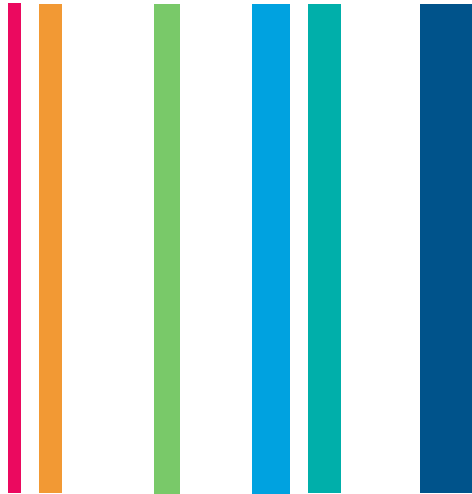


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Industrial Decarbonization: The Next Challenge

Rathin Kukreja

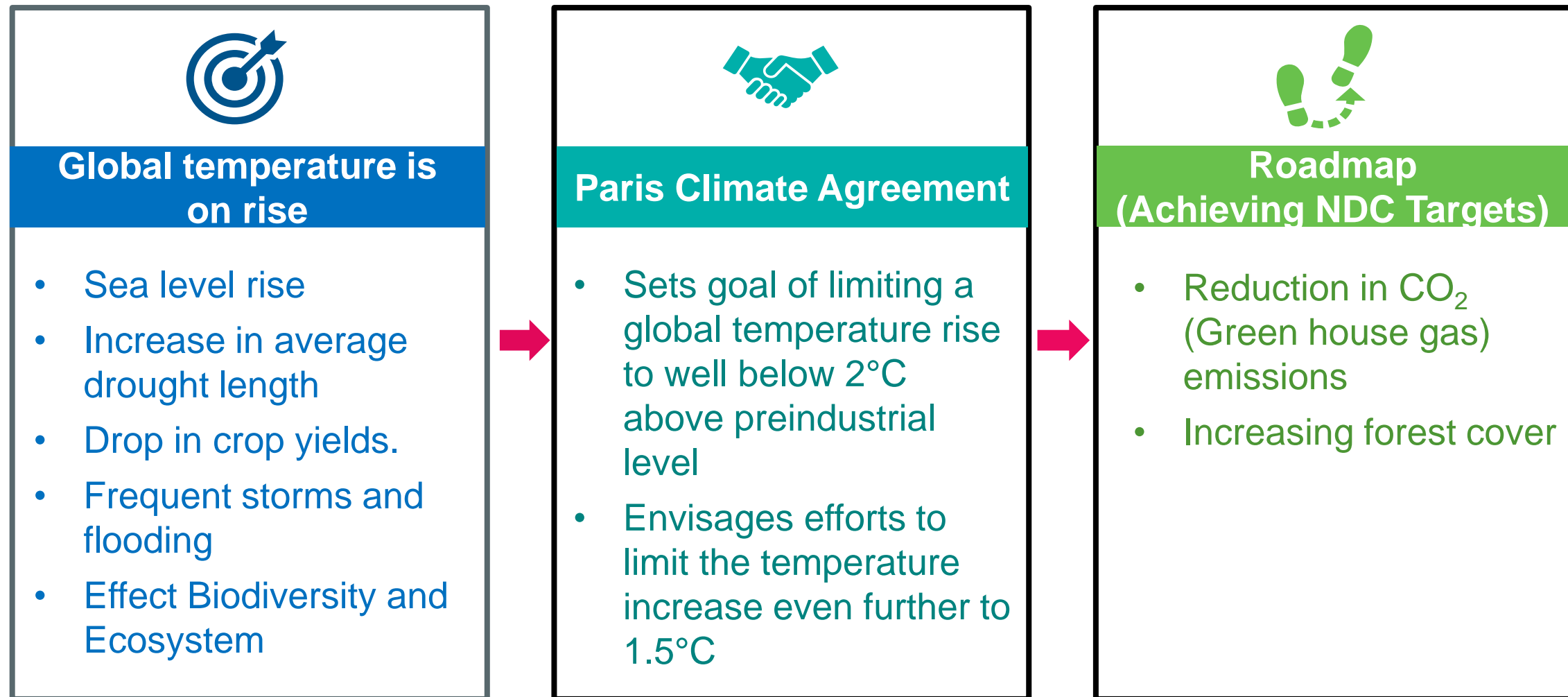
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What we will discuss

