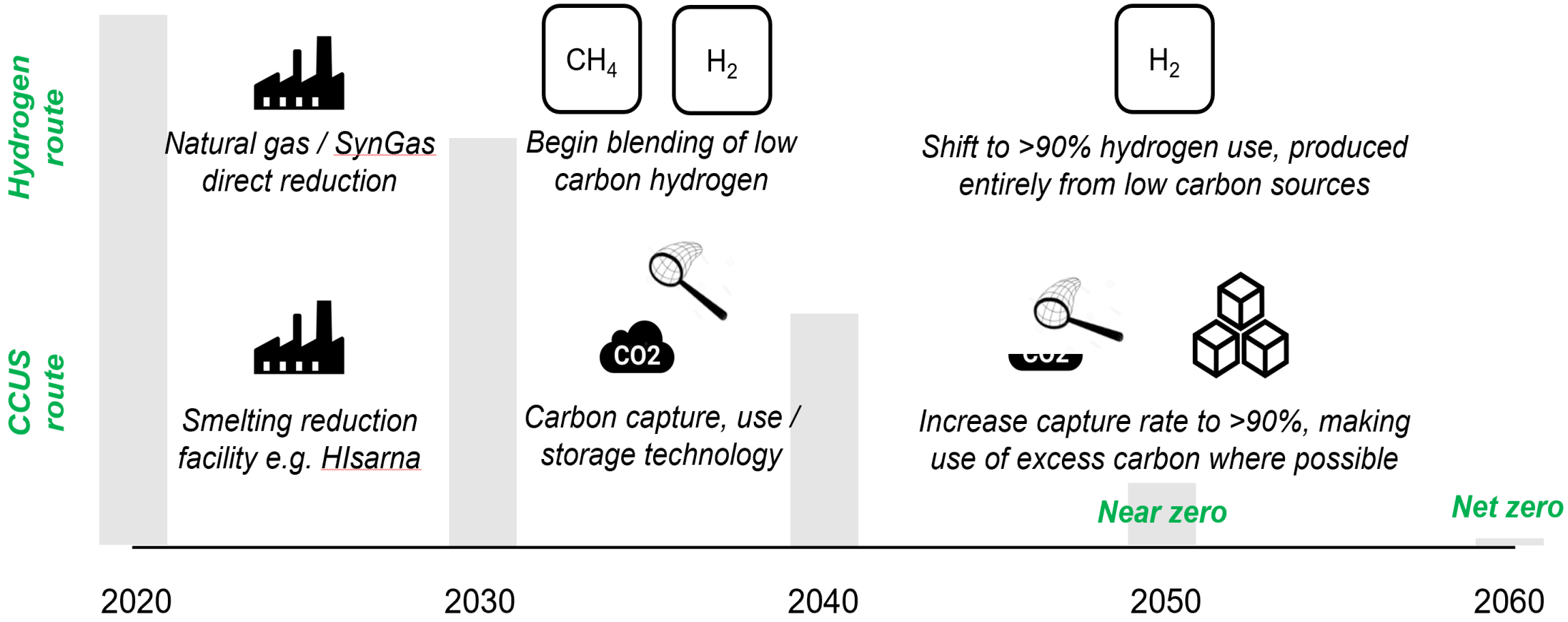
22%

73%

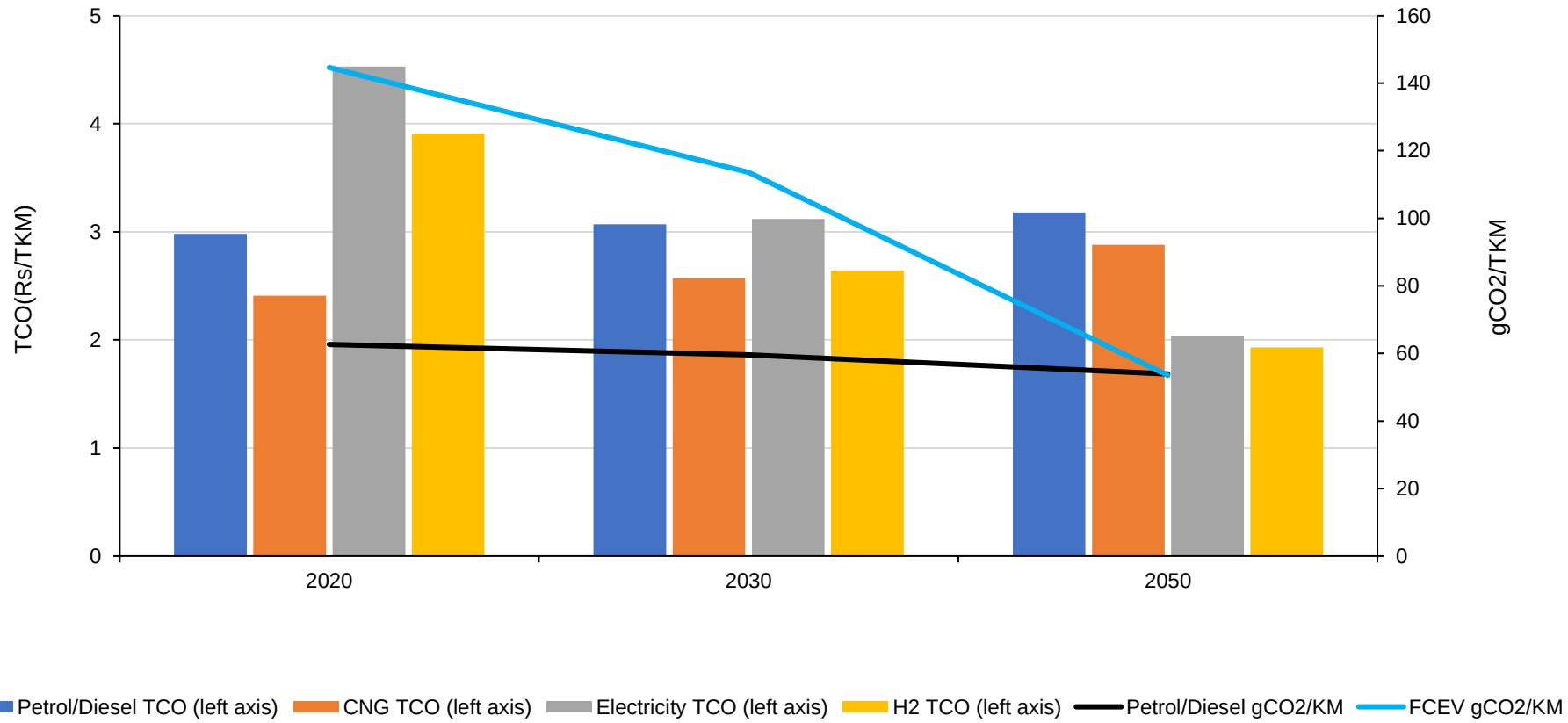
Key Message 5: In Industry, Hydrogen Can Start to Compete With Fossil Fuels In Certain Applications Already by 2030



