

# CCTS: Accelerating the path to decarbonization

## Strategy realised

March 2026

■ ■ ■  
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The better the answer.  
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# Foreword

India stands at an inflection point where its industrial growth ambitions intersect with an urgent global mandate for climate responsibility. As one of the world's fastest-growing economies, our ability to scale sustainably – while remaining competitive – will define not just commercial outcomes but also India's broader economic identity in the decades ahead.

This publication on the Carbon Credit Trading Scheme (CCTS) arrives at a crucial moment. CCTS represents more than a regulatory mechanism; it signals a structural shift in how Indian industries must plan, invest and operate. Having spent over two decades helping organizations rethink their business models, I see today a rare convergence of market opportunity and policy clarity. India's move toward market-based emission reduction mechanisms will push industries to adopt innovation-led transformation rather than incremental change.

The insights captured here underscore a compelling truth: decarbonization is now a strategic imperative, not merely a compliance exercise. As benchmarks tighten, companies that proactively invest in energy efficiency, digital monitoring and low-carbon pathways will unlock advantages far beyond cost savings. They will strengthen supply chains, future-proof their operations, elevate brand equity and build trust in the global marketplace.

Critically, this publication highlights the power of data-led decision making – a domain close to my heart. Digital and analytics interventions will define how industries track performance, optimize processes and make real-time choices about abatement levers. Companies that embrace digital transformation will accelerate their decarbonization journeys while gaining operational agility and competitive resilience.

India's ambition to lead the world in sustainable industrial growth is both bold and achievable. The CCTS provides the scaffolding for this transition; the onus is now on businesses to step forward with conviction. I am confident that this report will serve as a practical guide to leaders across sectors as they navigate the complexities of carbon markets and redesign their pathways to low-carbon value creation.

India's decarbonization debate is rapidly moving from ambition to architecture. The Carbon Credit Trading Scheme (CCTS) is that architecture – a policy instrument designed to translate emissions performance into commercial outcomes and to make carbon efficiency a boardroom variable rather than a sustainability footnote.

At its core, CCTS introduces a disciplined logic: baseline emissions intensity, target emissions intensity, measurement and verification and tradable Carbon Credit Certificates (CCCs) – with market pricing determined by supply and demand on exchanges. The initial compliance phase (2025–27) may appear manageable, but the direction of travel is unambiguous: benchmarks are expected to tighten and the financial exposure for delay can compound quickly as carbon prices rise.

This publication makes an important point that many industries underestimate: the cheapest carbon is the carbon you never emit – but only if you invest early and sequence levers intelligently. Across the designated sectors (including cement, iron and steel, aluminum, refineries, textiles, petrochemicals, paper and pulp and chlor alkali), the report shows how the “abatement stack” evolves – with energy efficiency and renewable electricity often delivering near term advantage, while capital intensive shifts (carbon capture, green hydrogen, electrification, alternate fuels) become increasingly relevant as targets harden.

There is also a strategic nuance here: CCTS is not just a compliance mechanism; it creates a new operating model requirement. Companies will need credible MRV systems, plant level emissions intelligence and governance that links decarbonization capex to carbon price risk – year by year, not in five year slogans.

In my work advising clients on energy transition strategy across hard to abate sectors – spanning renewables, green hydrogen, biomass and industrial decarbonization – I see the winners forming early: they treat carbon as a cost line, a revenue lever (through tradable certificates), and a competitiveness signal in global trade simultaneously. This report offers leaders a pragmatic lens to do exactly that: quantify exposure, prioritize levers and build a transition plan that holds up under tightening regulation and rising market expectations.



**Anurag Gupta**  
Partner and Leader,  
EY Parthenon India



**Kapil Bansal**  
Partner,  
EY Parthenon India

The steel sector occupies a central position in India's industrial growth and infrastructure development. At the same time, it faces significant decarbonization challenges. As India advances its Carbon Credit Trading Scheme (CCTS), energy-intensive industries such as steel will play a critical role in determining the success and credibility of the market.

This report provides timely and valuable insights into the structural and strategic considerations necessary for implementing a robust carbon market framework. For hard-to-abate sectors, carbon pricing mechanisms must strike the right balance – driving technological innovation while preserving industrial competitiveness. A predictable and transparent regulatory environment will be essential to encourage investments in green steel, low-carbon technologies and process efficiency.

India's carbon market architecture must be designed not only to meet domestic climate goals but also to enhance global integration and export competitiveness in an increasingly carbon-constrained world. With appropriate safeguards and strategic alignment, CCTS can serve as a powerful tool to mobilize finance, accelerate industrial decarbonization and reinforce India's climate leadership.

I commend the efforts behind this report and trust it will guide policymakers and industry stakeholders in building a credible, effective and forward-looking carbon market ecosystem.



**Mr. Sanjay Kumar Singh**

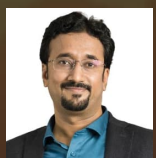
Director - Strategy & External Relations, Jindal Steel Ltd.  
Former Secretary, Ministry of Steel  
Chairman, Carbon Market Steel Committee, CMAI

The global transition toward net-zero emissions is reshaping economies, industries and investment flows. For India, this transition presents both a responsibility and an unprecedented opportunity. The Carbon Credit Trading Scheme (CCTS) is a cornerstone of this journey, designed to unlock the full potential of domestic carbon markets while strengthening environmental integrity.

As one of the world's most dynamic carbon markets, India has the capacity to lead in climate innovation, project development and climate finance mobilization. The insights presented in this report provide a comprehensive roadmap for operationalizing CCTS effectively – balancing regulatory robustness with market dynamism.

A well-designed carbon market can catalyze decarbonization across energy, industry, transport and agriculture. It can incentivize technology adoption, attract international capital under Article 6 mechanisms and support industries in achieving cost-effective emissions reductions. However, success will depend on clarity of policy, transparency of governance and active participation from both the public and private sectors.

I hope this report will help accelerate India's journey toward becoming a global hub for high-integrity carbon markets and climate solutions.



**Mr. Manish Dabkara**

President, CMAI  
MD & CEO, EKI Energy Services Ltd.

India stands at a defining moment in its climate journey. As the global community accelerates efforts toward net-zero emissions, the role of robust, transparent and high-integrity carbon markets has never been more critical. The Carbon Credit Trading Scheme (CCTS) represents a transformative step in strengthening India's domestic carbon market framework while aligning with international best practices.

This report comes at a pivotal time, offering deep insights into the operational, regulatory and market dimensions of India's emerging carbon ecosystem. It reflects the collaborative vision required to maintain environmental integrity, market efficiency and meaningful climate impact. The transition to a low-carbon economy is not merely a compliance exercise – it is an opportunity to drive innovation, mobilize green finance and enhance India's global competitiveness.

At CMAI, we firmly believe that carbon markets will play a catalytic role in accelerating decarbonization across sectors. By fostering stakeholder engagement, strengthening institutional mechanisms and encouraging private sector participation, India can build a resilient and globally credible carbon marketplace.

I am confident this work will serve as a valuable resource for policymakers, industry leaders and market participants as we collectively shape India's climate leadership.



**Mr. Rohit Kumar**

Secretary General, Carbon Markets  
Association of India and SAF Association



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1

Executive  
summary

# The initial CCTS targets are foundational, signaling the importance of proactive decarbonization by industry



## Market-based emission reduction scheme

India's Carbon Credit Trading Scheme (CCTS) is a market-based emission scheme that incentivizes emission reductions and operates through a two-tiered approach:

- Mandatory compliance mechanisms (which include mandatory targets for designated sectors)
- A voluntary offset mechanism (which enables emitters to buy credits to balance their emissions voluntarily)

Designated sectors: Cement, aluminum, chlor-alkali, paper and pulp, iron and steel, refineries, textiles, petrochemicals, fertilizers



## Initial targets are modest but foundational

For the compliance period 2025-2027, the overall greenhouse gas emissions intensity (GEI) reduction targets are as follows:

- Cement: 2% to 6%
- Aluminum: 4% to 7%
- Chlor-Alkali: 6% to 9%
- Paper and pulp: 4% to 9%
- Iron and steel: 4% to 6%
- Refineries: 2% to 6%
- Textiles: 4% to 12%
- Petrochemicals: 5%



## Initially modest, the financial burden of the CCTS could escalate sharply, affecting company revenues in the long run

Due to forthcoming technological advancements, the expenses associated with decarbonization initiatives are expected to decrease; however, the carbon prices\* required to comply with the CCTS are anticipated to rise significantly in the near future.



## Early compliance is essential

Early decarbonization under the CCTS provides benefits, including improved energy and operational efficiency, resulting in cost savings, besides mitigating the risk of escalating penalties.

Cost-intensive initiatives such as carbon capture, green fuels and low-carbon technological shifts will be necessary to meet stringent CCTS benchmarks in the future and to achieve net zero goals for companies.

With industry emissions trailing Science Based Target Initiatives (SBTi) and net zero benchmark trajectories, CCTS regulations are likely to tighten, underscoring the need for immediate decarbonization action.

\*Carbon prices refer to cost of purchasing certificates/carbon credits

Source: EY-Parthenon Analysis

# Strategic decarbonization pathways for India's cement sector: Carbon capture and energy efficiency measures are the primary levers for emission reduction and financial optimization

1

## Market and capacity dynamics

- Moderate growth in cement production
  - Cement production in India has grown from 337 MMT (million metric ton) in 2019 to 433 MMT in 2024, with a CAGR of 3.8%.
- Despite this, capacity utilization has remained flat at 65%-69%, indicating structural inefficiencies or overcapacity.

2

## Regulatory and financial implications

- Emerging compliance risks
  - A prominent company faces a potential emission gap of up to 82% by 2040 when benchmarked against Accelerated Decarbonization and SBTi targets.
- Financial exposure to carbon penalties
  - Non-alignment with decarbonization pathways could result in INR314-320 crore under CCTS penalties for the company by 2030.

3

## Strategic technology and investment levers

- Decarbonization as a Strategic Differentiator
  - Early adopters of technologies like RE, CCUS can position themselves as climate leaders
- Cost Mitigation through Energy Efficiency
  - Energy efficiency remains a cost-saving lever while supporting emissions reduction goals

4

## Future cost of inaction

- Declining cost of abatement
  - By abating emissions at a cost lower than the carbon price, the cement industry may realize significant cost savings between 2032 and 2035, by overcoming the higher costs tied to carbon prices.
- Carbon prices are expected to become more expensive, making internal decarbonization efforts more economically viable in the long term.

## Recommendations

1

### Accelerate transition plans

Companies should align with SBTi or accelerated decarbonization pathways to avoid future liabilities and capitalize on ESG opportunities.

2

### Invest in key levers

Prioritize carbon capture technologies, which contribute to more than 50% CO<sub>2</sub> abatement, and adopt energy efficiency measures as complementary strategies for emission reduction and financial optimization.

Source: EY-Parthenon Analysis

# Strategic decarbonization pathways for India's aluminum sector: Renewable energy and carbon capture measures are the primary levers for achieving more than 70% CO<sub>2</sub> abatement

1

## Market and capacity dynamics

- Moderate growth in aluminum production
  - India's primary aluminum production has seen moderate growth, increasing from 3.6 MMT to 4.2 MMT, reflecting a CAGR of 5.3%.
  - Exports to the EU have fallen from 30% in 2023 to 17% in 2024, indicating the effects of carbon pricing under the CBAM.

2

## Regulatory and Financial Implications

- Emerging compliance risks
  - An Indian conglomerate would have an emission differential of 10% by 2030 if compared with CCTS targets.
- Financial exposure to carbon penalties
  - Non-alignment with decarbonization pathways could result in ~INR1179-1185 crore under CCTS penalties for the company by 2030

3

## Strategic technology and Investment levers

- Decarbonization as a strategic differentiator
  - Early adopters of technologies like RE and alternate fuels can position themselves as climate leaders.
  - Energy efficiency measures like waste heat recovery, alumina efficiency are cost-saving measures along with emission reduction strategies.

4

## Future cost of inaction

- Declining cost of abatement
  - By abating emissions at a cost lower than the carbon price, the aluminum industry may realize significant cost savings between 2037 and 2040 by overcoming the higher costs tied to carbon prices.
  - Carbon prices are expected to become more expensive, making internal decarbonization efforts more economically viable in the long term.

## Recommendations

1

### Accelerate transition plans to avoid CBAM and CCTS impact

Compliance with SBTi and accelerated decarbonization are essential, as the financial impact of the CBAM on India's aluminum sector is anticipated to be significant.

2

### Invest in key levers

Prioritize renewable energy and carbon capture technologies as dual strategies for emission reduction, targeting by ~53% and ~21% in primary aluminum.

# Strategic decarbonization pathways for India's chlor-alkali sector: Renewable energy and energy efficiency measures are the primary levers for achieving up to 60% CO<sub>2</sub> abatement

1

## Market and capacity dynamics

- Moderate growth in caustic soda production
  - India's caustic soda production has seen moderate growth, increasing from 3.5 MMT to 4.6 MMT, reflecting a CAGR of 6.2% and at a capacity utilization of ~80%.
  - The production of chlorine during 2023-24 was 40.87 lakh MMT, compared to 39.63 lakh MMT in 2022-23, an increase of 3.1%.
  - Exports of caustic soda reached 465 KT in 2023-24, while imports have significantly decreased over the years, totaling 221 KT.

2

## Regulatory and Financial Implications

- Emerging compliance risks
  - An Indian chemical manufacturing company would have an emission differential of 58% by 2030 and 93% by 2040 if compared with accelerated decarbonization targets.
- Financial exposure to carbon penalties
  - Non-alignment with decarbonization pathways could result in INR94-100 crore under CCTS penalties for the company by 2030.

3

## Strategic technology and investment levers

- Decarbonization as a strategic differentiator
  - Early adopters of technologies like RE and carbon capture can position themselves as climate leaders.
  - Intervention across digital transformation and energy efficiency measures like brine temperature control and MVR has the potential to reduce emissions and provide cost benefits.

4

## Future cost of inaction

- Declining cost of abatement
  - By abating emissions at a cost lower than the carbon price, chlor-alkali sector may realize significant cost savings between 2030 and 2032 by overcoming the higher costs tied to carbon prices.
  - Carbon prices are expected to become more expensive, making internal decarbonization efforts more economically viable in the long term.

## Recommendations

1

### Accelerate transition plans to avoid CBAM and CCTS impact

Compliance with SBTi and accelerated decarbonization are essential, as the cost of abatement is projected to drop below the Indian carbon prices in the next five years.

2

### Invest in key levers

Prioritize RE to abate half of the total emissions. Also, focus on energy efficiency measures to reduce emissions by a further 15% to 18%, resulting in cost savings.

Source: EY-Parthenon Analysis

# Strategic decarbonization pathways for India's paper and pulp sector: Utilization of biomass for steam production, along with carbon capture measures, is essential for emission reduction

## 1 Market and capacity dynamics

- Moderate growth in the paper industry
  - India's paper production has seen moderate growth, increasing from 18.9 MMT to 23.8 MMT, reflecting a CAGR of 5.8% and utilization of 88%.
  - Export of paper, paperboard and newsprint have increased almost three times.

## 2 Regulatory and financial implications

- Emerging compliance risks
  - Diversified Indian conglomerate would have an emission differential of 66% by 2030 and 96% by 2040 if compared with accelerated decarbonization targets.
- Financial exposure to carbon penalties
  - Non-alignment with decarbonization pathways could result in ~INR23-29 crore under CCTS penalties for the company by 2030.

## 3 Strategic technology and investment levers

- Decarbonization as a strategic differentiator
  - Early adopters of technologies such as RE and alternate fuels can position themselves as climate leaders.
  - Interventions like pumping optimization, efficient rotors, heat recovery and turbo fans are crucial to abate emissions and lead to cost benefits.

## 4 Future cost of inaction

- Declining cost of abatement
  - By abating emissions at a cost lower than the carbon price, paper and pulp industry may realize significant cost savings between 2029 and 2031 by overcoming the higher costs tied to carbon prices.
  - Carbon prices are expected to become more expensive, making internal decarbonization efforts more economically viable in the long term.

## Recommendations

### 1 Accelerate transition plans to avoid CCTS impact

Compliance with SBTi and accelerated decarbonization are essential, as the cost of abatement is projected to drop below the Indian carbon prices in next four to five years.

### 2 Invest in key levers

Prioritize usage of biomass for steam production. Further, as the cost of technology reduces, P&P industry can leverage carbon capture to curb emissions.

# Strategic decarbonization pathways for India's iron and steel sector: Utilization of GH2 in BF, RE, and carbon capture measures are essential for emission reduction in BF-BOF steelmaking

1

## Market and capacity dynamics

- Tremendous growth in the iron and steel industry
- India's crude steel production has seen steady growth, increasing from 109 MMT in FY20 to 144 MMT in FY24, reflecting a CAGR of 5.72%.
- Globally, India is the second-largest producer of steel and is on the path to achieving of 300 MMT installed capacity, with 255 MMT expected by FY31.

2

## Regulatory and financial implications

- Emerging Compliance Risks
  - Diversified Indian conglomerate with would have an emission differential of 67% by 2030 and 96% by 2040 if compared with accelerated decarbonization targets.
- Financial exposure to carbon penalties
  - Non-alignment with decarbonization pathways could result in ~INR3,010-3,016 crore under CCTS penalties for the company by 2030.

3

## Strategic Technology and Investment Levers

- Decarbonization as a strategic differentiator
  - Early adopters of technologies like RE, carbon capture, and GH2 injection in BF can position themselves as climate leaders.
  - In the short term, BF-BOF players may focus on energy efficiency principles like energy monitoring, variable speed drives, heat recovery systems etc. to abate emissions, leading to cost saving.

4

## Future Cost of Inaction

- Declining cost of abatement
  - By abating emissions at a cost lower than the carbon price, iron and steel industry may realize significant cost savings between 2035 and 2039 by overcoming the higher costs tied to carbon prices.
  - Carbon prices are expected to become more expensive, making internal decarbonization efforts more economically viable in the long term.

## Recommendations

1

### Accelerate transition plans to avoid CBAM and CCTS impact

Compliance with SBTi and accelerated decarbonization are essential, as the financial impact of the CBAM on India's iron and steel sector is anticipated to be significant.

2

### Invest in key levers

Prioritize energy efficiency measures. Further, as the cost of technology reduces, iron and steel industry can leverage carbon capture to curb emissions .

Source: EY-Parthenon Analysis

# Strategic decarbonization pathways for India's refinery sector: Electrification, alternate fuels and carbon capture measures are essential for emission reduction in refineries

1

## Market and capacity dynamics

- Considerable growth in the refinery sector
  - India's refinery installed capacity has seen sharp growth, increasing from 215 MMT in FY14 to 257 MMT in FY24, reflecting a growth of 19.5%.
  - As of date, India has 23 refineries and is ranked fourth in terms of installed refining capacity globally.

2

## Regulatory and financial implications

- Emerging compliance risks
  - Diversified Indian conglomerate would have an emission differential of 58% by 2030 and 93% by 2040 if compared with accelerated decarbonization targets.
- Financial exposure to carbon penalties
  - Non-alignment with decarbonization pathways could result in ~INR272-278 crore under CCTS penalties for the company by 2030.

3

## Strategic technology and investment levers

- Decarbonization as a strategic differentiator
  - Early adopters of technologies like carbon capture and electrification can position themselves as climate leaders.
  - Adapting "in the money" initiatives like heat recovery, Organic Rankine cycle and RE integration leads to emission intensity reduction and cost savings.

4

## Future cost of inaction

- Declining cost of abatement
  - By abating emissions at a cost lower than the carbon price, Indian refineries may realize significant cost savings between 2029 and 2033 by overcoming the higher costs tied to carbon prices.
  - Carbon prices are expected to become more expensive, making internal decarbonization efforts more economically viable in the long term.

## Recommendations

1

### Accelerate transition plans to avoid CCTS impact

Compliance with CCTS targets and adopting accelerated decarbonization is crucial to mitigate the financial impact of the CCTS on India's refinery sector.

2

### Invest in key levers

Prioritize RE and energy efficiency measures. Further, as the cost of technology reduces, refineries can leverage carbon capture to curb emissions.

# Strategic decarbonization pathways for India's textiles sector: Adoption of renewable power and biomass usage are the most crucial levers for emissions reduction in the textiles industry

1

## Market and capacity dynamics

- Sharp growth in the textile sector
  - India currently has more than 3,400 textile mills installed, with domestic textile and apparel production valued around US\$176 billion
  - The market for Indian textiles and apparel is projected to grow at a 10% CAGR to reach US\$350 billion by 2030

2

## Regulatory and Financial Implications

- Emerging compliance risks
  - Diversified Indian conglomerate would have an emission differential of 67% by 2030 and 96% by 2040 if compared with accelerated decarbonization targets
- Financial exposure to carbon penalties
  - Non-alignment with decarbonization pathways could result in ~INR53-59 crore under CCTS penalties for the company by 2030.

3

## Strategic Technology and Investment Levers

- Decarbonization as a Strategic Differentiator
  - RE adaption is a cost saving measure in the textile industry
  - Alternate fuels like biomass usage in CPP is also a cost saving initiative leading to emissions reduction

4

## Future Cost of Inaction

- Declining cost of abatement
  - By abating emissions at a cost lower than the carbon price, textile industry may realize significant cost savings by overcoming the higher costs tied to carbon prices
  - Carbon prices are expected to become more expensive, making internal decarbonization efforts more economically viable in the long term

## Recommendations

1

### Accelerate transition plans to avoid CCTS impact

Compliance with SBTi and accelerated decarbonization are essential, as the financial impact of the CCTS on India's textiles sector is anticipated to be significant.