- **Need for Decarbonization**
- **Why Industrial Decarbonization**
- **Industrial Decarbonization - Why a Challenge**
- **Industrial Decarbonization-India Scenario**
- **Hard to Abate Sectors**
- **SWOT of Indian Industrial Sector vis-à-vis decarbonization**
- **Technology Options**
- **Technology Readiness Levels**
- **Way forward-Decarbonizing India's Industrial Sector**

Decarbonization and it's need

Decarbonization is elimination of carbon dioxide from Energy sources i.e. net zero emissions

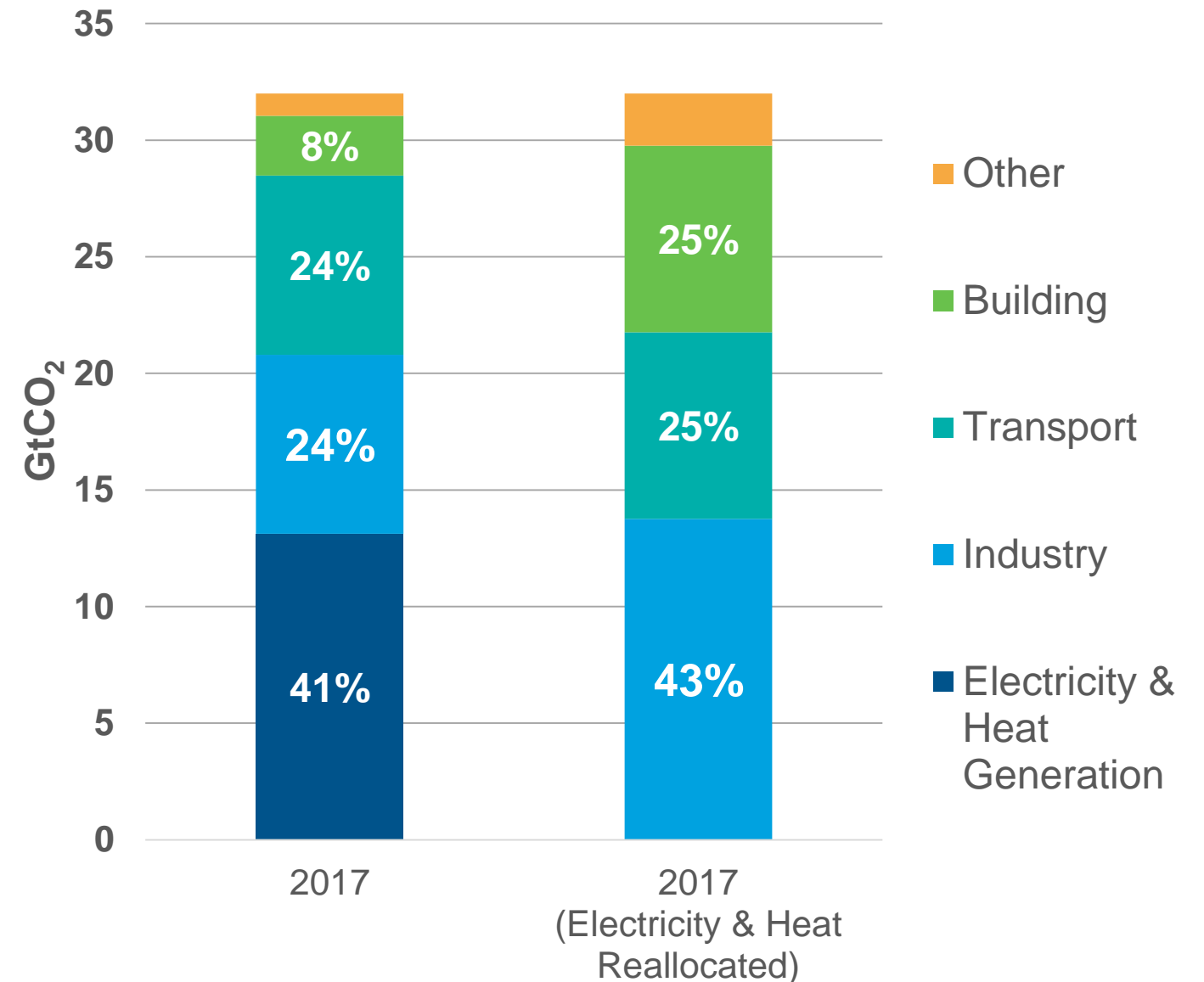


The main benefiter from decarbonization is human health

Why industrial decarbonization

- ❑ The industry accounts for about quarter of the total GHG emissions with CO₂ comprising of more than 90 percent of direct GHG emissions.
- ❑ Transport, Power and Buildings sector have already seen breakthrough in technology innovations and upscaling their adoption to make them cost-effective. This has not been the case for industrial sector due to various challenges.

Global CO₂ Emissions by Sector, 2017*



Industrial decarbonization – Why a challenge

Industry processes need temperatures of 500 °C and above. Such high process heat is difficult generated by renewable energy



Industrial processes are highly integrated, making changes can be very complicated.



CO₂ emissions from feedstock requires process level changes, they cannot be simply eliminated by fuel change.



Existing facilities will require costly rebuilds or retrofits, as they are built for a lifetime of 30 years or more.



Industrial decarbonization – India Scenario

India is third largest emitter of Greenhouse Gases after China and USA

- ❑ India's Industrial sector is second most emission intensive sector next to power.
- ❑ Decarbonization of industrial sector will therefore play a pivotal role in achieving the NDC targets.
- ❑ By 2050, nearly one-third of CO₂ emissions will be from Industrial sector under the Business As Usual (BAU) scenario