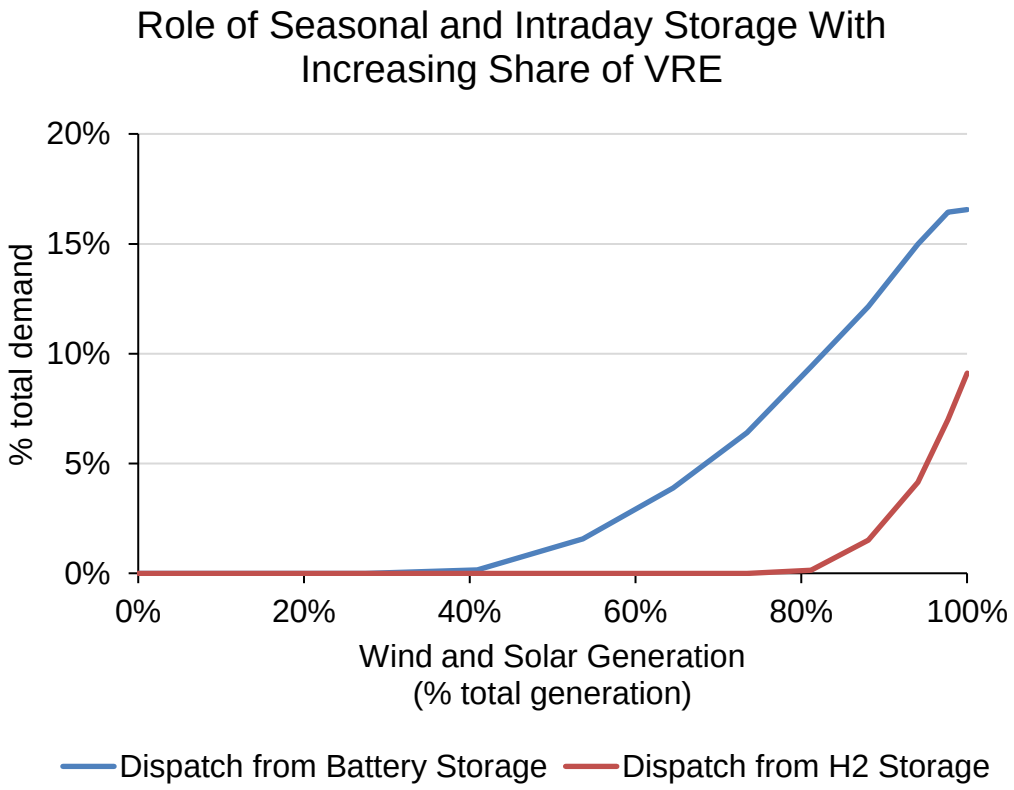
Key Message 5.1: In Industry, Hydrogen Can Be Part of a Cost-Competitive, Step-Wise Route to Decarbonization by 2060