2

### Invest in key levers

Prioritize RE and biomass usage. Further, as the cost of technology reduces, textile industries can leverage BESS to curb emissions.

Source: EY-Parthenon Analysis

# Strategic decarbonization pathways for India's petrochemical sector: RE adoption and carbon capture measures are essential for achieving meaningful emission reduction

1

## Market and capacity dynamics

- Tremendous growth prospects
  - India's petrochemical production capacity is projected to increase from 29.6 MMTPA in 2024 to 46 MMTPA by 2030, reflecting a 55.4% growth.
  - India ranks sixth globally in chemical and petrochemical production.

2

## Regulatory and financial implications

- Emerging compliance risks
  - Diversified Indian would have an emission differential of 58% by 2030 and 93% by 2040 if compared with accelerated decarbonization targets.
- **Financial exposure to carbon penalties**
  - Non-alignment with decarbonization pathways could result in ~INR107-113 crore under CCTS penalties for the company by 2030.

3

## Strategic technology and investment levers

- Decarbonization as a Strategic Differentiator
  - Early adopters of technologies like alternate fuels, carbon capture can position themselves as climate leaders
  - Energy efficiency and RE integration are the low hanging fruits serving dual benefits: emissions reduction and cost savings

4

## Future cost of inaction

- Declining cost of abatement
  - By abating emissions at a cost lower than the carbon price, petrochemicals may realize significant cost savings between 2034 and 2039 by overcoming the higher costs tied to carbon prices.
  - Carbon prices are expected to become more expensive, making internal decarbonization efforts more economically viable in the long term.

## Recommendations

1

### Accelerate transition plans to avoid CCTS impact

Compliance with CCTS targets and adopting accelerated decarbonization is crucial to mitigate the financial impact of the CCTS on India's petrochemical sector.

2

### Invest in Key Levers

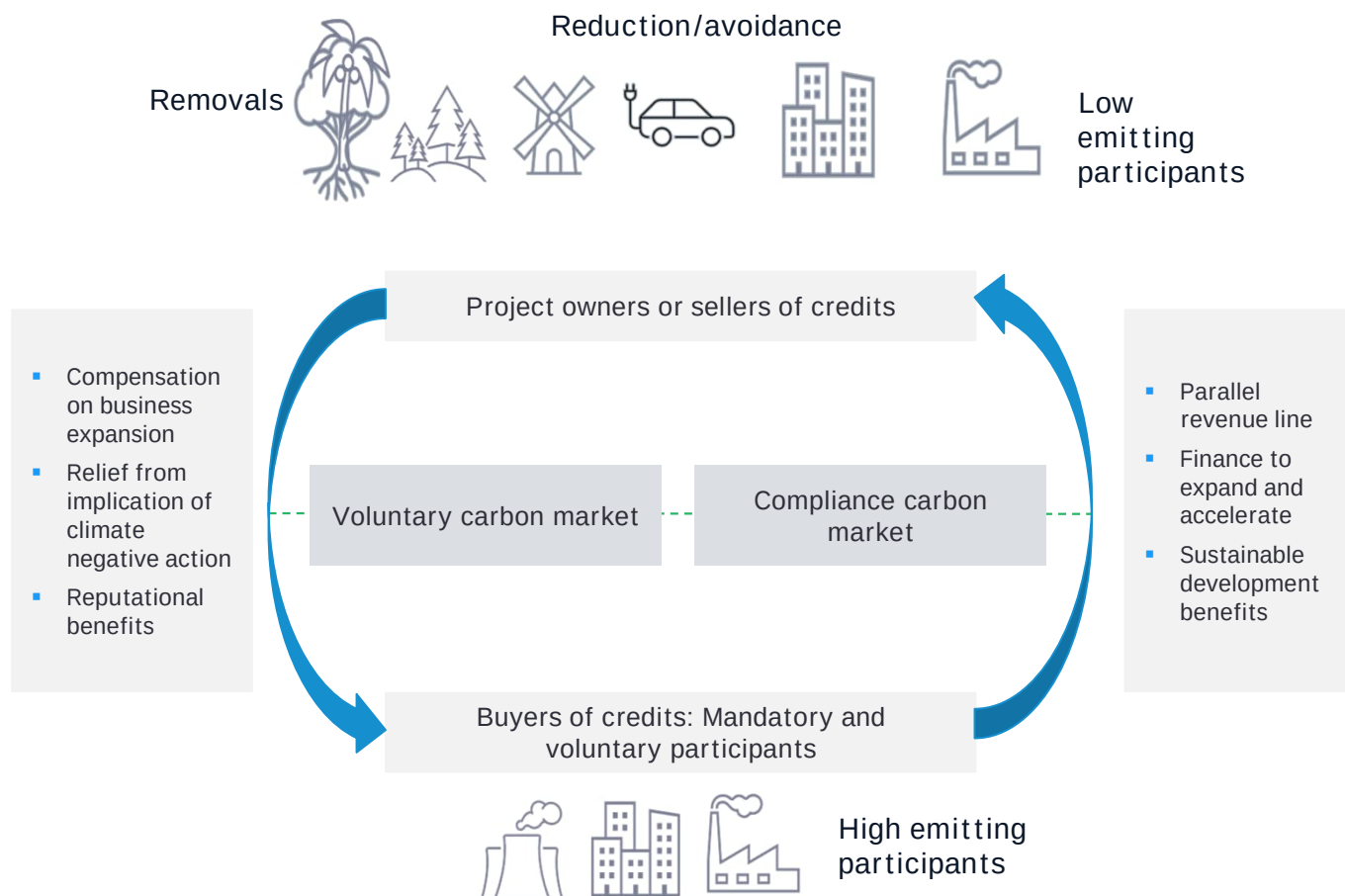
Prioritize RE and energy efficiency measures. Further, as the cost of technology reduces, leverage carbon capture and green H2 to curb emissions.



## 2 | Carbon markets

India's Carbon Credit Trading Scheme established in April 2025, operates with a dual approach, combining the mandatory emission reduction targets with Voluntary carbon mechanism

# Carbon markets overview



## 1 What are carbon markets?

Carbon markets are carbon pricing mechanisms that enable governments and non-state actors to trade greenhouse gas emission credits. The aim is to achieve climate targets and implement climate actions cost-effectively.

## 2 Why are they important?

Developing countries need up to US\$6 trillion to meet climate goals. Current funding is vastly inadequate, with the IPCC report suggesting levels that are three to six times lower than needed by 2030.

Carbon markets are seen as a potential solution to finance climate action and incentivize governments and private entities to reduce their emissions.

## 3 What are various types of carbon markets?

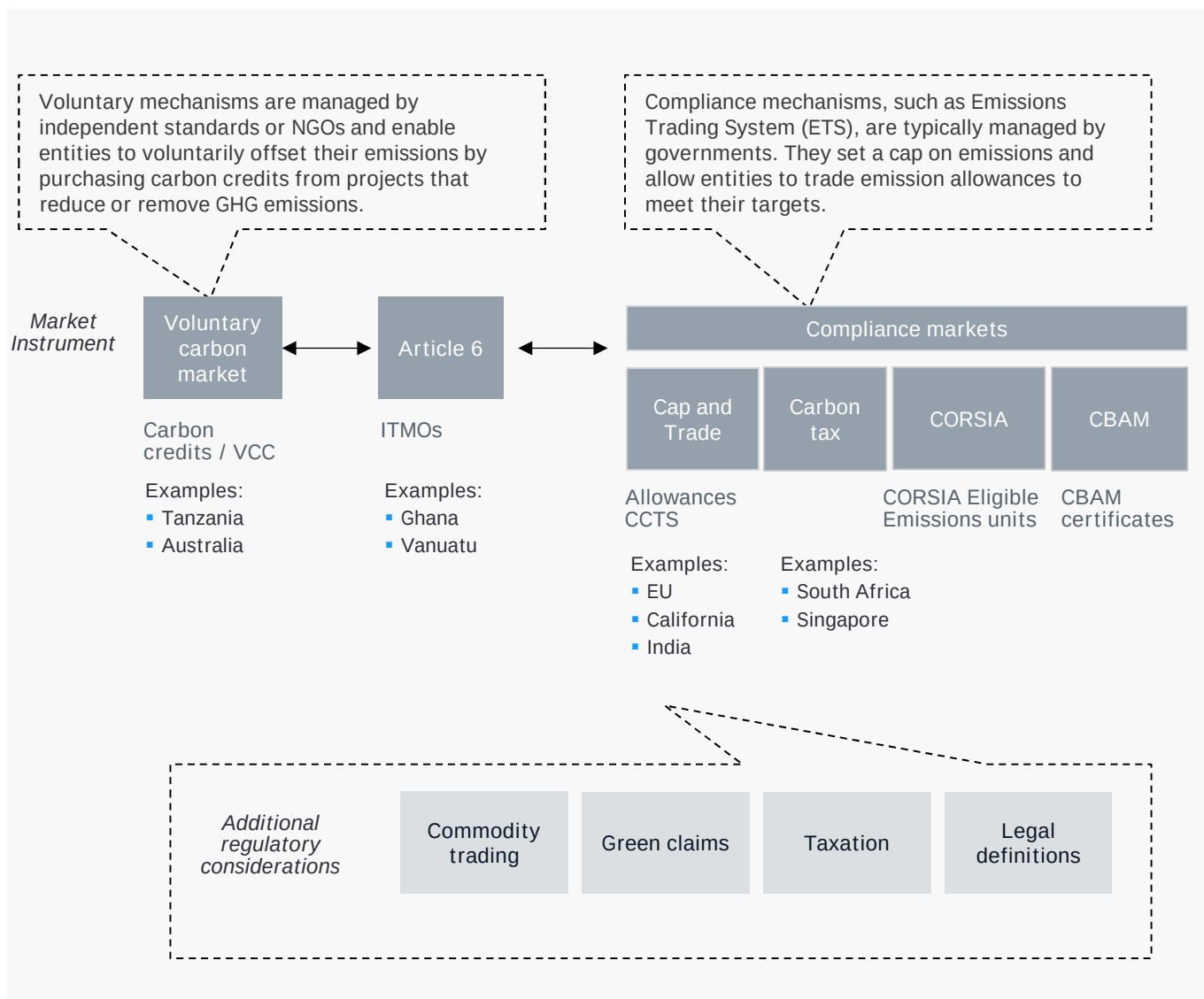
Compliance markets are created as a result of any national, regional and/or international policy or regulatory requirement.

- E.g., an emission trading system that uses "cap-and-trade" where businesses or countries get emission allowances and are required to buy additional credits if they exceed their caps.

Voluntary markets refer to the issuance, buying and selling of carbon credits on a voluntary basis.

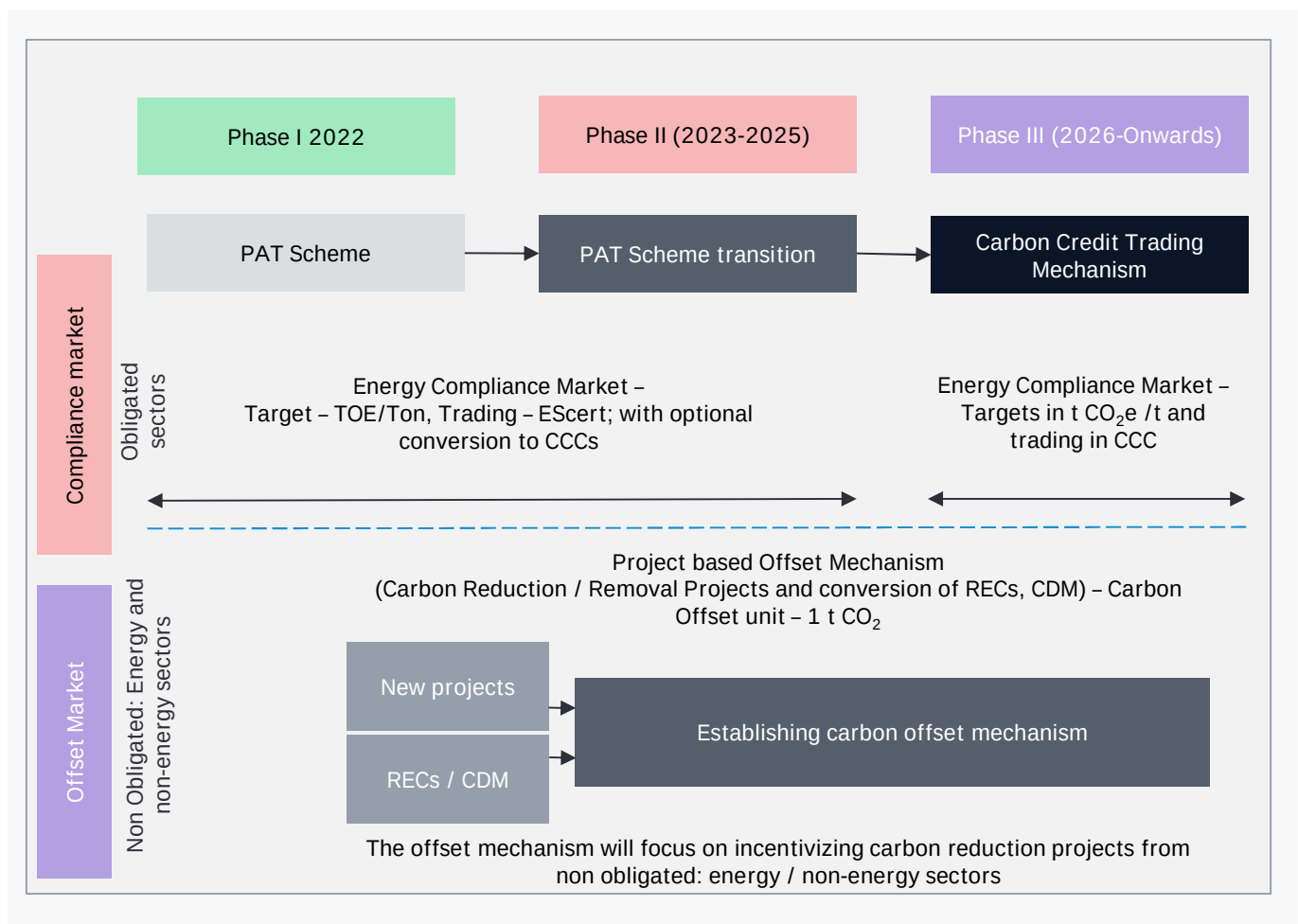
## Mechanisms of carbon markets

The multiple overlaps existing between these markets feed into a variety of credit trading opportunities

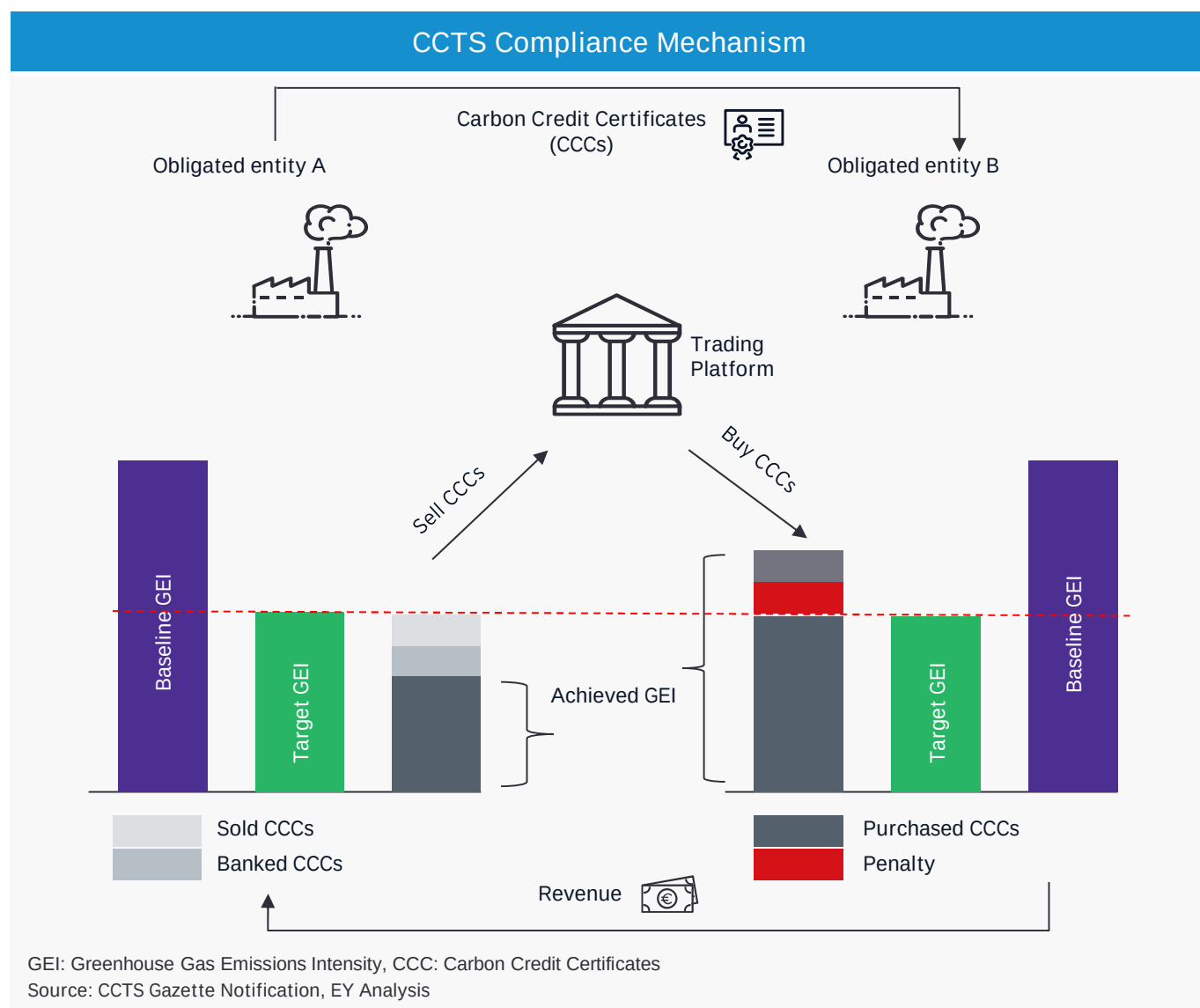


Source: EY-Parthenon Analysis

# Indian carbon market framework operates with a mix of compliance and voluntary mechanisms



With the establishment of Carbon Credit Trading Scheme (CCTS) and regulatory mandates, companies will have the option to trade carbon reductions against their target GEI



### Key aspects of CCTS

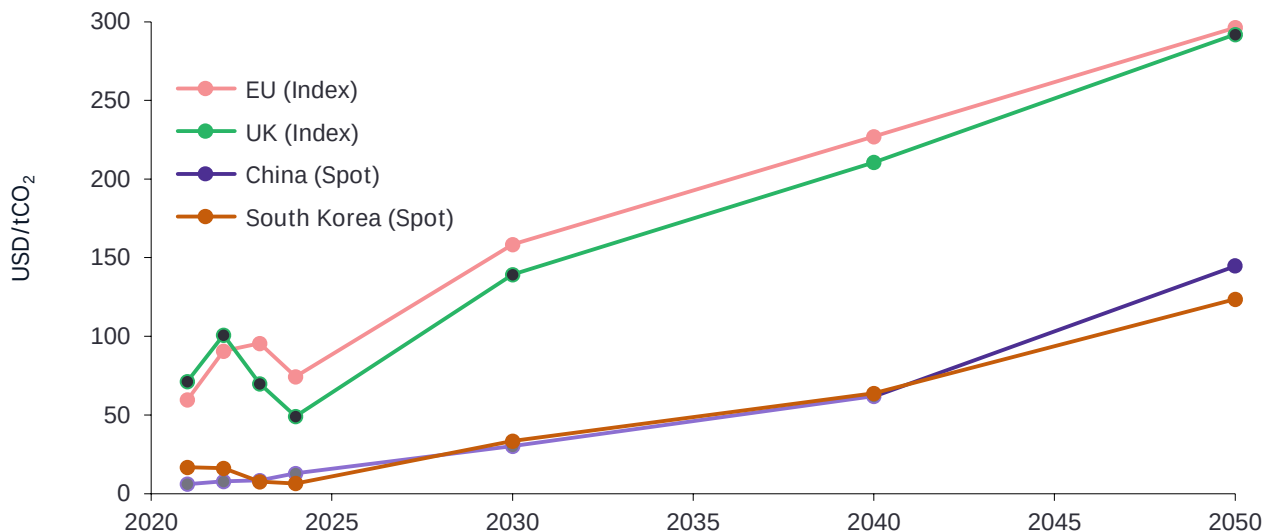
- The Compliance Mechanism under the Indian Carbon Market (ICM) aims to regulate and reduce greenhouse gas (GHG) emissions through a structured framework involving targets, monitoring, verification, and trading of carbon credit certificates (CCC)
- The initial set of sectors chosen under CCTS scheme are
- If an obligated entity's actual emission intensity is lower than the target, Bureau of Energy Efficiency (BEE) will issue CCCs equivalent to the difference, multiplied by the production volume.
- Entities failing to achieve their GEI targets will have to purchase corresponding number of CCCs to cover the excess emissions. Penalties will be applied on failing to meet compliance obligations.

- CCCs will be traded through the exchanges and the price of carbon will be dynamically decided as per the supply and demand of carbon credits.