Electricity is the key sector for industrial decarbonization

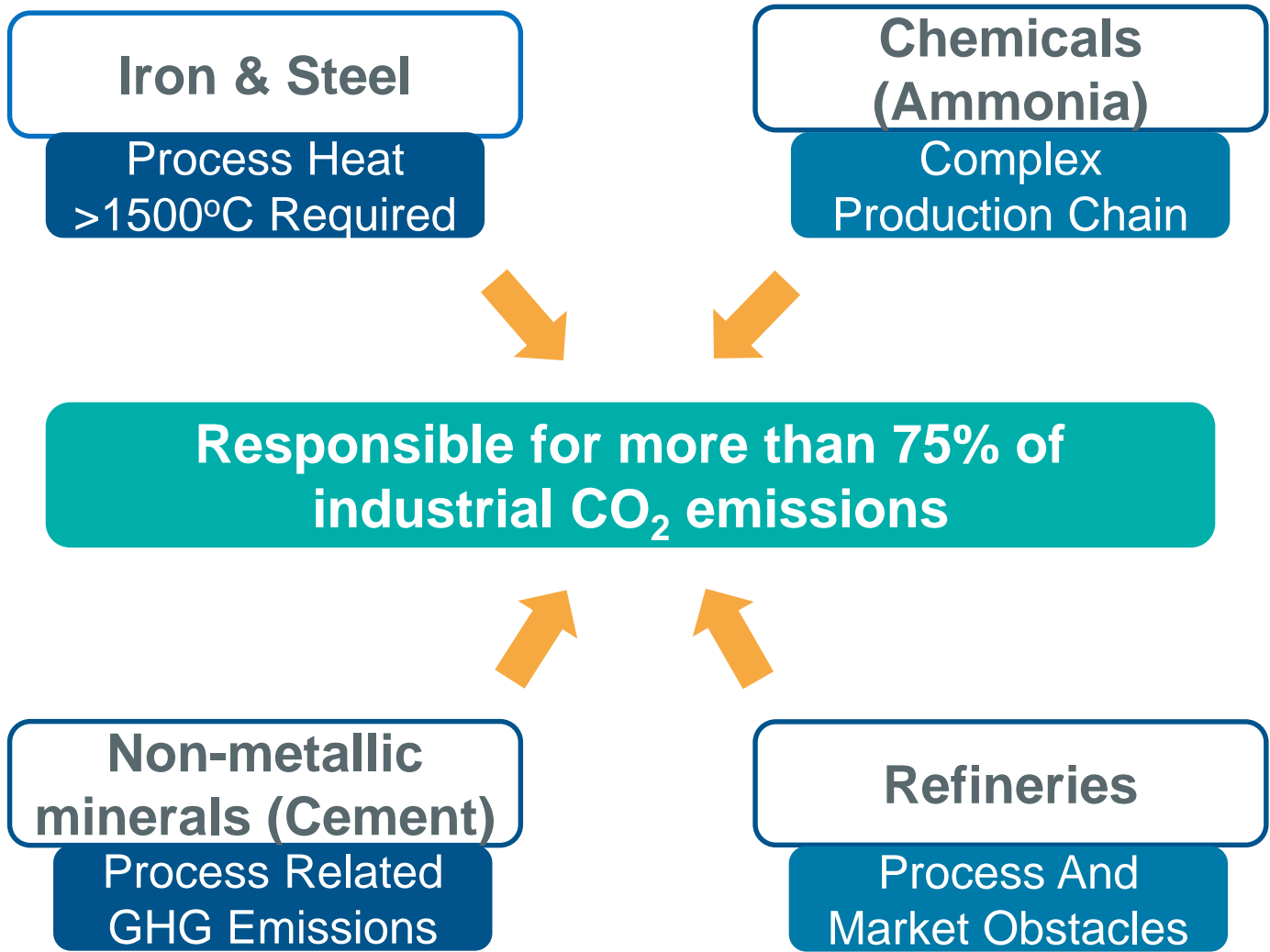
If India's emissions are to peak in 2030 and temperature increase to be limited to 2°C, then:

54%

will be the share of electricity in the energy mix for industrial sector by 2050, as compared to 29 per cent in the BAU scenario*