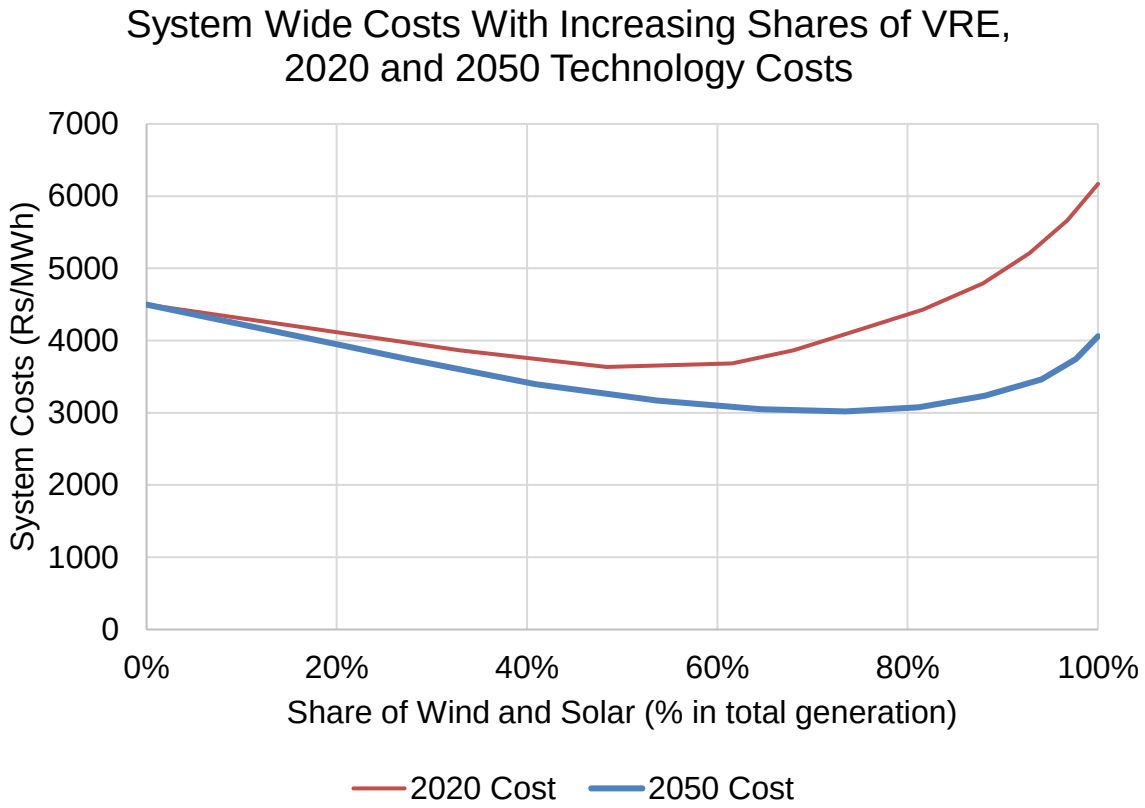


Key Message 6: In Transport, Even In Heavy Duty Segments, BEV Vehicles Will Become Very Competitive, Reducing the Use of H2 To Very Long Distance Transport