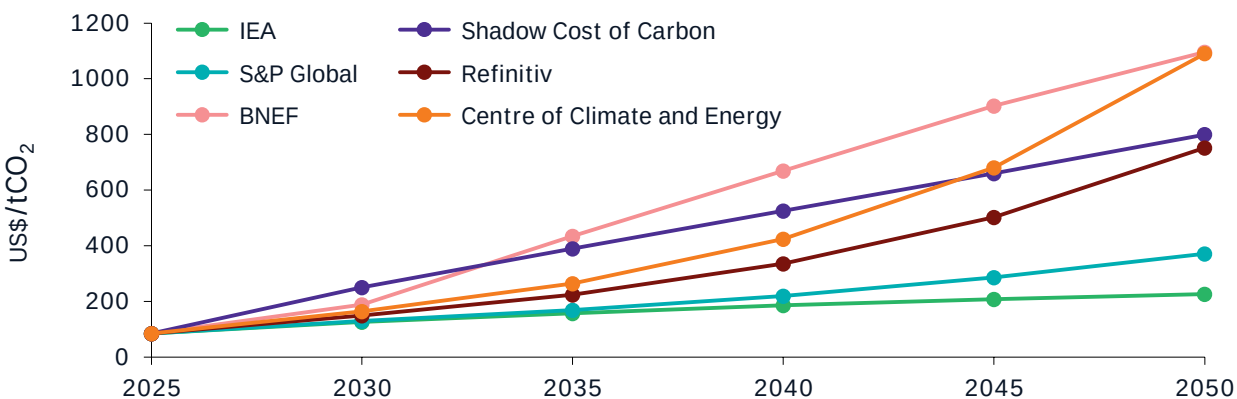
| Final        | Draft                     |
|--------------|---------------------------|
| Aluminium    | Refinery & petrochemicals |
| Chlor-Alkali | Textiles                  |
| Cement       | Iron and steel            |
| Pulp & Paper | Aluminium                 |

# Evolution of carbon prices and projections across various geographies and India

## Carbon prices: Historical



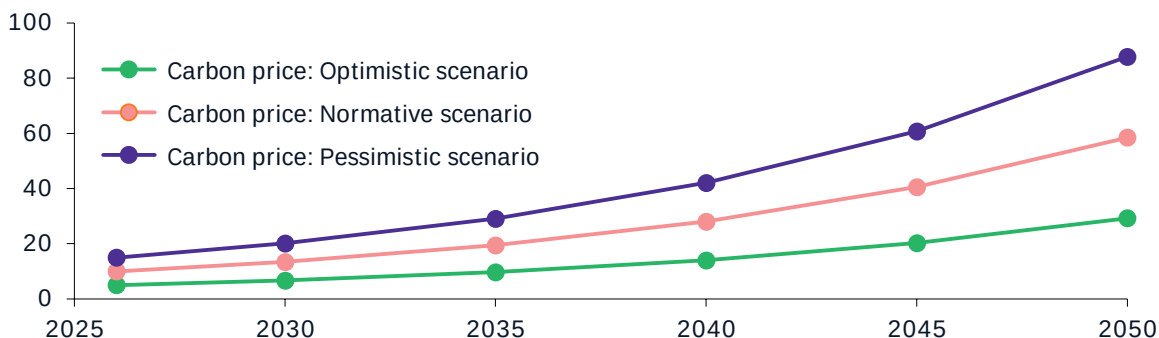
## EU carbon prices: Projections



## CAGR

| IEA   | S&P   | BNEF  | SCOC  | Refinitiv | CCE    |
|-------|-------|-------|-------|-----------|--------|
| 3.69% | 5.60% | 9.92% | 8.65% | 8.00%     | 10.00% |

## Indian carbon prices: Projections

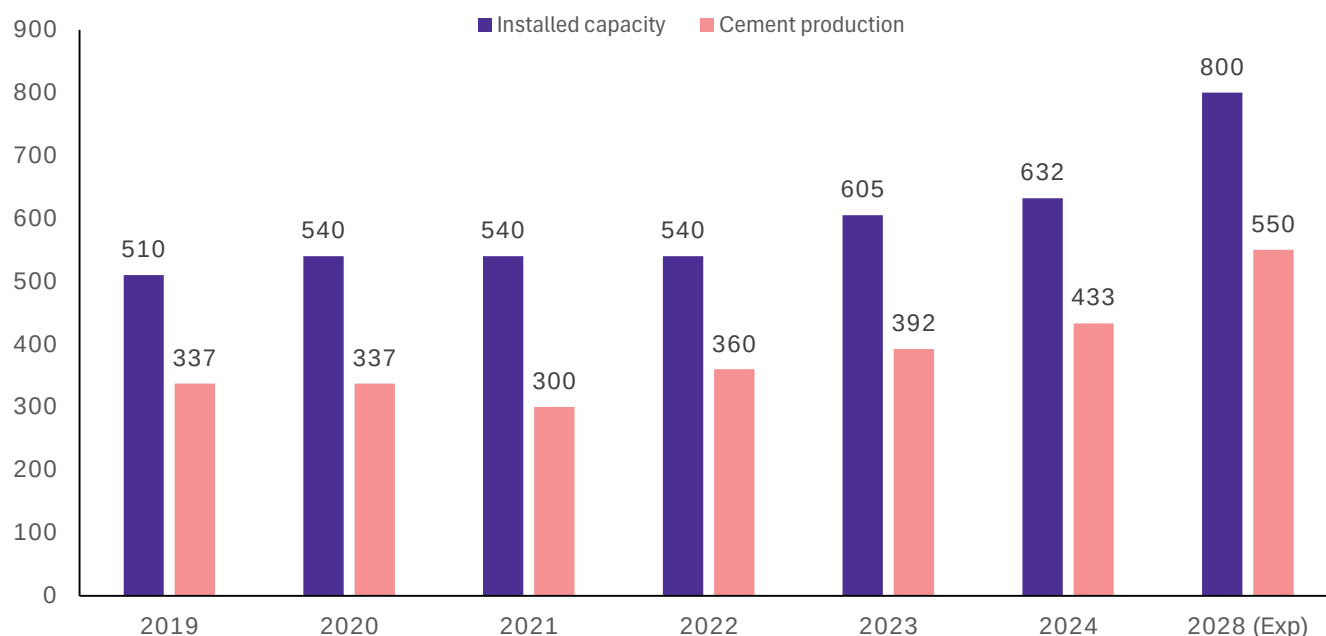




# 3 | Sectoral decarbonization

## Cement sector with total installed capacity of ~630 MMT contributes to ~20% of India's industrial GHG emissions

### India's refinery sector trend (MMTPA)



### Sector highlights

- The cement sector operates at a capacity utilization of 65% to 69%.
- As of 2024, India's share of cement exports is 2% to 3% of production capacity.
- India's cement industry has decreased its emissions intensity by 19.4% over the last five years, due to the use of alternative materials like fly ash and slag in blended cement production.
- The Indian cement sector is likely to add 150-160 MMT, bringing the total installed capacity to about 782-792 MMT by FY2028.



#### Parameters

#### Description

India's total installed cement capacity (FY2024) 632 million ton

India's share in global cement production (2024) ~10%

CO2 emissions from cement sector (FY2024) ~252.44 MMTCO<sub>2</sub>

PPC (blended) cement % in the industry 72%

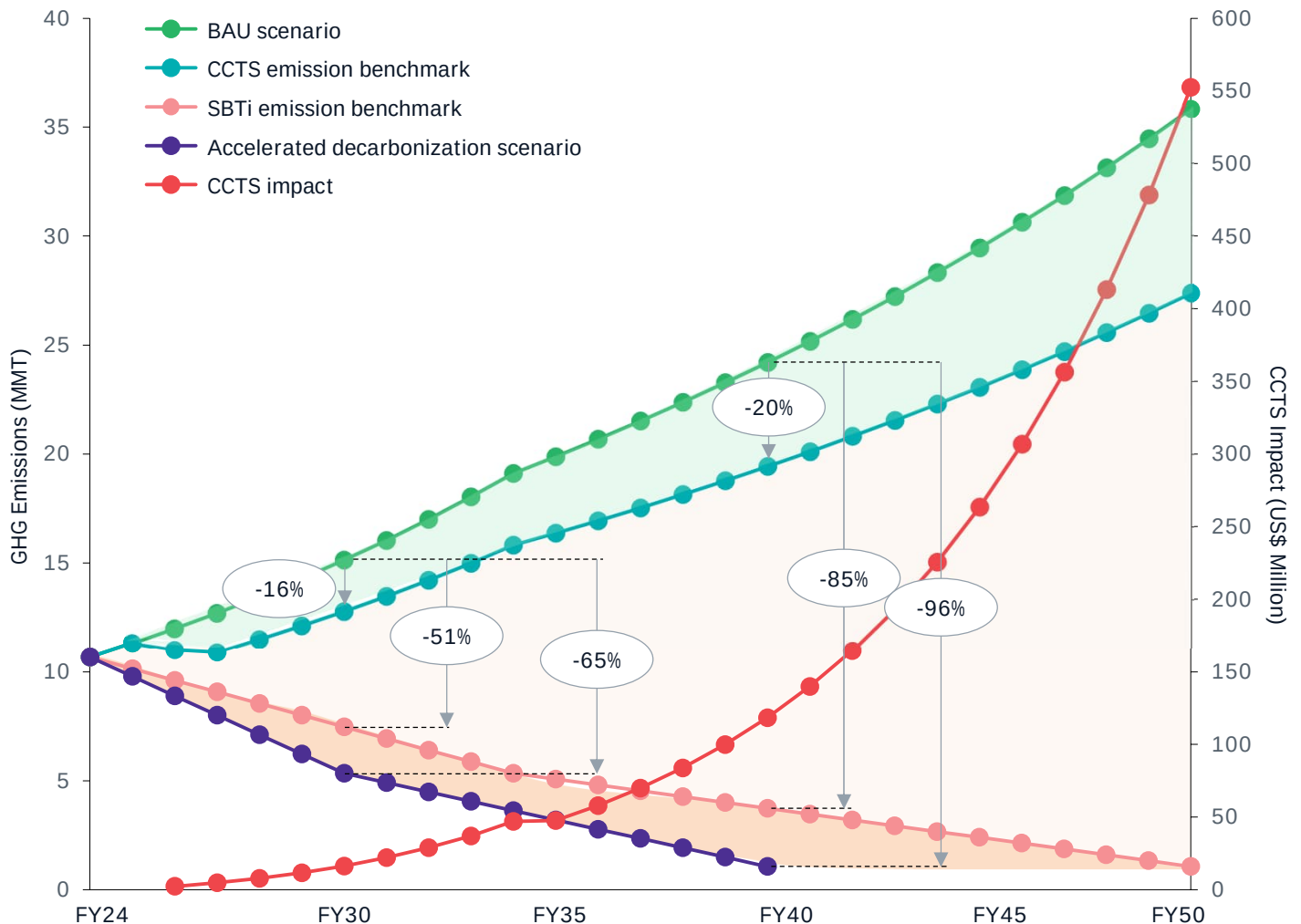
#### CCTS targets

- Sectoral reduction target
  - An average 2% to 6% reduction in emission intensity over the baseline during the compliance period would translate to an 8.67 MMT reduction of CO<sub>2</sub>e (assuming constant installed capacity as per FY 2023-2024) by FY27.
  - During the compliance period, based on the production forecast, there is a potential net increase of 31.54 MMT of CO<sub>2</sub> e in absolute numbers.

Source: EY-P Research, JMK Report, Ministry of commerce

## Case study: A prominent cement company should decarbonize its assets to avoid penalties on 16% excess emissions above CCTS benchmarks

### Emission scenarios with CCTS/ SBTi mandates and cost saving potential



Note:

- SBTi targets are aligned as per 1.5 Degree scenario with long term target of 50% emission reduction in 10 years and Net zero by 2050
- Accelerated decarbonization scenario targets 50% emission reduction by 2030 and net zero by 2040
- The Cement sector is projected to grow at 6% annually until FY 2035, after which the growth rate is expected to stabilize at 4% in the long term

The company would have to pay for these emissions under the CCTS scheme in case of BAU scenario (e.g., if the company does not decarbonize).

The company would have an emission differential of 51% by 2030 and 85% by 2040 if compared with SBTi targets.

The company would have an emission differential of 65% by 2030 and 96% by 2040 if compared with accelerated decarbonization targets.

- The company would have to pay for the excess emissions above CCTS benchmark.
- The CCTS penalty will differ as the growth rate increases and CCTS benchmark decreases if the company does not decarbonize.

- Since the SBTi line is below CCTS emission benchmark, adherence to the same and having an accelerated decarbonization journey can help the company avoid CCTS penalties.

Source: EY-Parthenon Analysis

## Case study: The company is expected to incur a financial implication of ~INR314-320 crore from 2026 to 2030 due to the impact of CCTS, if no decarbonization is undertaken

### Sensitivity Analysis highlighting financial impact FY 26-30 (INR cr.)

| Sensitivity table                | Production growth scenario                              | No growth | Expected growth | Normative (cement sector growth benchmark) | Optimistic |
|----------------------------------|---------------------------------------------------------|-----------|-----------------|--------------------------------------------|------------|
| CCTS industry benchmark scenario | %                                                       | 0%        | 4%              | 6%                                         | 8%         |
| As-is (Present)                  | As per BEE Gazette                                      | 239-245   | 287-293         | 314-320                                    | 343-349    |
| Industry weighted average        | Average of all plants (category wise) (in terms of GEI) | 238-244   | 286-292         | 312-318                                    | 341-347    |
| Pessimistic (stricter targets)   | -5% (GEI target lower Industry weighted avg)            | 458-464   | 543-549         | 591-597                                    | 642-648    |
| Optimistic (lenient targets)     | +5% (GEI target higher than Industry weighted avg)      | 18-24     | 28-34           | 33-39                                      | 39-45      |

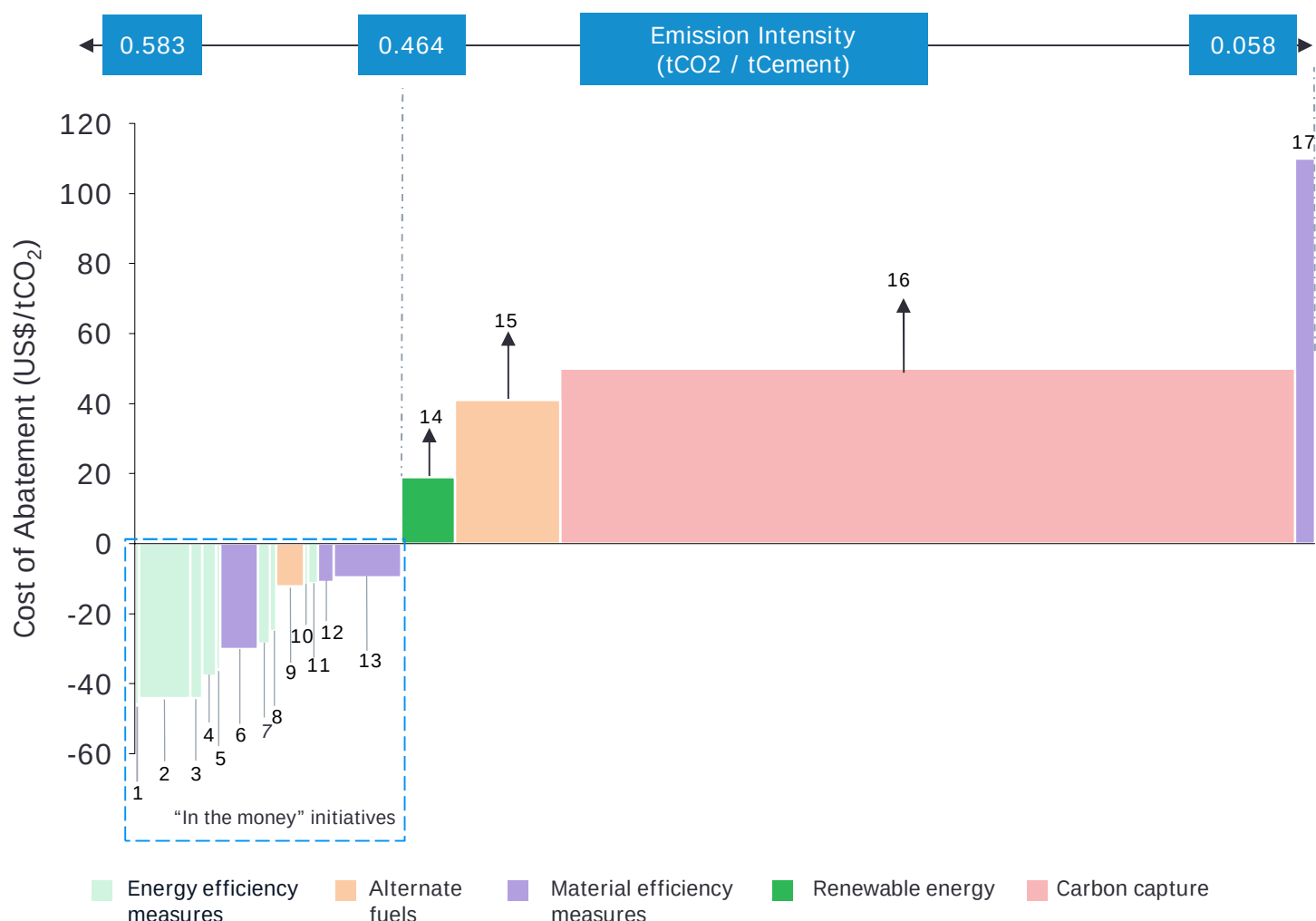


### Insights

- In the BAU scenario, taking into account no industry growth for cement, the company is projected to experience a financial impact of ~ INR314 crore from 2025 to 2030, considering the carbon price at US\$10 per ton of CO<sub>2</sub>.
- The costs in the table represent the cost of not decarbonizing for the company's plants.
- Assumptions:
  - Nine plants of the company have been considered for analysis in this table (taken directly from the GoI Gazette by BEE).
  - The financial impact is calculated cumulatively from 2026 to 2030. The net present value of the impact has been mentioned in the table.
  - A carbon price scenario with a normative pricing of US\$10 has been taken into account for the analysis
  - Production growth scenarios have been built based on the cement sector trends in India.
  - The "Industry Weighted Average" for GHG emission intensity has been established based on the performance of all the companies in the particular sub-sector (PPC, OPC, grinding).
  - The CCTS benchmark sensitivity scenarios have been built based on +5% and -5% of the "Industry Weighted Average" intensity benchmark.

Source: EY Analysis

Indian cement sector has multiple pathways to decarbonization, with carbon capture emerging as the most crucial lever for CO<sub>2</sub> reduction; and energy efficiency measures leading to cost savings



“In the money” initiatives

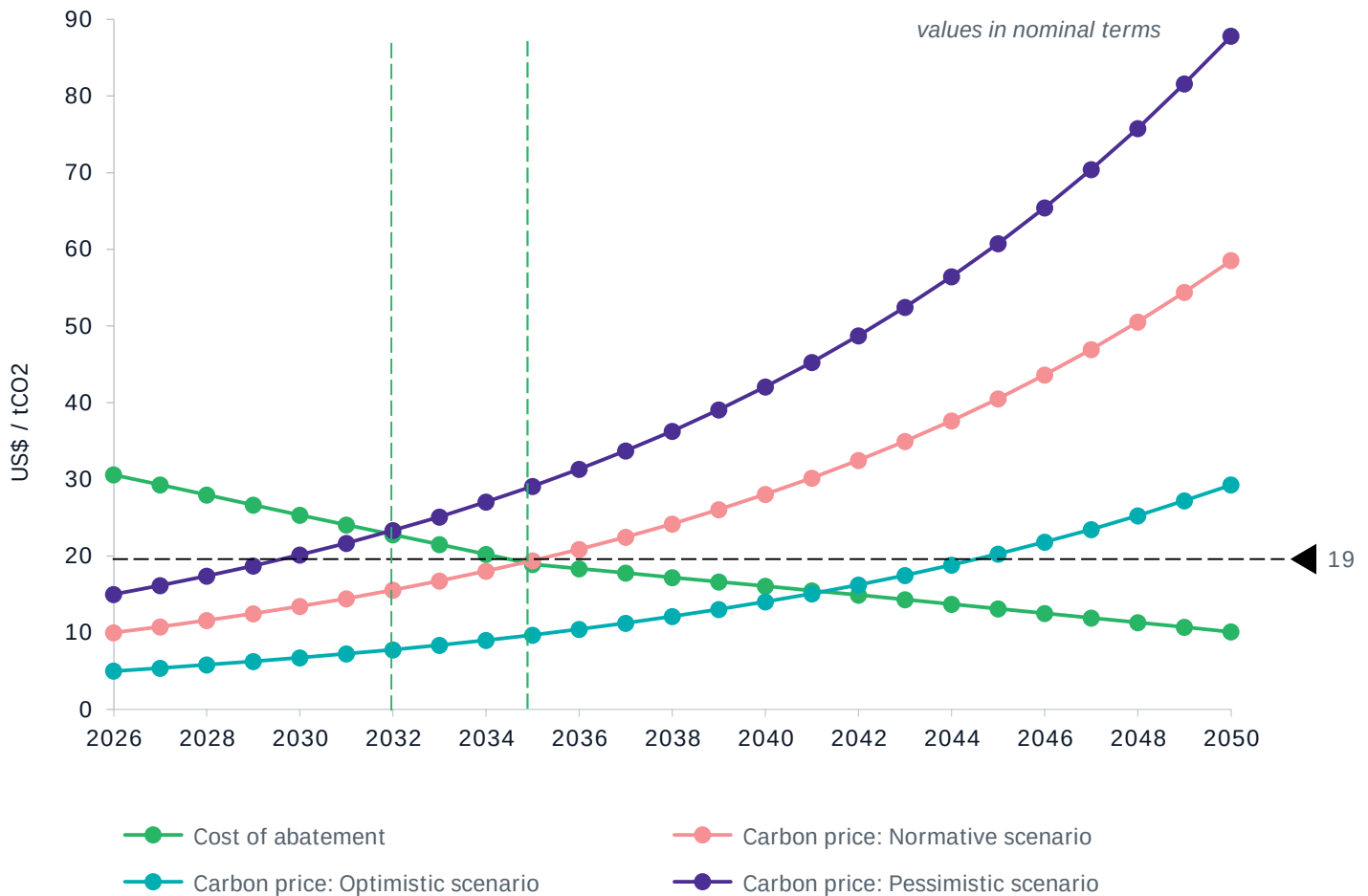
|                                   |                                  |                                      |                                         |
|-----------------------------------|----------------------------------|--------------------------------------|-----------------------------------------|
| 1. Efficient electrical equipment | 5. Optimising auxiliary power    | 9. Improving burnability of material | 13. Increasing fly ash to 35% in PPC    |
| 2. Waste Heat Recovery            | 6. Increasing slag to 70% in PSC | 10. Burner retrofit                  | 14. Renewable energy use in electricity |
| 3. Automation System              | 7. Enhancement in Kiln           | 11. High efficiency clinker coolers  | 15. Increasing TSR to 30% in kiln fuel  |
| 4. Efficient Grinding System      | 8. Heat rate reduction in CPP    | 12. Substitute OPC with LC3 cement   | 16. Carbon Capture                      |
|                                   |                                  |                                      | 17. Decreasing Clinker to 85% in OPC    |