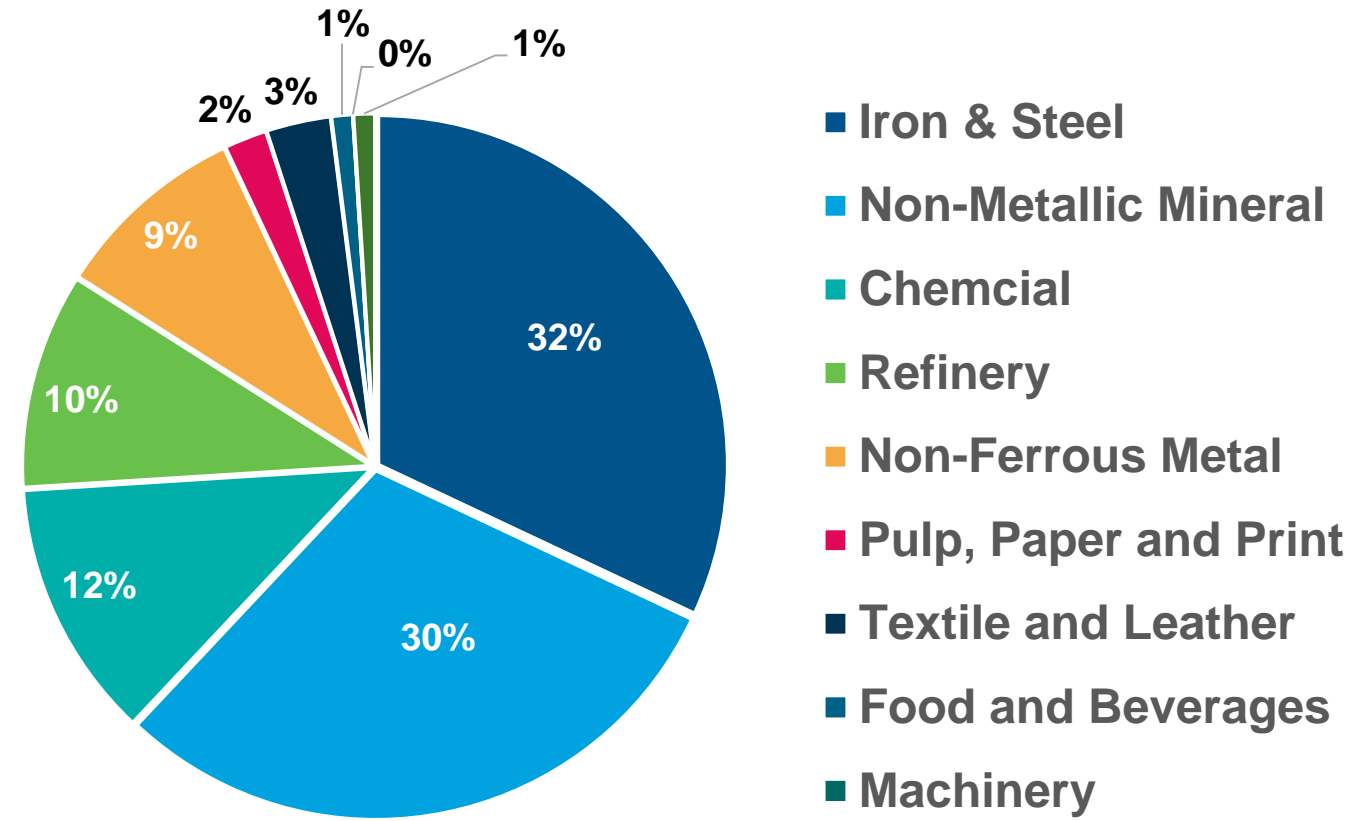
Industrial decarbonization – Hard to abate sectors

Sectors with high share of emissions from feedstocks and high-temperature heat



Decarbonization potential for India
635 Million* Tons of Co2 equivalent

India Industrial Emissions by Sector, 2015*



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* Source: GHG Platform India

SWOT of Indian Industrial Sector vis-à-vis decarbonization

Strengths

- * Presence in private and public sector
- * Abundant and low-cost labour
- * Domestic demand for industrial products

Weaknesses

- * No clear road map and policies
- * Weak R&D setup
- * Lack of technical know how

Opportunities

- * Huge decarbonization potential
- * Global Collaboration
- * Reap benefits of cost-effective technologies

Threats

- * Large unorganized sector
- * Rising fuel and raw material cost
- * Aging infrastructure

Decarbonization of industries – Technology options



Energy Efficiency (EE)



Renewable Energy



Circular Economy
& Demand Side
Management



Biomass as
Fuel/Feedstock



Hydrogen as
fuel/feedstock

CO₂

Carbon Capture
Usage & Storage
(CCUS)








Electrification of Heat



Other Novel
Technologies

Technology Readiness Levels (TRLs)

	 CCUS	 Hydrogen	 Biomass	 Heat Electrification	 Other Novel Technologies
Iron & Steel	✓	✓	✓		Electrolysis of iron ore ✓
Chemicals (Ammonia)	✓	✓	✓		Low carbon H ₂ through electrolysis ✓
Non-Metallic Minerals (Cement)	✓		✓		Low-carbon cement ✓
Refineries	✓		✓	✓	Green Methanol ✓

✓ = TRL 6 ✓ = TRL 7-8 ✓ = TRL 8-9

Way forward-Decarbonizing India's Industrial Sector

1 Prepare a comprehensive vision and blueprint for circular economy in India

2 Develop mechanisms for technology transfer from developed nations to India

3 Develop long term sector specific road maps for hard to abate sectors

4 Develop innovative carbon finance instruments to promote decarbonization

5 Increase awareness and Generate 'call to action' among stakeholders for industrial decarbonization

Thank you!

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