Key Message 7: In Power, H2 Could Provide An Important Source of Seasonal Storage, But Is Expensive and Only Required in High RE Systems





Key Message 8: Green Hydrogen Production Could Require Around 1000 TWh of Green Electricity by 2050, Placing Further Pressure on Power System Decarbonization

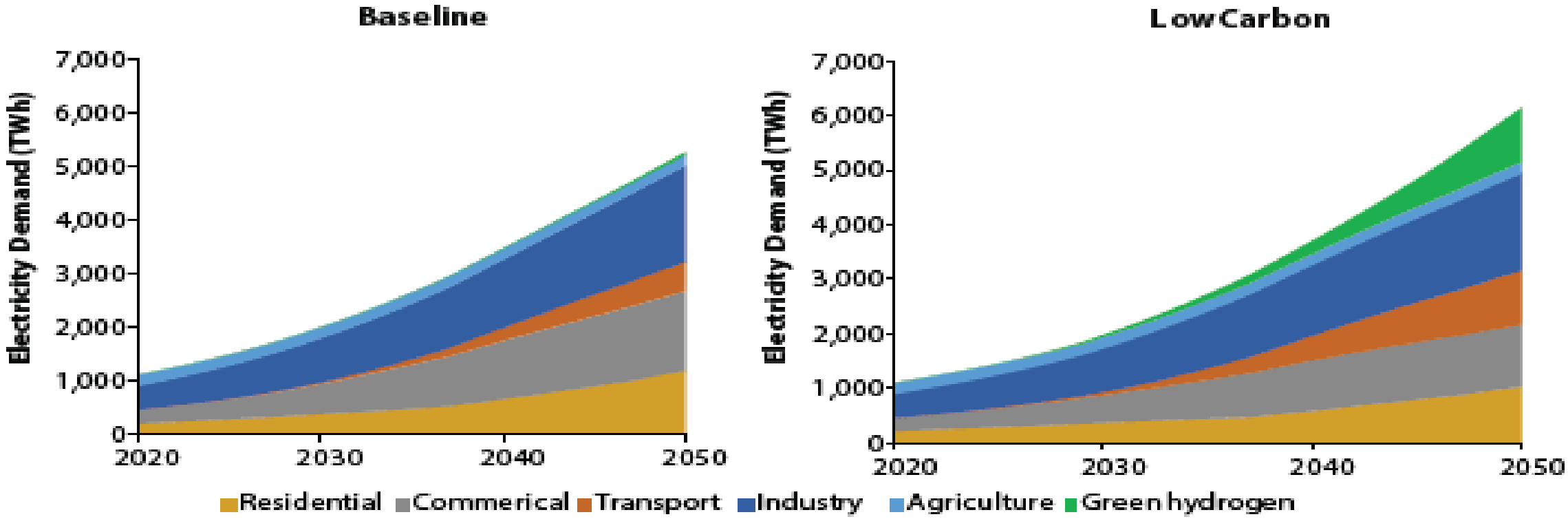


Figure 50: Annual electricity demand by major end-use sector, Baseline and Low-Carbon Scenarios

Source: TERI analysis

Key Message 9: Constant H2 Supply to Industry is Possible and Cost-Effective with VRE, But Open Access RE, Curtailment and H2 Storage Characterise the Optimal System

Costs of H2 in a typical Gujarat cluster

Item	Unit	2020	2030	2050
Optimal PV	MW	41	72	86
Optimal Wind	MW	84	41	17
Optimal Electrolyser	MW	42	53	62
Optimal Battery	MWh	0	0	0
Optimal H2 Store	MWh	414	699	6062
Solar Curtailment	%	26%	22%	11%
Wind Curtailment	%	17%	6%	2%
Grid Consumption	%	14%	6%	0%
Levelised Cost, Scenario 1	Rs/kg	288	152	93
	$/kg	3.89	2.06	1.26
Levelised Cost, Scenario 2*	Rs/kg	260	132	81
	$/kg	3.52	1.78	1.10

Key Take Aways

1. The hype is real – by 2030, low-cost green hydrogen will be competitive.

2. Hydrogen is not a panacea for the energy system.

3. To capture the full benefits, policy is required:
    1. R&D.
    2. Demonstration and commercialization in key sectors.
    3. Infrastructure and incentives.
    4. Optimise the deployment of H2 from a system-wise perspective.
    5. International partnerships and funding.

THANK YOU