Note: 1. Carbon capture costs includes capturing CO<sub>2</sub> from source, and excludes the costs of CO<sub>2</sub> for storage/utilization. 2. Cost savings are in nominal terms

Source: CEEW, EY-Parthenon Analysis

# The Indian cement industry stands to gain by investing in decarbonization technologies early on, as purchasing carbon credit certificates will become expensive in the future

## Indian Cement Industry: Cost of Abatement v/s Carbon Prices



## Insights

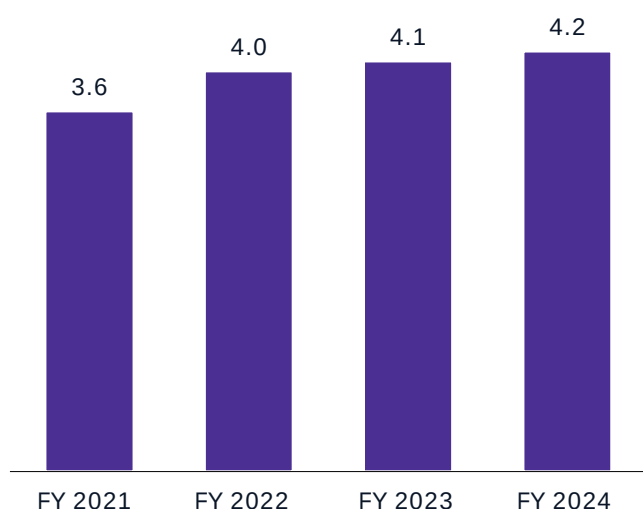
- By abating CO2 emissions at a cost lower than the carbon price, the cement industry may realize significant cost savings by overcoming the higher costs tied to carbon prices.
- In a normal scenario, it is projected that by the year 2036, the cost of decarbonization will drop below US\$19/tCO2. Concurrently, carbon prices in India are expected to rise above this level.
- As these technologies scale and mature in the coming years, the cost of decarbonization will continue to decline, creating stronger and faster incentives for the cement industry.

### Key notes:

- A carbon price scenario with a normative pricing of US\$10/tCO2 in 2026 has been taken into account for the analysis.
- In pessimistic and optimistic scenarios, the carbon price starts at US\$15 and US\$5, respectively.
- All identified decarbonization levers are considered simultaneously to plot the blended cost of abatement in each year.

Aluminum sector, with a total installed capacity of 4.2 MMT (primary), contributes to ~8% of India's industrial GHG emissions; CCTS targets mandatory reduction of ~4.3 MMT of CO<sub>2</sub> by FY27

#### India's primary aluminium production trend (MMT)



#### Highlights

- From FY2021 to FY2024, India's aluminum production has seen moderate growth, increasing from 3.6 MMT to 4.2 MMT, reflecting a CAGR of 5.3%.
- As of 2024, aluminum exports from India total around 2.45 MMT, of which 0.3 MMT is being exported to the European Union.
- Exports to the EU represented 30% of India's total aluminum exports in FY2023. However, this share dropped to 17% in FY2024, indicating the expected effects of carbon pricing under the CBAM.
- The aluminum sector in India accounts for 8% of the country's industrial GHG emissions, totaling 82.72 MMT CO<sub>2</sub> e (2023).
- The country recorded exports of aluminum and its related articles worth INR63,34 crore (US\$7.54 billion).

#### Parameters

#### Description

|                                                    |                                     |
|----------------------------------------------------|-------------------------------------|
| Global aluminum production (2024)                  | ~72 MMT                             |
| Indian aluminum market size                        | INR1,09,950 cr. (US\$12.14 billion) |
| India's share in global aluminum production (2024) | ~5.5%                               |
| Indian GHG emissions* (FY2024)                     | ~73 MMTCO <sub>2</sub> e            |

#### CCTS targets

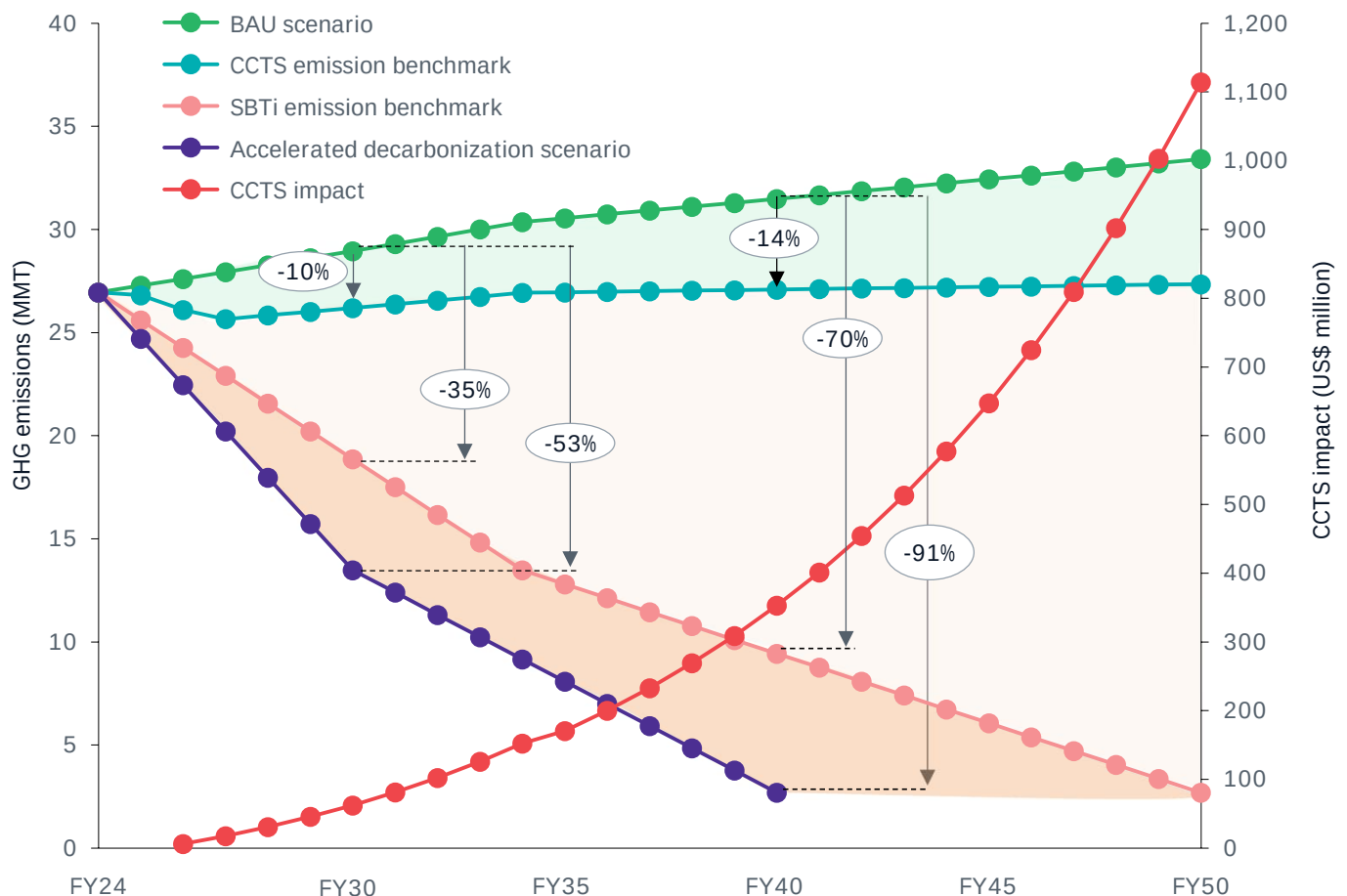
- Sectoral Reduction target
  - An average 4-7% reduction in emission intensity over baseline during compliance period would translate to ~4.3 MMT reduction of CO<sub>2</sub> e by FY27 (assuming constant installed capacity as per FY 2023-2024)
  - During the compliance period, based on the production forecast, there is a potential net decrease of ~1.74 MMT of CO<sub>2</sub> emissions

Source: EY-Parthenon Research, Annual reports, Ministry of commerce

\*Emissions include scope 1+ scope 2

## Case Study: A renowned aluminum company should start decarbonizing their assets to avoid CCTS penalties on 10-14% emissions differential from BaU

### Emission scenarios with CCTS/ SBTi mandates and cost saving potential



Source: EY-Parthenon Analysis

Note:

1. SBTi targets are aligned as per 1.5 Degree scenario with long term target of 50% emission reduction in 10 years and Net zero by 2050
2. Accelerated decarbonization scenario targets 50% emission reduction by 2030 and net zero by 2040
3. The Aluminium sector is projected to grow at 1.2% annually until FY 2035, after which the growth rate is expected to stabilize at 0.6% in the long term

The company would have to pay for these emissions in CCTS scheme in case of BAU scenario (eg: if company does not decarbonize)

The company would have an emission differential of 35% by 2030 and 70% by 2040 if compared with SBTi targets

The company would have an emission differential of 53% by 2030 and 91% by 2040 if compared with Accelerated Decarbonization targets

- The company would have to pay for the excess emissions above CCTS benchmark
- The CCTS penalty will differ as the growth rate increases and CCTS benchmark decreases if the company does not decarbonize

- Since the SBTi line is below CCTS emission benchmark, adherence to the same and having an accelerated decarbonization journey can help the company avoid CCTS penalties

Normative carbon pricing: The company is expected to face a financial implication of ~INR 1,179-1185 crore from 2026 to 2030 due to CCTS impact if no decarbonization is undertaken

#### Sensitivity analysis highlighting financial impact FY 26-30 (cr.)

| Sensitivity table                | Production growth scenario                                       | No growth | Pessimistic | Normative ( <i>textile growth benchmark</i> ) | Optimistic |
|----------------------------------|------------------------------------------------------------------|-----------|-------------|-----------------------------------------------|------------|
| CCTS Industry Benchmark scenario | %                                                                | 0%        | 0.6%        | 1.2%                                          | 1.8%       |
| As-is (Present)                  | As per BEE Gazette                                               | 1113-1119 | 1146-1152   | 1179-1185                                     | 1213-1219  |
| Industry Weighted Average        | Average of all plants (category wise) ( <i>in terms of GEI</i> ) | 1036-1042 | 1062-1068   | 1089-1095                                     | 1115-1121  |
| Pessimistic (stricter targets)   | -5% ( <i>GEI target lower Industry weighted avg</i> )            | 1362-1368 | 1395-1401   | 1429-1435                                     | 1464-1470  |
| Optimistic (lenient targets)     | +5% ( <i>GEI target higher than industry weighted avg</i> )      | 711-717   | 729-735     | 748-754                                       | 767-773    |

Source: EY-Parthenon Analysis



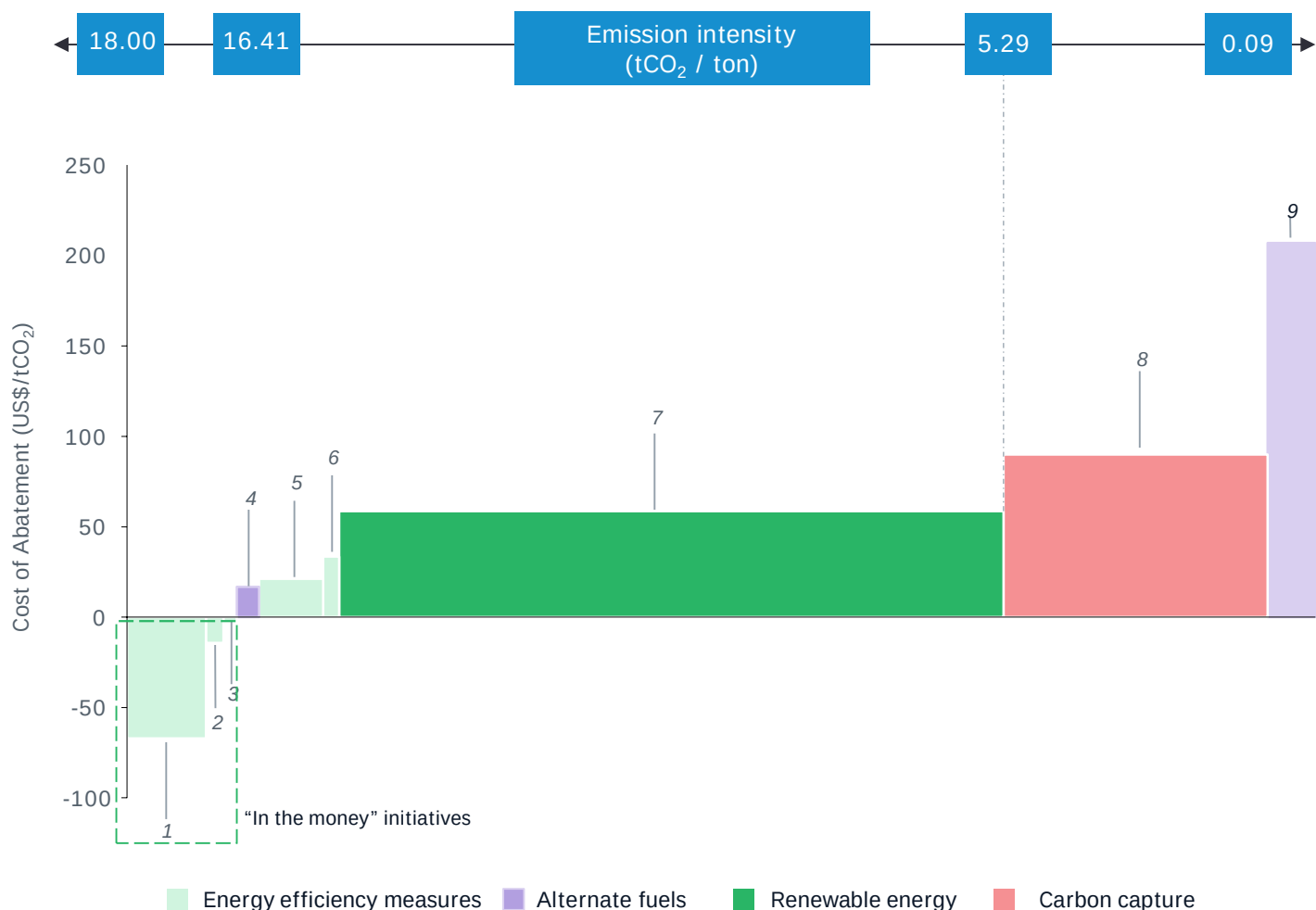
#### Insights

- In the BAU scenario, taking into account a 1.2% industry growth rate for aluminum, the company is projected to incur a financial impact of INR1,179-1,185 crore from 2026 to 2030, considering the carbon price at US\$10 per ton of CO<sub>2</sub>.
- The costs in the table represent the cost of not decarbonizing for the company plants.

#### Assumptions:

- Four plants of the company have been considered for analysis in this table (taken directly from the GoI Gazette by BEE).
- The financial impact is calculated cumulatively from 2025 to 2030. The net present value of the impact has been mentioned in the table.
- A carbon price scenario with a normative pricing of US\$10 has been taken into account for the analysis.
- Production growth scenarios have been built basis the aluminum sector trends in India.
- The "Industry Weighted Average" for GHG emission intensity has been considered for scenario analysis.
- The CCTS benchmark sensitivity scenarios have been built basis +5% and -5% of the "Industry Weighted Average" intensity benchmark.

RE is the key decarbonization lever for the Indian aluminium sector, particularly in the smelting process, with carbon capture and energy efficiency acting as other key measures



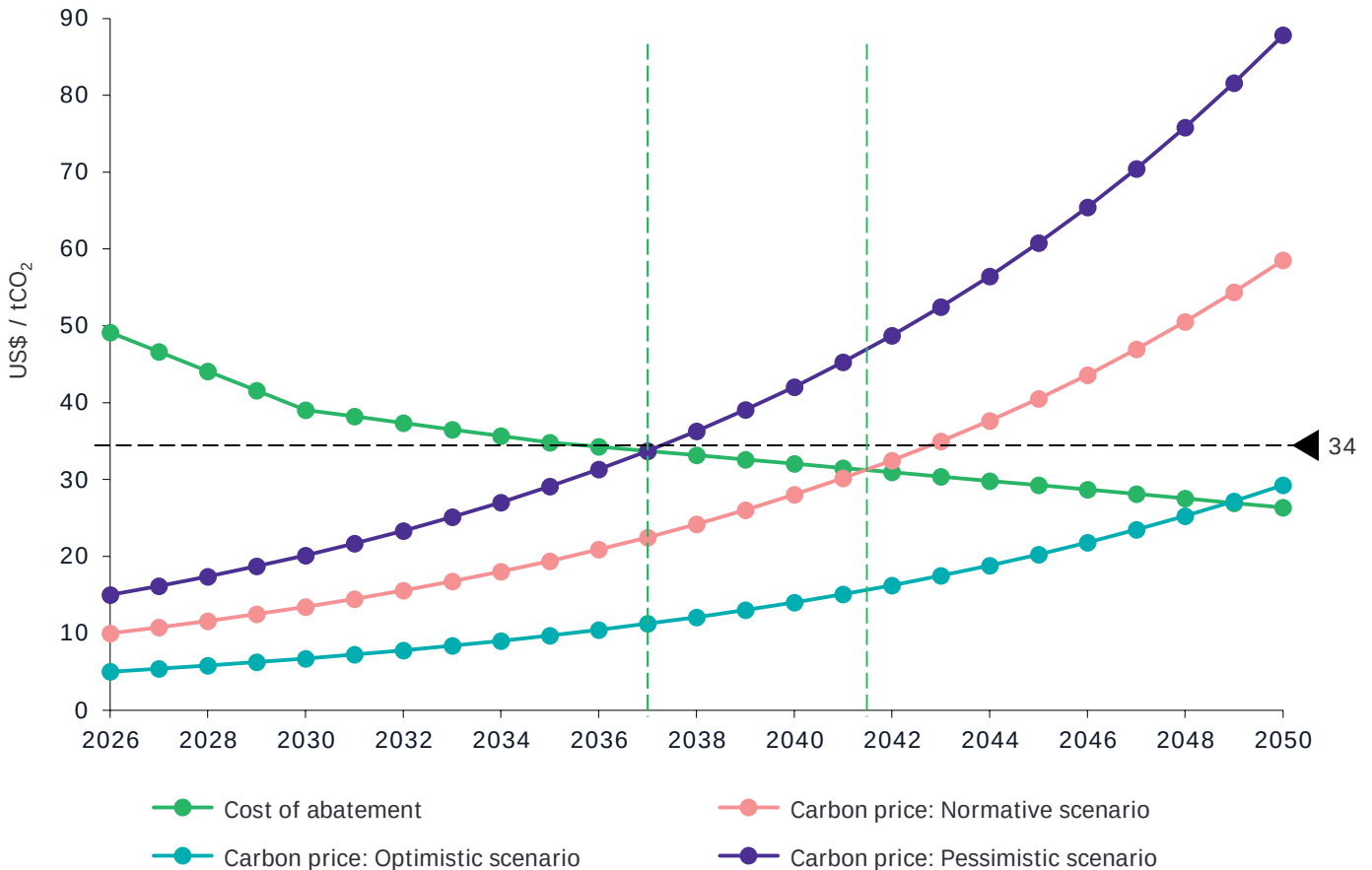
Source: CEEW, EY-Parthenon Analysis

Note: Carbon capture costs includes capturing CO<sub>2</sub> from source, and excludes the fate of captured CO<sub>2</sub> for storage/utilization

|                                |                                |                          |
|--------------------------------|--------------------------------|--------------------------|
| 1. Alumina EE                  | 4. Biomass fuel switch         | 7. Renewable electricity |
| 2. Aluminium energy efficiency | 5. Inert anodes                | 8. Carbon capture        |
| 3. Electrolysis off gas WHR    | 6. Cell operation optimization | 9. NG fuel switch        |

# The Indian aluminum industry may begin investing in decarbonization technologies now, as abatement costs are expected to fall below Indian carbon prices by the next decade

## Indian Aluminium Industry: Cost of Abatement v/s Carbon Prices



Source: EY-Parthenon Analysis

## Insights

- By abating CO<sub>2</sub> emissions at a cost lower than the carbon price, the aluminum industry may realize significant cost savings by overcoming the higher costs tied to carbon prices.
- In a pessimistic scenario, it is projected that by the year 2037, the cost of decarbonization will drop below US\$34/tCO<sub>2</sub>. Concurrently, carbon prices in India are expected to rise above this level.
- As the technologies scale further and matures in upcoming years, the cost of decarbonization decreases further, leading to quicker incentivization for the aluminum industry.

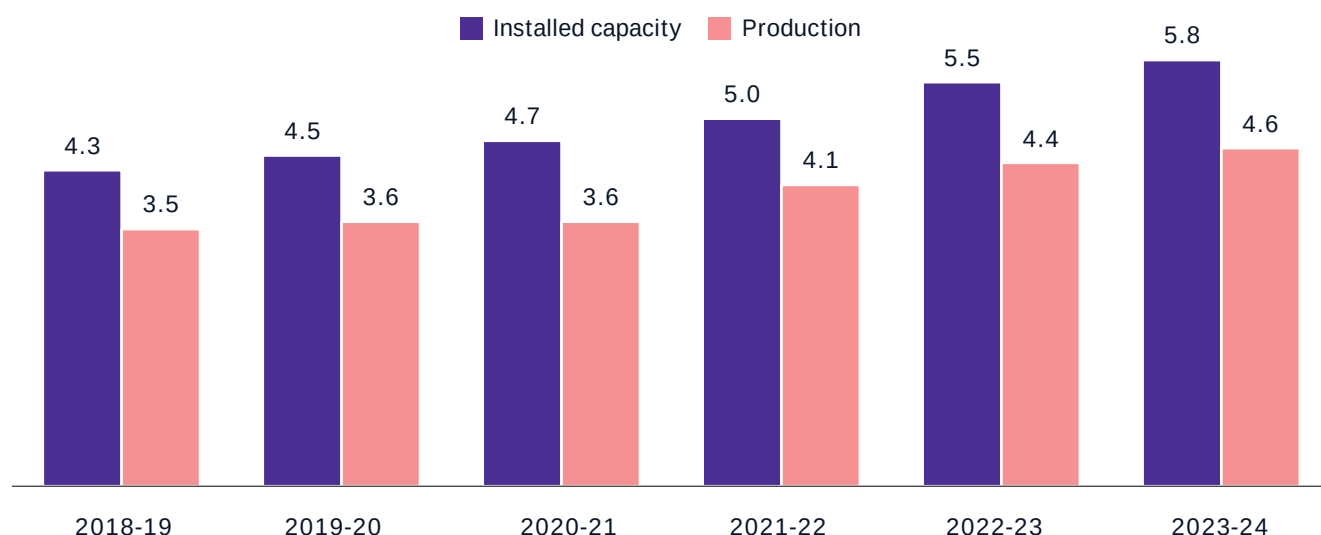
### Assumptions:

- A carbon price scenario with a normative pricing of US\$10/tCO<sub>2</sub> in 2026 has been taken into account for the analysis.
- In pessimistic and optimistic scenarios, carbon price starts at US\$15 and US\$5, respectively.
- All identified decarbonization levers are considered at once to plot the blended cost of abatement in each year.

Source: EY-Parthenon Analysis

# Overview of the caustic soda market size, production trends, capacity and the import and export market; CCTS targets a mandatory reduction of ~0.66 MMT of CO<sub>2</sub> by FY27

India's Caustic Soda production trend (MMT)



## Highlights

- The caustic soda sector operates at a capacity utilization of ~80% and is growing at a CAGR of 6.2%.
- Indian exports of caustic soda reached 465 KT in 2023-24, while imports have significantly decreased over the years, totaling 221 KT in the same period.
- The production of chlorine during 2023-24 was 40.87 lakh MMT, compared to 39.63 lakh MMT in 2022-23, an increase of 3.1%.
- India recently introduced a new environmental framework for caustic soda manufacturing, establishing emission and effluent standards to regulate hydrochloric acid emissions and limit wastewater generation, effective March 2026.



## Parameters

## Description

Global caustic soda production (2024)

~98 million metric ton

Indian caustic soda market size

INR32,000–35,000 cr (~US\$3.8-4.2 billion)

India's share in global caustic soda production

~5.5%

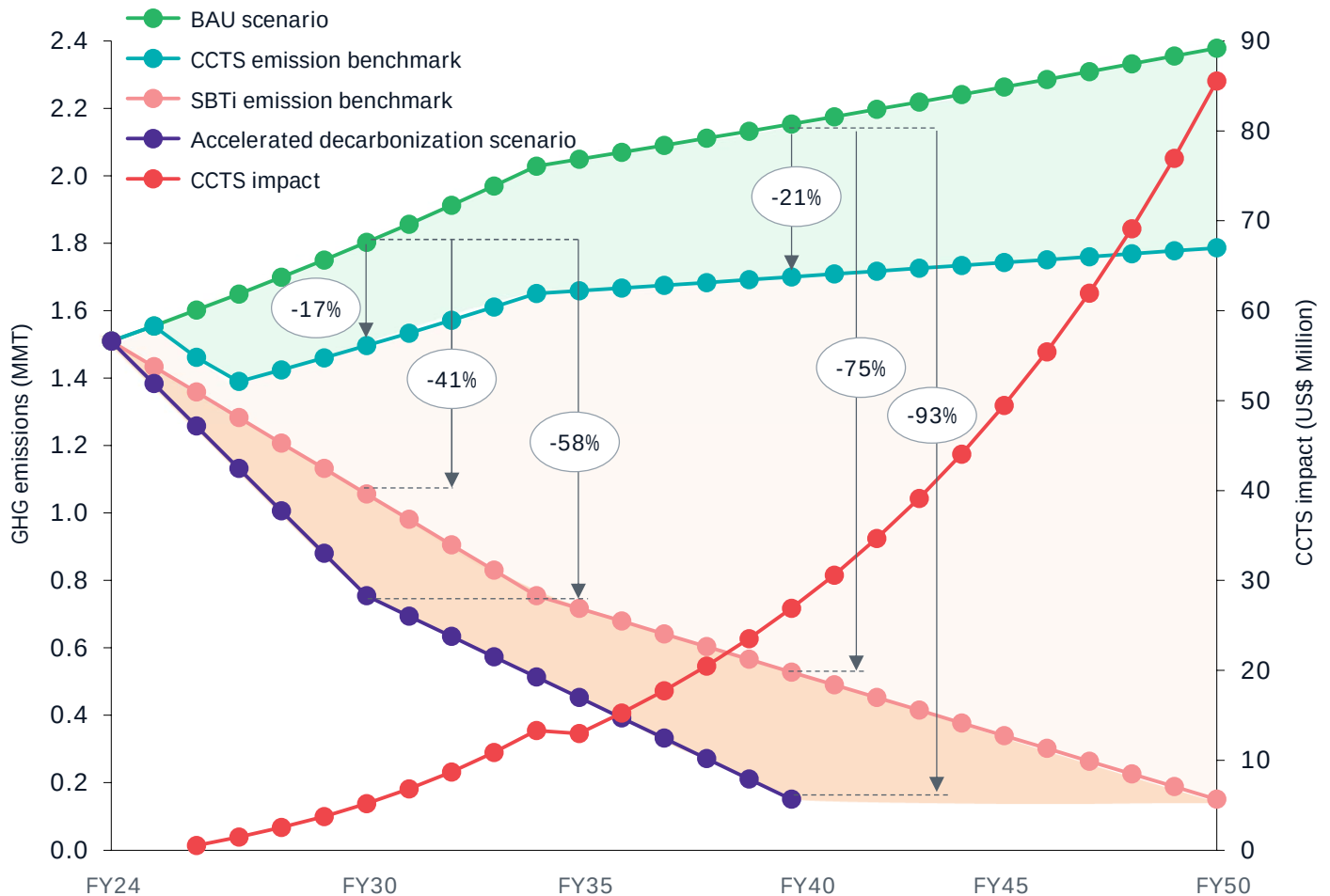
## CCTS targets

- Sectoral reduction target
  - An average 6%-9% reduction in emission intensity over the baseline during the compliance period.
  - This would translate to ~0.66 MMT reduction of CO<sub>2</sub> e by FY27.

Source: EY-Parthenon Analysis

## Case Study: A leading company should start decarbonizing their assets to avoid CCTS penalties on 17-21% emissions differential from BaU

### Emission scenarios with CCTS/ SBTi mandates and cost saving potential



Note:

- SBTi targets are aligned as per 1.5 Degree scenario with long term target of 50% emission reduction in 10 years and Net zero by 2050
- Accelerated decarbonization scenario targets 50% emission reduction by 2030 and net zero by 2040
- The Chlor-alkali sector is projected to grow at 3% annually until FY 2035, after which the growth rate is expected to stabilize at 1% in the long term

The company would have to pay for these emissions in CCTS scheme in case of BAU scenario (eg: if company does not decarbonize)

The company would have an emission differential of 41% by 2030 and 75% by 2040 if compared with SBTi targets

The company would have an emission differential of 58% by 2030 and 93% by 2040 if compared with Accelerated Decarbonization targets

- The company would have to pay for the excess emissions above CCTS benchmark
- The CCTS penalty will differ as the growth rate increases and CCTS benchmark decreases if the company does not decarbonize

- Since the SBTi line is below CCTS emission benchmark, adherence to the same and having an accelerated decarbonization journey can help the company avoid CCTS penalties

Source: EY-Parthenon Analysis

## Normative carbon pricing: The company is expected to incur a financial implication of ~INR 94-100 cr. from 2026 to 2030 due to the impact of CCTS

### Sensitivity Analysis highlighting financial impact FY 26-30 (cr.)

| Sensitivity table                | Production growth scenario                                       | No growth | Pessimistic | Normative ( <i>textile growth benchmark</i> ) | Optimistic |
|----------------------------------|------------------------------------------------------------------|-----------|-------------|-----------------------------------------------|------------|
| CCTS industry benchmark scenario | %                                                                | 0%        | 1%          | 3%                                            | 5%         |
| As-is (Present)                  | As per BEE Gazette                                               | 81-87     | 86-92       | 94-100                                        | 104-110    |
| Industry weighted average        | Average of all plants (category wise) ( <i>in terms of GEI</i> ) | 104-110   | 109-115     | 118-124                                       | 128-134    |
| Pessimistic (stricter targets)   | -5% ( <i>GEI target lower than Industry weighted avg</i> )       | 104-110   | 109-115     | 118-124                                       | 128-134    |
| Optimistic (lenient targets)     | +5% ( <i>GEI target higher than Industry weighted avg</i> )      | 103-109   | 108-114     | 118-124                                       | 127-133    |



### Insights

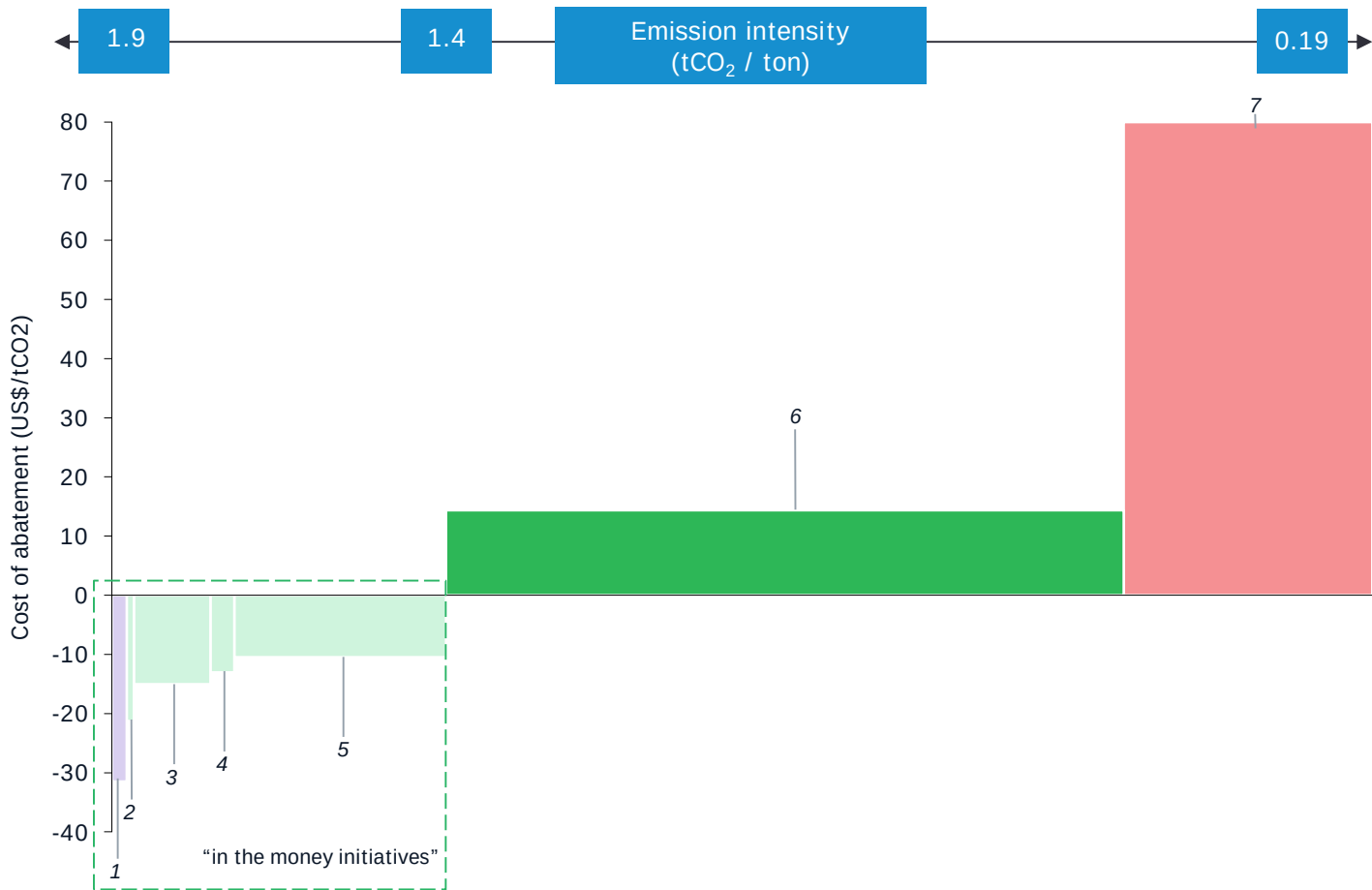
- In the BAU scenario, taking into account a 3% industry growth rate for chlor-alkali, the company is projected to experience a financial impact of INR94-100 crore from 2025 to 2030, considering the carbon price at US\$10 per ton of CO2 equivalent.
- The costs in the table represent the cost of not decarbonizing for the company's plants.

#### Assumptions:

- Two plants of the company have been considered for analysis in this table (taken directly from the GoI Gazette by BEE).
- The financial impact is calculated cumulatively from 2026 to 2030. The net present value of the impact has been mentioned in the table.
- A carbon price scenario with a normative pricing of US\$10 has been taken into account for the analysis
- Production growth scenarios have been built basis the chlor-alkali sector trends in India.
- The "Industry Weighted Average" for GHG emission intensity has been considered for scenario analysis.
- The CCTS benchmark sensitivity scenarios have been built basis +5% and -5% of the "Industry Weighted Average" intensity benchmark.

Source: EY-Parthenon Analysis

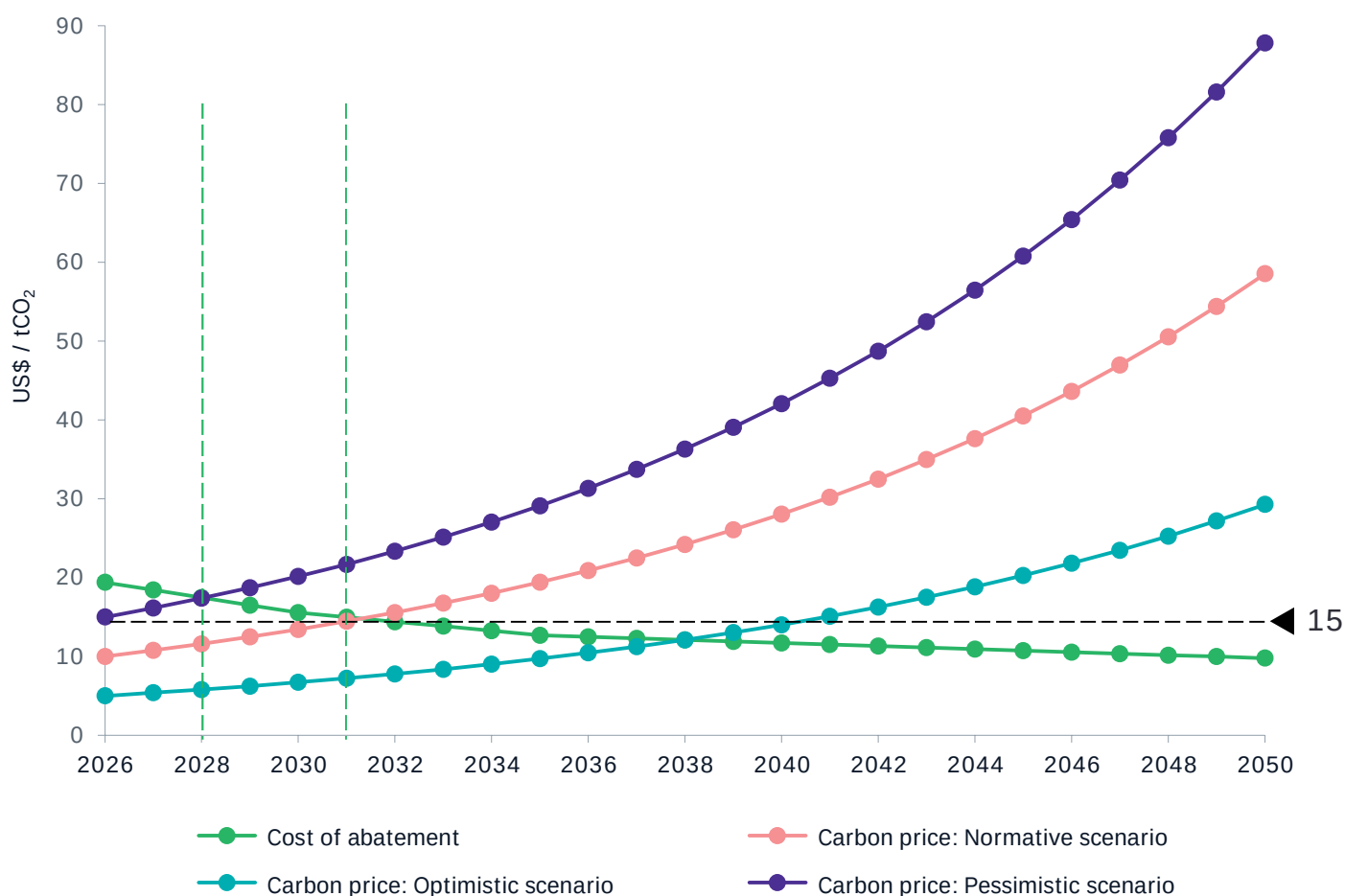
# RE is the key decarbonization lever for the Indian Chlor-Alkali sector, with energy efficiency measures acting as important abatement lever



|                              |                       |                                   |
|------------------------------|-----------------------|-----------------------------------|
| 1. Digital twin              | 3. MVR                | 5. Zero gap electrolysis          |
| 2. Brine temperature control | 4. Brine purification | 6. Renewable electricity (80% RE) |
|                              |                       | 7. Carbon capture                 |

# The Indian Chlor Alkali sector may start investing in decarbonization technologies now, as the cost of abatement is projected to drop below the Indian carbon prices in next 5 years

## Indian Chlor-Alkali Industry: Cost of Abatement v/s Carbon Prices



## Insights

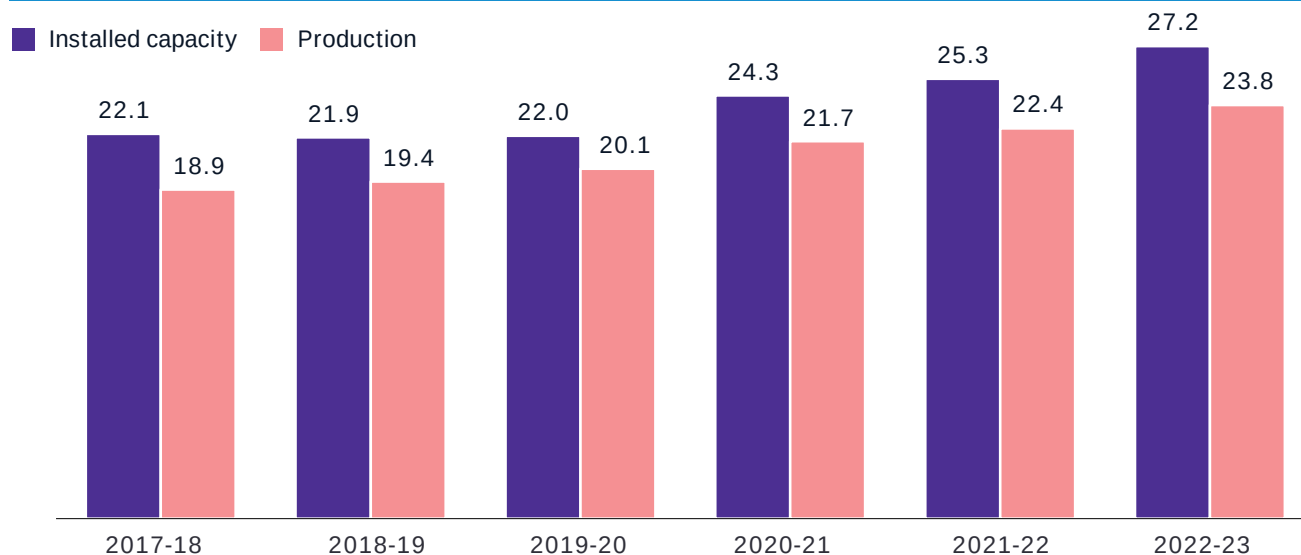
- By abating CO<sub>2</sub> emissions at a cost lower than the carbon price, chlor-alkali industry may realize significant cost savings by overcoming the higher costs tied to carbon prices.
- In a normative scenario, it is projected that by the year 2031, the cost of decarbonization will drop below US\$15/tCO<sub>2</sub>. Concurrently, carbon prices in India are expected to rise above this level.
- As the technologies scale further and matures in upcoming years, the cost of decarbonization decreases further, leading to quicker incentivization for the chlor-alkali sector.

### Assumptions:

- A carbon price scenario with a normative pricing of US\$10/tCO<sub>2</sub> in 2026 has been taken into account for the analysis.
- In the pessimistic and optimistic scenarios, carbon price starts at US\$15 and US\$5, respectively.
- All identified decarbonization levers are considered at once to plot the blended cost of abatement in each year.

# Overview of the paper industry market size, production trends, capacity and import and export markets; CCTS targets a mandatory reduction of ~750 KT of CO<sub>2</sub> by FY27

## India's paper industry production trend (MMT)



## Highlights

- The paper industry operates at a capacity utilization of ~88% and at a CAGR of 5.8%.
- Import of paper, paperboard and newsprint has grown from 1.785 MMT in 2010-11 to 2.59 MMT in 2023-24
  - Overall, Imports have risen at a CAGR of 11% in value terms (from INR 3,411 cr. in 2010-11 to INR 13,248 cr. in 2023-24)
- Exports of paper, paperboard and newsprint have increased almost three times from 0.53 MMT in 2010-11 to 1.56 MMT in 2023-24.
- FDI inflows in paper and pulp until September 2024 was INR15,121 crore (US\$1.74 billion).

## Parameters

## Description

|                                    |                            |
|------------------------------------|----------------------------|
| No of paper mills                  | 850-870 (~520 operational) |
| Annual revenue                     | INR80,000 crore            |
| India's share in global production | 5-6%                       |
| Production capacity                | 27.15 MMT                  |

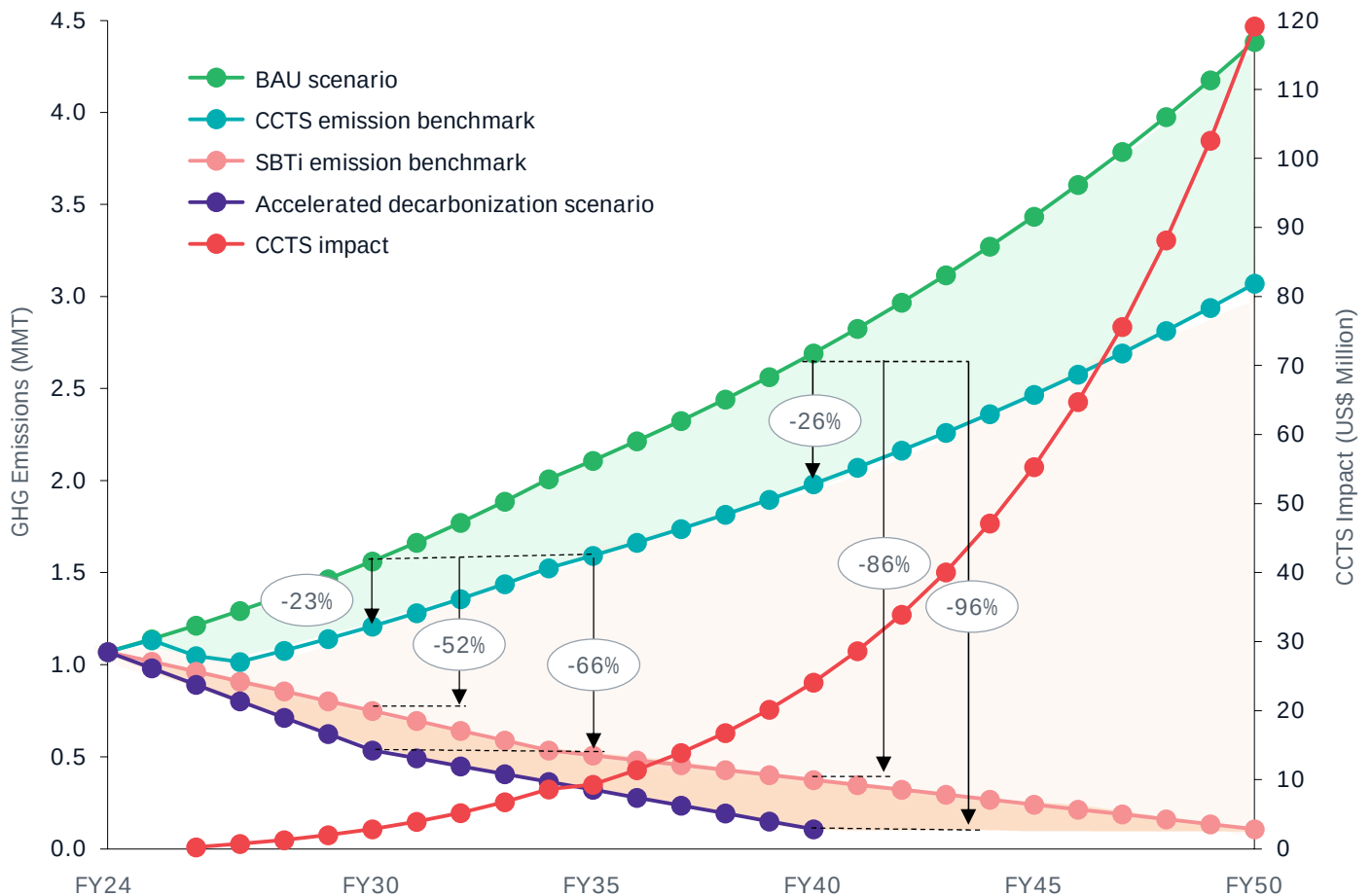
## CCTS targets

- Sectoral reduction target
  - An average 4% to 9% reduction in emission intensity over the baseline during the compliance period would translate to ~750 KT reduction of CO<sub>2</sub>e by FY27 (assuming constant installed capacity as per FY 2023-2024).
  - During the compliance period, based on the production forecast, there is a potential net increase of ~240 KT of CO<sub>2</sub>e emissions.

Source: EY-Parthenon Analysis

## Case study: A leading paper & pulp company should begin decarbonizing its assets to avoid CCTS penalties on a 23% to 26% emissions gap from BAU

### Emission scenarios with CCTS/ SBTi mandates and cost saving potential



#### Note:

1. SBTi targets are aligned as per 1.5 Degree scenario with long term target of 50% emission reduction in 10 years and net zero by 2050
2. Accelerated decarbonization scenario targets 50% emission reduction by 2030 and net zero by 2040
3. The paper and pulp sector is projected to grow at 6.5% annually until FY 2035, after which the growth rate is expected to stabilize at 5% in the long term

The company would have to pay for these emissions in CCTS scheme in case of BAU scenario (eg: if company does not decarbonize)

The company would have an emission differential of 52% by 2030 and 86% by 2040 if compared with SBTi targets

The company would have an emission differential of 66% by 2030 and 96% by 2040 if compared with Accelerated Decarbonization targets

- The company would have to pay for the excess emissions above CCTS benchmark
- The CCTS penalty will differ as the growth rate increases and CCTS benchmark decreases if the company does not decarbonize

- Since the SBTi line is below CCTS emission benchmark, adherence to the same and having an accelerated decarbonization journey can help the company avoid CCTS penalties

Source: EY-Parthenon Analysis

Normative carbon pricing: The company is expected to incur a financial implication of ~INR 23-29 crores from 2026 to 2030 due to the impact of CCTS, if no decarbonization is undertaken

#### Sensitivity Analysis highlighting financial impact FY 26-30 (cr.)

| Sensitivity table                | Production growth scenario                                 | No Growth | Pessimistic | Normative ( <i>paper and pulp growth</i> ) | Optimistic |
|----------------------------------|------------------------------------------------------------|-----------|-------------|--------------------------------------------|------------|
| CCTS industry benchmark scenario | %                                                          | 0%        | 4%          | 6%                                         | 8%         |
| As-is (Present)                  | As per BEE Gazette                                         | 17-23     | 21-27       | 23-29                                      | 25-31      |
| Industry weighted average        | Average of all plants (category wise)<br>(in terms of GEI) | 26-32     | 31-38       | 33-39                                      | 36-42      |
| Pessimistic (stricter targets)   | -5%<br>(GEI target lower Industry weighted avg)            | 32-38     | 38-44       | 41-47                                      | 44-50      |
| Optimistic (lenient targets)     | +5%<br>(GEI target higher than industry weighted avg)      | 20-26     | 24-30       | 26-32                                      | 28-34      |

Source: EY-Parthenon Analysis



#### Insights

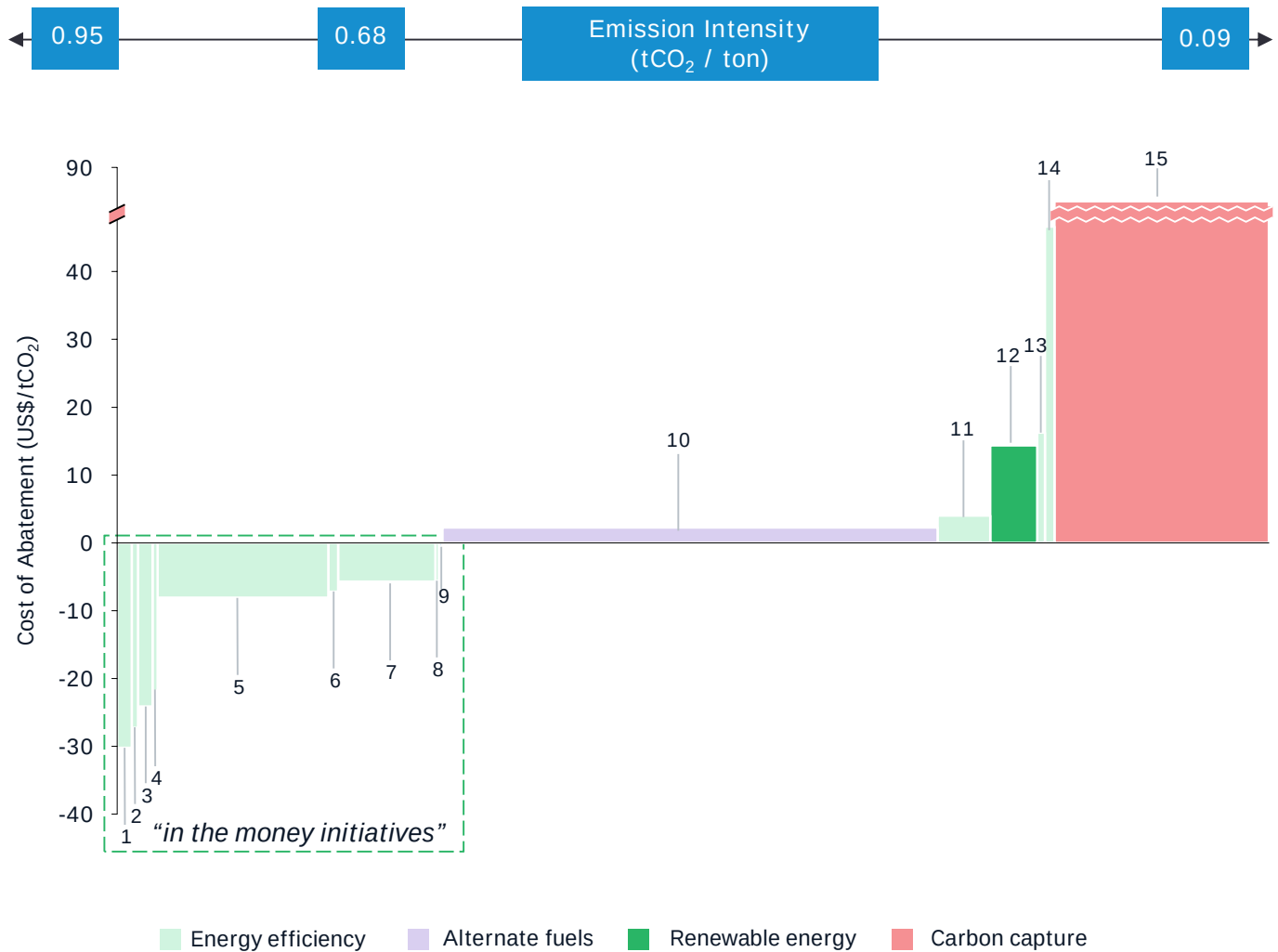
- In the BAU scenario, taking into account a 6% industry growth rate for the paper and pulp industry, the company is projected to experience a financial impact of INR24-29 crore from 2026 to 2030, considering the carbon price at US\$10 per ton of CO2 equivalent.
- The costs in the table represent the cost of not decarbonizing for the company.

#### Assumptions:

- Three plants of the company have been considered for analysis in this table (taken directly from the Gol Gazette by BEE).
- The financial impact is calculated cumulatively from 2025 to 2030. The net present value of the impact has been mentioned in the table.
- A carbon price scenario with a normative pricing of US\$10 has been taken into account for the analysis
- Production growth scenarios have been built basis the paper and pulp sector trends in India.
- The "Industry Weighted Average" for GHG emission intensity has been considered for scenario analysis.
- The CCTS benchmark sensitivity scenarios have been built basis +5% and -5% of the "Industry Weighted Average" intensity benchmark.

Source: EY-Parthenon Analysis

## Substituting coal with biomass in the paper and pulp industry is the biggest lever to abate emissions associated with thermal energy, followed by energy efficiency measures



|                                |                                 |                        |                                 |                        |
|--------------------------------|---------------------------------|------------------------|---------------------------------|------------------------|
| 1. Pumping optimization        | 4. Vacuum system optimization   | 7. Heat recovery       | 10. 60% coal subt. With biomass | 13. Efficient refiners |
| 2. Advanced process control    | 5. Enclosed paper machine hoods | 8. Efficient rotors    | 11. Shoe press                  | 14. Gap forming        |
| 3. Turbo fans in vacuum system | 6. Usage of thermo-compressors  | 9. Efficient screening | 12. 100% renewable electricity  | 15. Carbon capture     |

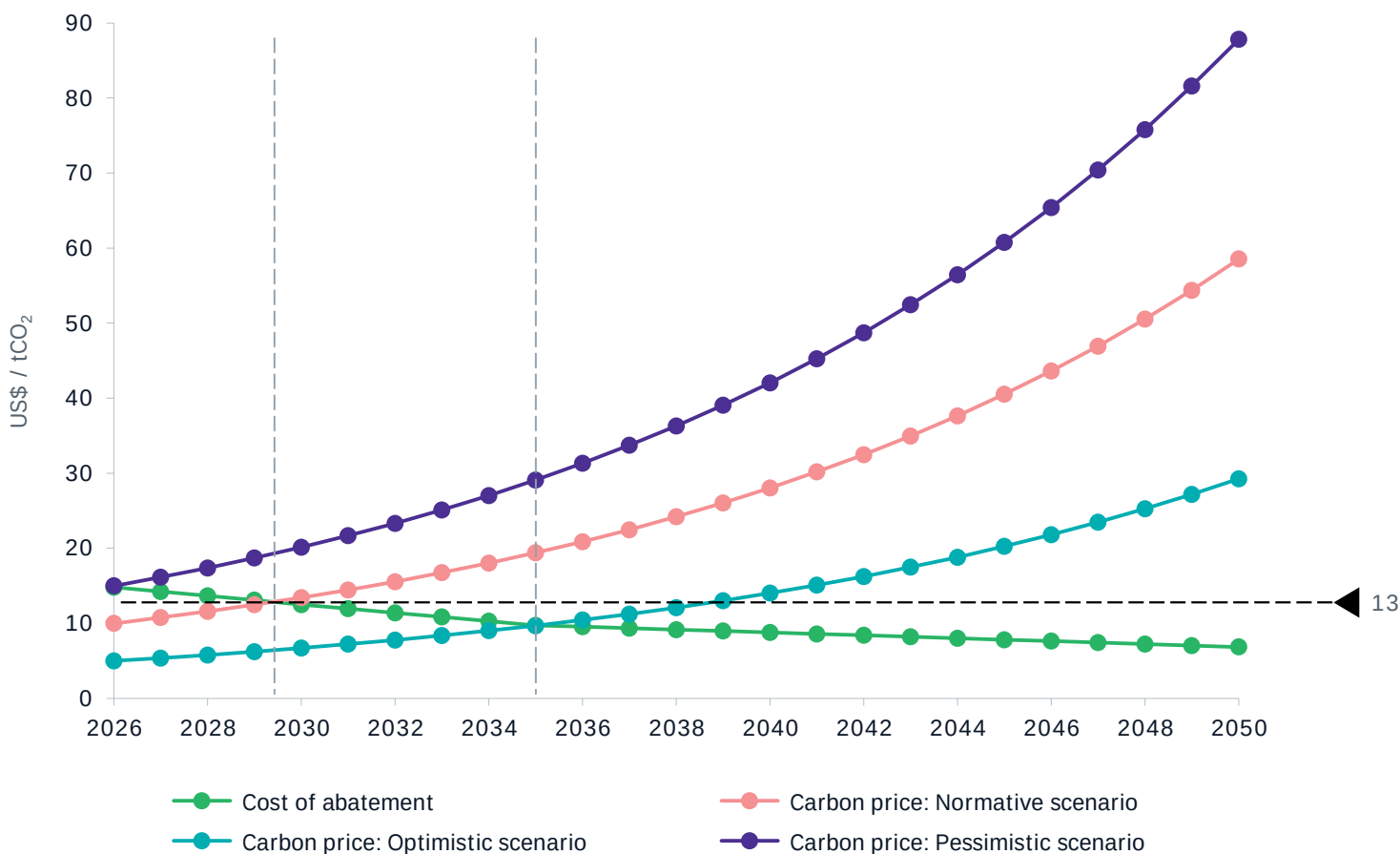
### Note:

1. The decarbonization levers is identified for the RCF (Recycled) paper making process which is the major paper production pathway in India
2. Carbon capture costs includes capturing CO<sub>2</sub> from source, and excludes the fate of captured CO<sub>2</sub> for storage/utilization.
3. The analysis considers specific power consumption of 535 kWh/t paper from coal fired captive power plant; 2.52 t steam/t paper consumption from coal fired boilers. Analysis is normalized for 0.95 tCO<sub>2</sub> /t paper

Source: EY-Parthenon Analysis

# The Indian paper and pulp sector may start investing in decarbonization technologies now, as the cost of abatement is projected to drop below Indian carbon prices in the next four years

## Indian Pulp & Paper Industry: Cost of Abatement v/s Carbon Prices



## Insights

- By abating CO<sub>2</sub> emissions at a cost lower than the carbon price, the paper and pulp industry may realize significant cost savings by overcoming the higher costs tied to carbon prices.
- In a normative scenario, it is projected that by the year 2029, the cost of decarbonization will drop below US\$15/tCO<sub>2</sub>. Concurrently, carbon prices in India are expected to rise above this level.
- As the technologies scale further and mature in the upcoming years, the cost of decarbonization decreases further, leading to quicker incentivization for the paper and pulp industry.

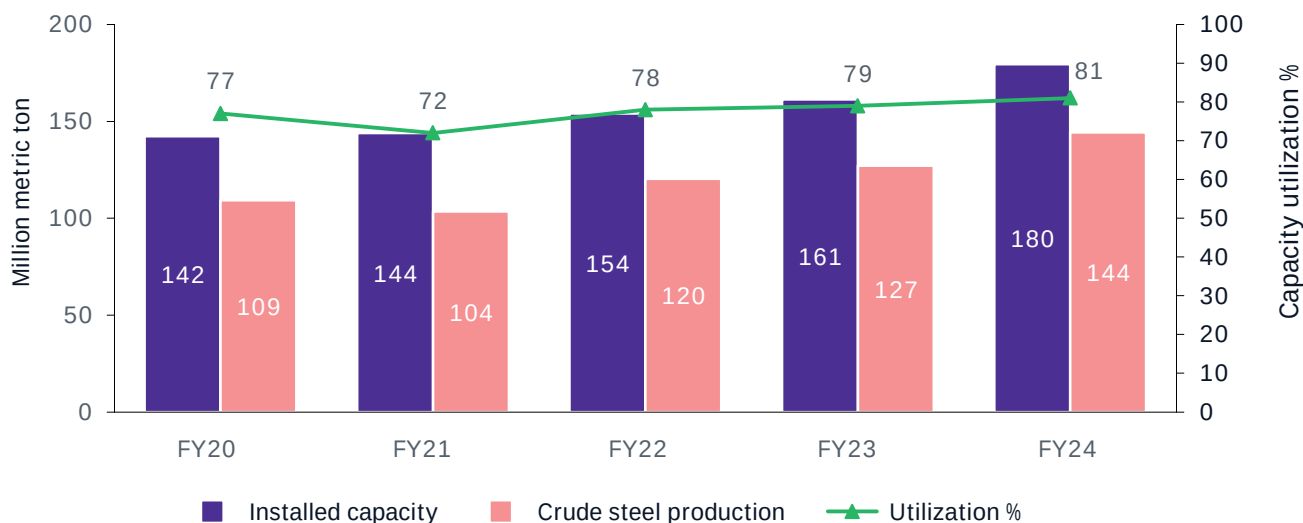
### Assumptions:

- A carbon price scenario with a normative pricing of US\$10/tCO<sub>2</sub> in 2026 has been taken into account for the analysis.
- In pessimistic and optimistic scenarios, the carbon price starts at US\$15 and US\$5, respectively.
- All identified decarbonization levers are considered at once to plot the blended cost of abatement in each year.

Source: EY-Parthenon Analysis

Globally, India is the second-largest producer of crude steel and is on track to achieve 255 MMT production by FY31

### India's Iron and Steel industry trend (MMT)



### Highlights

- India aims to reach 300 MMT installed capacity by FY31 under the National Steel Policy.
- Domestic steel demand is growing at 9%-10% Y-o-Y, led by end-use sectors like automotive, infrastructure and construction sectors.
- The PLI Scheme expected to add 26 MMT of specialty capacity, INR42,500 crore investment.
- India has developed a Green Steel Taxonomy to standardize definitions.
  - The emission intensity reduction targets for the companies fall in the range of 4% to 9% over the baseline during the compliance period.
  - This would translate to ~19.5 MMT reduction of CO<sub>2</sub>e by FY27 (assuming constant installed capacity as per FY 2023-2024).

### Parameters

### Description

|                                         |                                           |
|-----------------------------------------|-------------------------------------------|
| Global Steel Production (2024)          | 1,882 million metric tons                 |
| India's global rank in steel production | 2 <sup>nd</sup>                           |
| Global crude steel EI                   | 1.92 tCO <sub>2</sub> per ton crude steel |
| India's crude steel EI                  | 2.55 tCO <sub>2</sub> per ton crude steel |

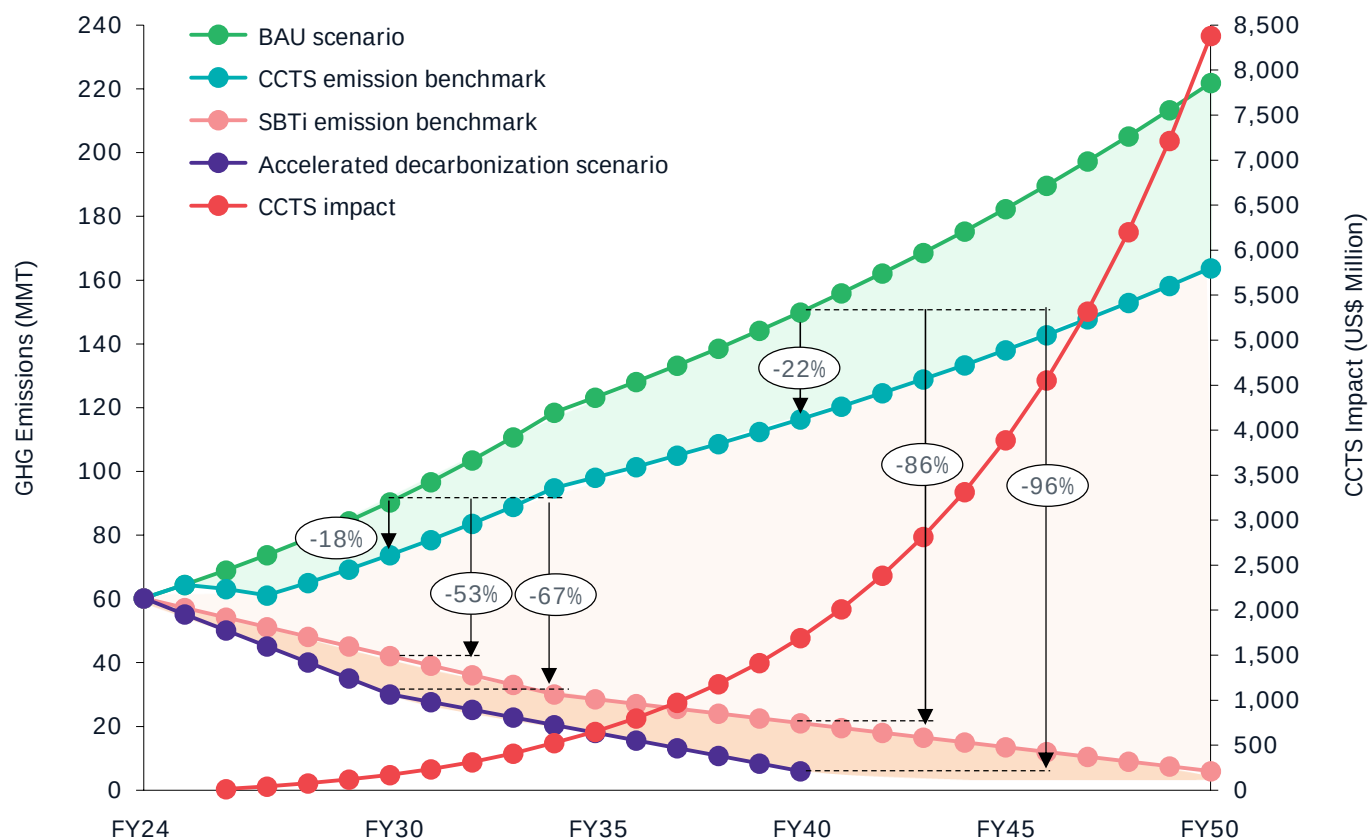
### CCTS targets

- Sectoral Reduction target
  - The emission intensity reduction targets for the companies fall in the range of 4% to 9% over the baseline during the compliance period
  - This would translate to ~19.5 MMT reduction of CO<sub>2</sub>e by FY27 (assuming constant installed capacity as per FY 2023-2024)

Source: EY-Parthenon Analysis

## Case study: A major iron and steel company should start decarbonizing its assets to avoid CCTS penalties on 18% to 22% emissions differential from BAU

### Emission scenarios with CCTS/ SBTi mandates and cost saving potential



Source: EY-Parthenon Analysis

#### Note:

- SBTi targets are aligned as per 1.5 Degree scenario with long term target of 50% emission reduction in 10 years and net zero by 2050
- Accelerated decarbonization scenario targets 50% emission reduction by 2030 and net zero by 2040
- The iron and steel sector is projected to grow at 7% annually until FY 2035, after which the growth rate is expected to stabilize at 5% in the long term

The company would have to pay for these emissions in CCTS scheme in case of BAU scenario (eg: if company does not decarbonize)

The company would have an emission differential of 53% by 2030 and 86% by 2040 if compared with SBTi targets

The company would have an emission differential of 67% by 2030 and 96% by 2040 if compared with Accelerated Decarbonization targets

- The company would have to pay for the excess emissions above CCTS benchmark
- The CCTS penalty will differ as the growth rate increases and CCTS benchmark decreases if the company does not decarbonize

- Since the SBTi line is below CCTS emission benchmark, adherence to the same and having an accelerated decarbonization journey can help the company avoid CCTS penalties

Normative carbon pricing: The company is expected to incur a financial implication of INR3010-3016 crore from 2026 to 2030 due to the impact of CCTS if no decarbonization is undertaken

#### Sensitivity Analysis highlighting financial impact FY 26-30 (cr.)

| Sensitivity Table                | Production growth scenario                              | No Growth | Pessimistic | Normative (iron and steel growth) | Optimistic |
|----------------------------------|---------------------------------------------------------|-----------|-------------|-----------------------------------|------------|
| CCTS Industry Benchmark scenario | %                                                       | 0%        | 5%          | 7%                                | 9%         |
| As-is (Present)                  | As per BEE Gazette                                      | 2173-2179 | 2747-2753   | 3010-3016                         | 3295-3301  |
| Industry Weighted Average        | Average of all plants (category wise) (in terms of GEI) | 3600-3606 | 4457-4463   | 4846-4852                         | 5266-5272  |
| Pessimistic (stricter targets)   | -5% (GEI target lower Industry weighted avg)            | 4665-4671 | 5758-5764   | 6254-6260                         | 6876-6882  |
| Optimistic (lenient targets)     | +5% (GEI target higher than Industry weighted avg)      | 2537-2543 | 3158-3164   | 3441-3447                         | 3746-3752  |



#### Insights

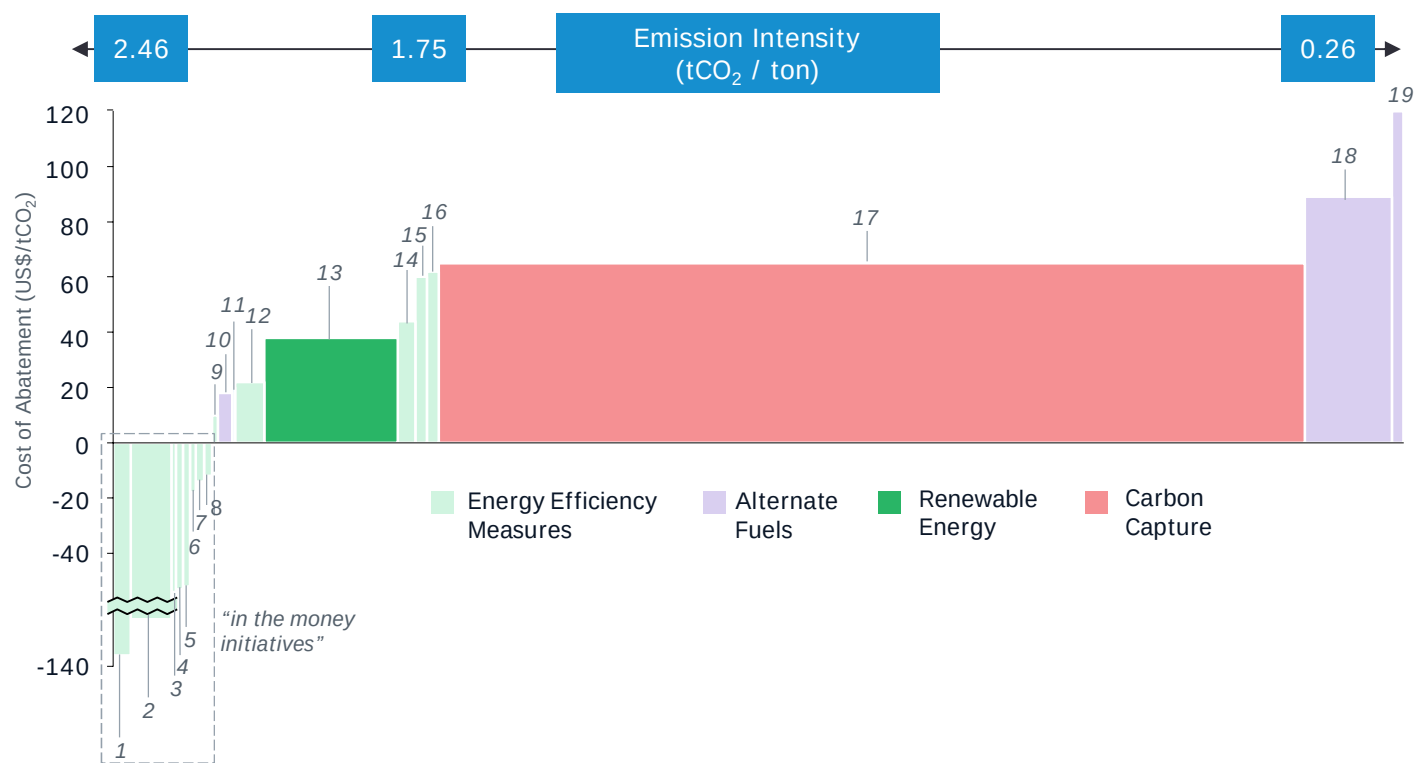
- In the BAU scenario, taking into account a 7% industry growth rate for the iron and steel industry, the company is projected to experience a financial impact of INR3,010-3,016 crore from 2026 to 2030, considering the carbon price at US\$10 per ton of CO<sub>2</sub>eq
- The costs in the table represent the cost of not decarbonizing for the company plants

#### Assumptions:

- Three plants of the company have been considered for analysis in this table (taken directly from the GoI Gazette by BEE)
- The financial impact is calculated cumulatively from 2025 to 2030. The net present value of the impact has been mentioned in the table.
- A carbon price scenario with normative pricing of US\$10 has been taken into account for the analysis
- Production growth scenarios have been built basis the iron and steel sector trends in India.
- The "Industry Weighted Average" for GHG emission intensity has been considered for scenario analysis
- The CCTS benchmark sensitivity scenarios have been built basis +5% and -5% of the "Industry Weighted Average" intensity benchmark.

Source: EY-Parthenon Analysis

## Carbon capture is the most crucial lever to abate emissions associated in BF-BOF steelmaking process in India, followed by energy efficiency measures



|                                        |                                 |                                    |                                 |                         |
|----------------------------------------|---------------------------------|------------------------------------|---------------------------------|-------------------------|
| 1. Increasing PCI rate                 | 5. Stove sensible heat recovery | 9. BOF gas: sensible heat recovery | 13. Renewable energy            | 17. Carbon capture      |
| 2. COG use                             | 6. Variable speed drives        | 10. Biomass injection              | 14. TRT                         | 18. NG injection in BF  |
| 3. Increasing sinter burner efficiency | 7. Cogeneration                 | 11. Cmc                            | 15. Sinter cooler heat recovery | 19. GH2 injection in BF |
| 4. Energy monitoring system            | 8. Preventive maintenance       | 12. Cdq                            | 16. Slag heat recovery          |                         |

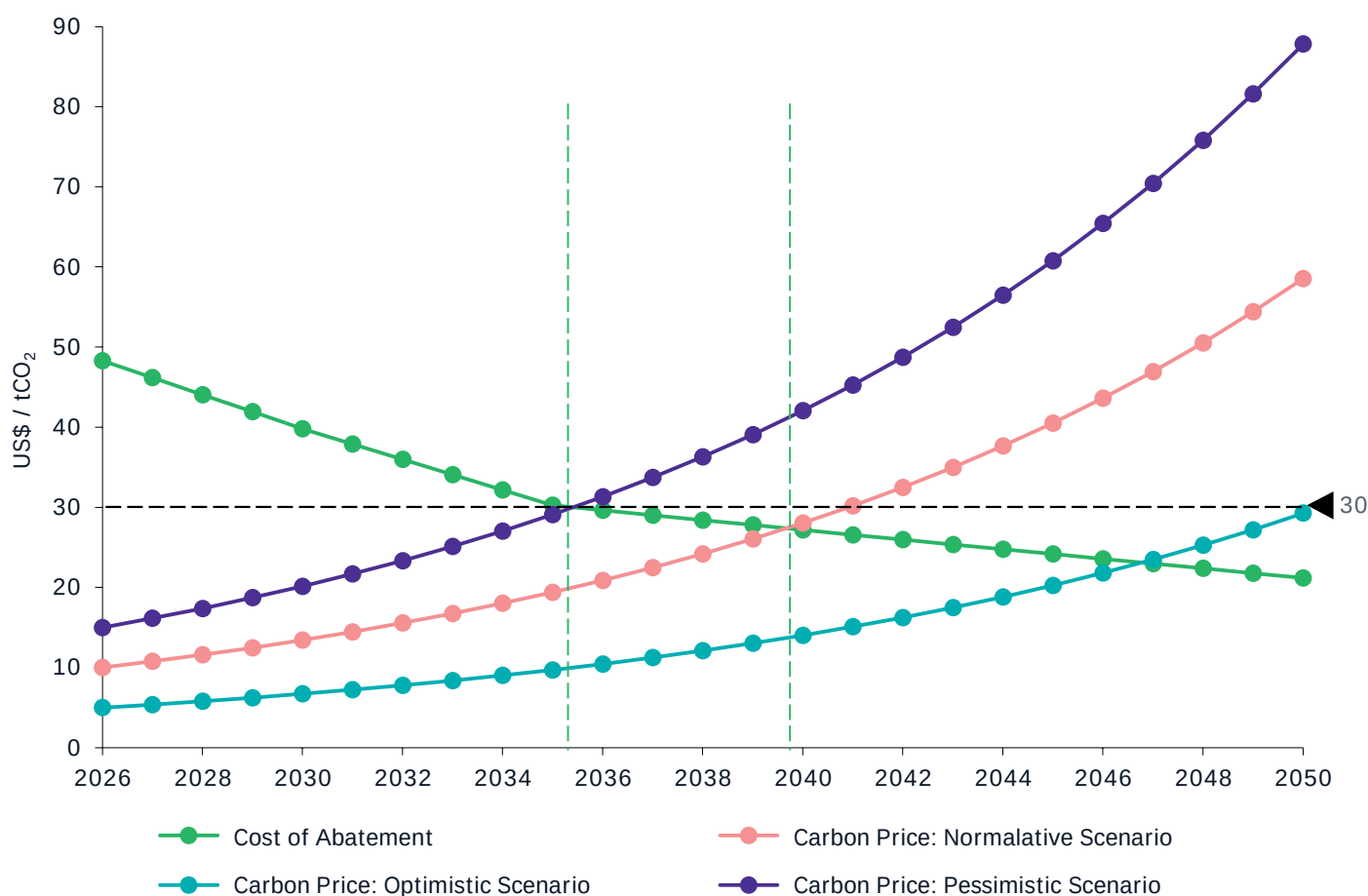
Note:

- Carbon capture costs includes capturing CO<sub>2</sub> from source, and excludes the fate of captured CO<sub>2</sub> for storage/utilization.

Source: CEEW, EY-Parthenon Analysis

# The Indian iron and steel industry may start investing in decarbonization technologies now, as the cost of abatement is projected to fall below Indian carbon prices by the next decade

## Indian iron and steel (BF-BOF): Cost of abatement vs. carbon prices



## Insights

- By abating CO<sub>2</sub> emissions at a cost lower than the carbon price, the iron and steel industry may realize significant cost savings by overcoming the higher costs tied to carbon prices.
- In a pessimistic scenario, it is projected that by the year 2035, the cost of decarbonization will drop below US\$30/tCO<sub>2</sub>. Concurrently, carbon prices in India are expected to rise above this level.
- As the technologies scale further and matures in upcoming years, the cost of decarbonization decreases further, leading to quicker incentivization for the iron and steel industry.

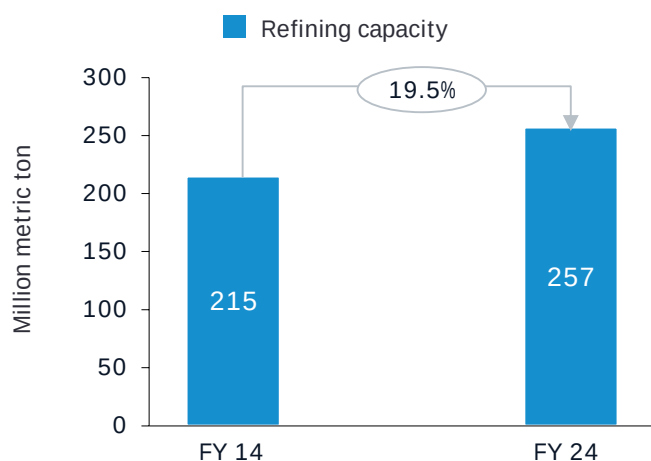
### Assumptions:

- A carbon price scenario with a normative pricing of \$10/tCO<sub>2</sub> in 2026 has been taken into account for the analysis.
- In pessimistic and optimistic scenario, carbon price starts at \$15 & \$5 respectively
- All identified decarbonization levers are considered at once to plot the blended cost of abatement in each year

Source: EY-Parthenon Analysis

India's refinery sector is the fourth largest in the world, with an installed capacity of 257 MMTPA, which is projected to grow to 310 MMTPA by 2028 driven by rising energy demand

### India's refinery sector trend (MMTPA)



### Highlights

- India's refining capacity has grown from 215.1 MMTPA to 256.8 MMTPA over the past decade.
- As the world's fourth-largest crude oil refiner, India is expected to add approximately one million barrels per day of refining capacity by 2028, taking the refining capacity to 309.5 MMTPA.
- India is the third-largest consumer of crude oil, with a demand of 5.59 million bpd in 2024, reflecting a 4.1% growth over the previous year.
- Oil demand in India is projected to register a twofold growth, reaching one million barrels by 2045.
- India aims to nearly double its refining capacity to 450 to 500 million tons by 2030, in line with the growing oil demand.

### Parameters

### Description

|                                          |                                 |
|------------------------------------------|---------------------------------|
| No of refineries                         | 23                              |
| Combined capacity                        | 257 MMTPA                       |
| India's global rank in refining capacity | 4th                             |
| Avg. refining emission intensity         | 37.3 (tCO <sub>2</sub> e/MBBLS) |

### CCTS targets

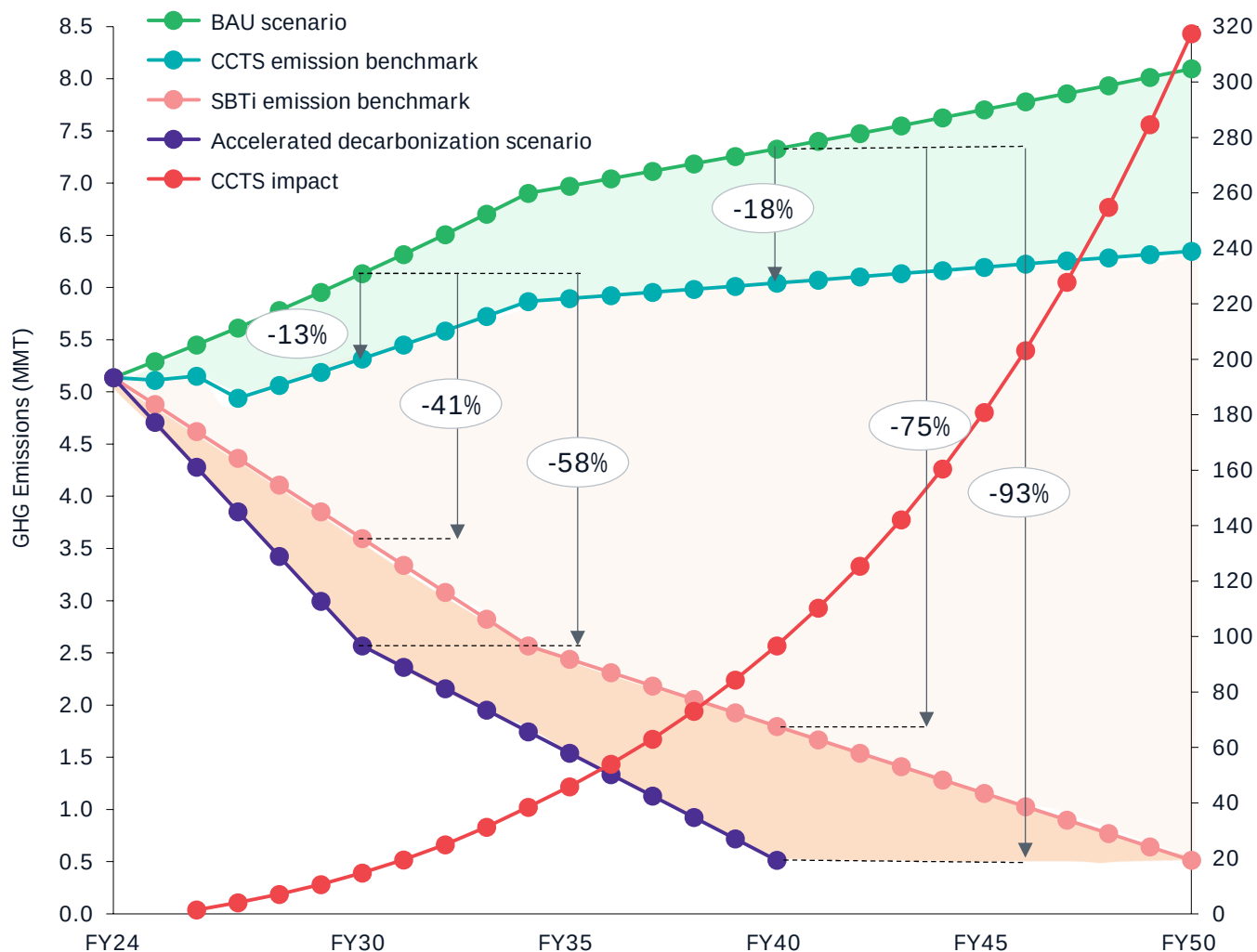
- Sectoral Reduction target**
  - The emission intensity reduction targets for refineries fall in the range of 2% to 6% over the baseline during the compliance period.
  - This would translate to ~3.3 MMT reduction of CO<sub>2</sub>e by FY27 (assuming constant installed capacity as per FY 2023-2024).

MBBLS: 1000 barrels

Source: EY-Parthenon Research, [PIB](#)

## Case study: A prominent refinery in India should start decarbonizing its assets to avoid CCTS penalties on 13% to 18% emissions differential from BAU

### Emission scenarios with CCTS/ SBTi mandates and cost saving potential



Note:

- SBTi targets are aligned as per 1.5 Degree scenario with long term target of 50% emission reduction in 10 years and net zero by 2050
- Accelerated decarbonization scenario targets 50% emission reduction by 2030 and net zero by 2040
- The refinery sector is projected to grow at 3% annually until FY 2035, after which the growth rate is expected to stabilize at 1% in the long term

The company would have to pay for these emissions in CCTS scheme in case of BAU scenario (eg: if company does not decarbonize)

The company would have an emission differential of 41% by 2030 and 75% by 2040 if compared with SBTi targets

The company would have an emission differential of 58% by 2030 and 93% by 2040 if compared with Accelerated Decarbonization targets

- The company would have to pay for the excess emissions above CCTS benchmark
- The CCTS penalty will differ as the growth rate increases and CCTS benchmark decreases if the company does not decarbonize

- Since the SBTi line is below CCTS emission benchmark, adherence to the same and having an accelerated decarbonization journey can help the company avoid CCTS penalties

MBBLs: 1000 barrels  
Source: EY-Parthenon Analysis

Normative carbon pricing: The company is expected to incur a financial implication of ~INR 272-278 crore from 2026 to 2030 due to the impact of CCTS, if no decarbonization is undertaken

#### Sensitivity Analysis highlighting financial impact FY 26-30 (INR cr.)

| Sensitivity table                | Production growth scenario                                 | No Growth | Pessimistic | Normative ( <i>refinery growth benchmark</i> ) | Optimistic |
|----------------------------------|------------------------------------------------------------|-----------|-------------|------------------------------------------------|------------|
| CCTS industry benchmark scenario | %                                                          | 0%        | 1%          | 3%                                             | 5%         |
| As-is (Present)                  | As per BEE Gazette                                         | 235-241   | 248-254     | 272-278                                        | 299-305    |
| Industry Weighted Average        | Average of all plants (category wise)<br>(in terms of GEI) | 296-302   | 310-316     | 337-343                                        | 365-370    |
| Pessimistic (stricter targets)   | -5%<br>(GEI target lower Industry weighted avg)            | 393-399   | 412-418     | 447-453                                        | 484-490    |
| Optimistic (lenient targets)     | +5%<br>(GEI target higher than Industry weighted avg)      | 199-205   | 208-214     | 226-232                                        | 246-252    |



#### Insights

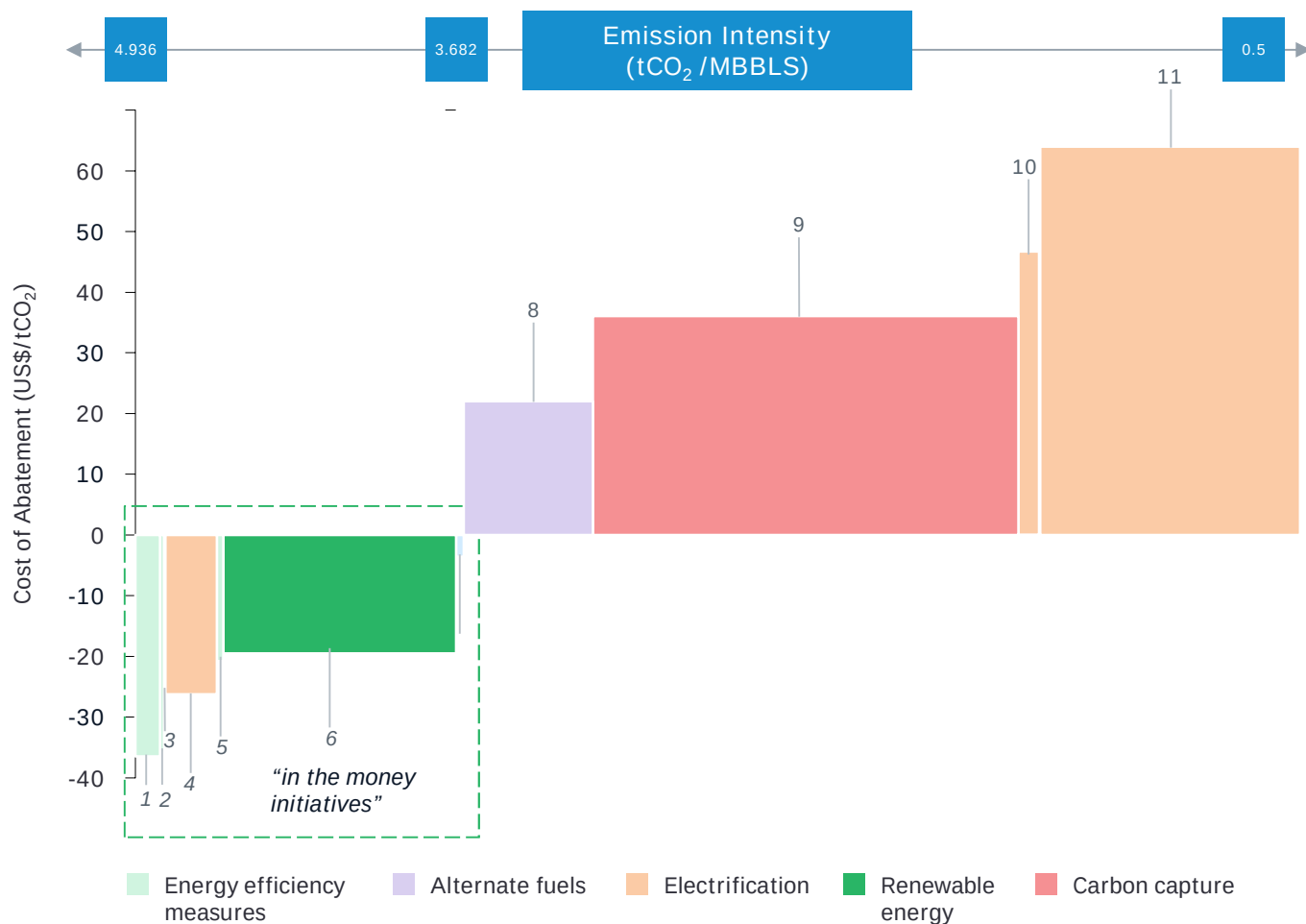
- In the BAU scenario, taking into account a 3% industry growth rate for the refining sector, the company is projected to experience a financial impact of INR272-278 crore from 2026 to 2030, considering the carbon price at US\$10 per ton of CO<sub>2</sub> equivalent.
- The costs in the table represent the cost of not decarbonizing.

#### Assumptions:

1. Three plants of the company have been considered for analysis in this table (taken directly from the GoI Gazette by BEE).
2. The financial impact is calculated cumulatively from 2025 to 2030. The net present value of the impact has been mentioned in the table.
3. A carbon price scenario with normative pricing of US\$10 has been taken into account for the analysis
4. Production growth scenarios have been built basis the refining sector trends in India.
5. The "Industry Weighted Average" for GHG emission intensity has been considered for scenario analysis.
6. The CCTS benchmark sensitivity scenarios have been built basis +5% and -5% of the "Industry Weighted Average" intensity benchmark.

Source: EY-Parthenon Analysis

Electrification of boilers and carbon capture are among the most critical levers for decarbonizing the refinery sector, together accounting for approximately 54% of potential emission reductions



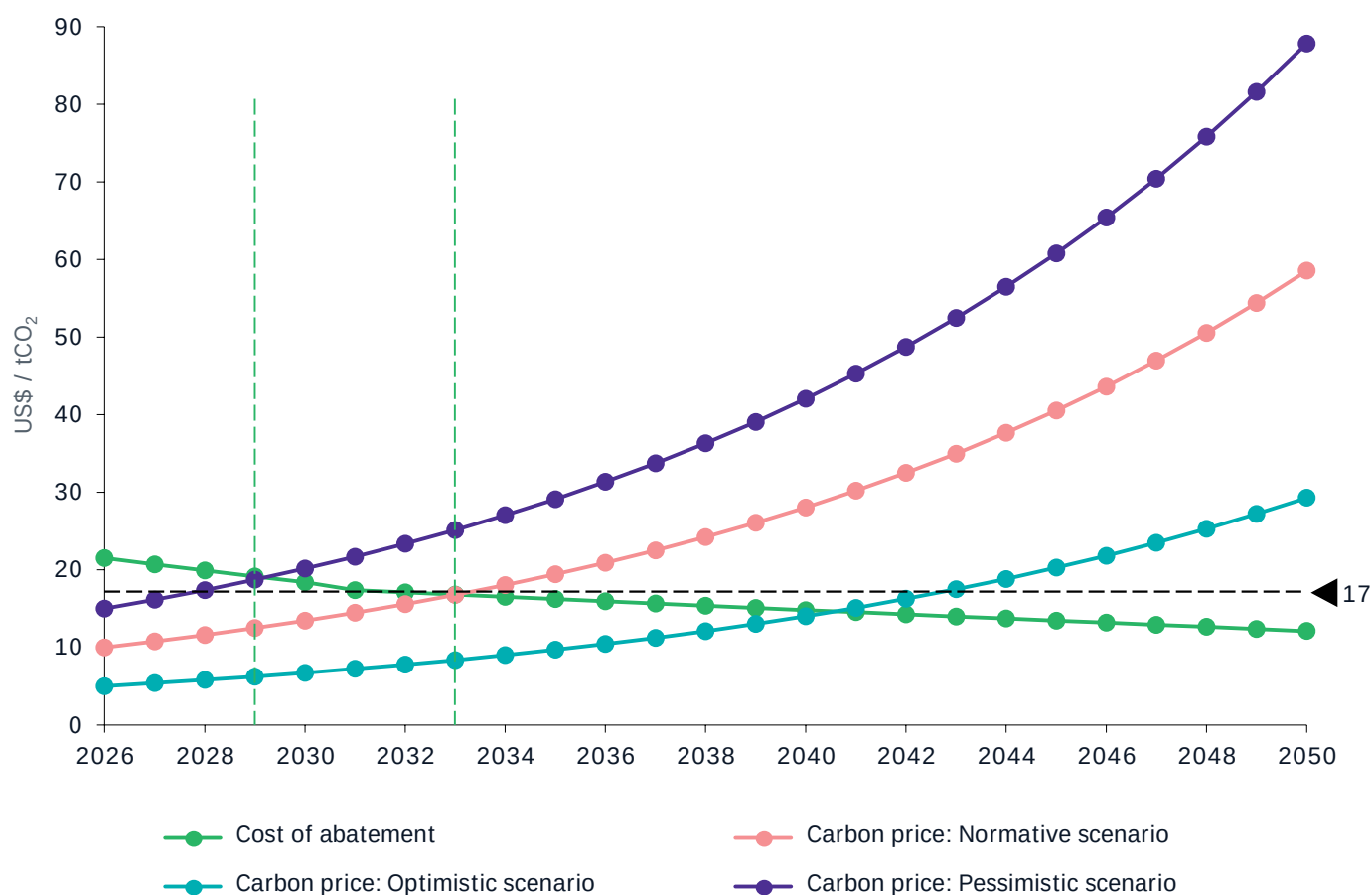
MBBLS: 1000 barrels

Source: EY-Parthenon Analysis

|                                  |                            |                                       |                             |
|----------------------------------|----------------------------|---------------------------------------|-----------------------------|
| 1. Heat recovery and integration | 4. Drive electrification   | 7. Power recovery turbine             | 10. Electrical heat tracing |
| 2. Organic rankine cycle         | 5. Energy efficient motors | 8. Alternate fuel (compressed biogas) | 11. Electric boilers        |
| 3. Jacketing for insulation      | 6. RE adoption             | 9. Carbon capture                     |                             |

## Indian refineries may start investing in decarbonization technologies now, as the cost of abatement is projected to drop below the Indian carbon prices in next 6 to 8 years

### Indian Refineries: Cost of Abatement v/s Carbon Prices



### Insights

- By abating CO<sub>2</sub> emissions at a cost lower than the carbon price, the refining industry may realize significant cost savings by overcoming the higher costs tied to carbon prices.
- In a normative scenario, it is projected that by the year 2033, the cost of decarbonization will drop below US\$17/tCO<sub>2</sub>. Concurrently, carbon prices in India are expected to rise above this level.
- As technologies scale further and mature in the upcoming years, the cost of decarbonization decreases further, leading to quicker incentivization for the industry.

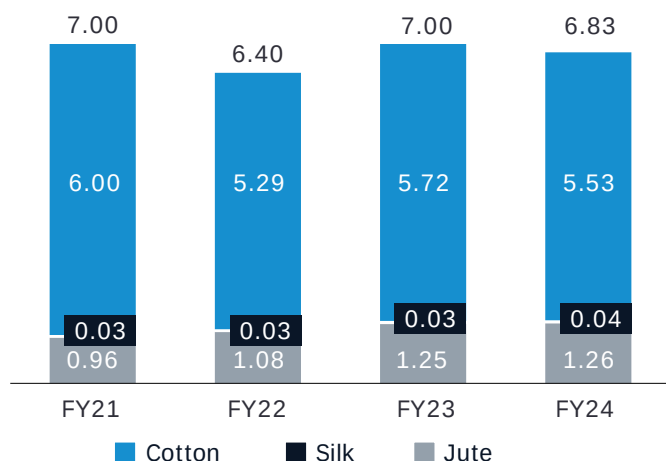
#### Assumptions:

- A carbon price scenario with normative pricing of US\$10/tCO<sub>2</sub> in 2026 has been taken into account for the analysis.
- In pessimistic and optimistic scenarios, the carbon price starts at US\$15 and US\$5, respectively.
- All identified decarbonization levers are considered at once to plot the blended cost of abatement in each year.

Source: EY-Parthenon Analysis

India is the second-largest textile manufacturer and sixth-largest exporter in the world, with over 3,400 textile mills installed currently

### Indian Refineries: Cost of Abatement v/s Carbon Prices



### Highlights

- The textiles and apparel industry contributes 2.3% to the country's GDP, 13% to industrial production and 12% to exports.
- The market for Indian textiles and apparel is projected to grow at a 10% CAGR, reaching US\$350 billion by 2030, with exports expected to reach US\$100 billion.
- Cotton production in India is projected to reach 7.2 million metric tons by 2030, driven by increasing demand from consumers.
- The government has approved the establishment of seven PM Mega Integrated Textile Region and Apparel (PM MITRA) parks in greenfield/brownfield sites, with an outlay of INR4445 crore for a period of seven years up to 2027-28.

| Parameters                              | Description   |
|-----------------------------------------|---------------|
| No of textile mills                     | 3400+         |
| Domestic textile and apparel production | US\$ 175.7 Bn |
| Exports value                           | US\$ 35.87 Bn |

### CCTS targets

- Sectoral Reduction target
  - Emission intensity targets vary across sub-sectors, but on average, a 4%-12% reduction from the baseline will be required during the compliance period.
  - This would translate to ~1.6 MMT reduction of CO<sub>2</sub> e by FY27 (assuming constant installed capacity as per FY 2023-2024).

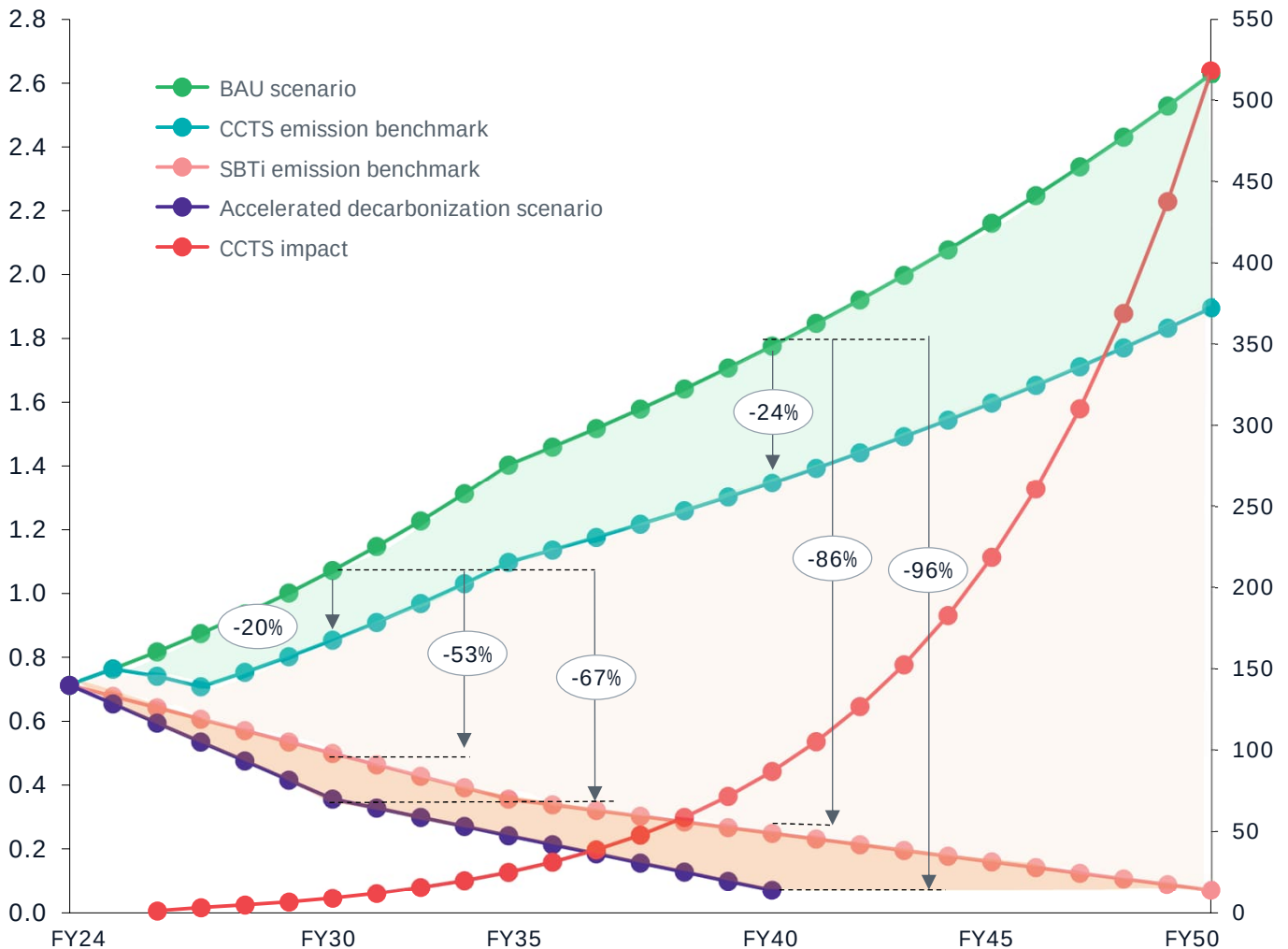
MBBLS: 1000 barrels

Source: EY-Parthenon Research, [Cotton production](#), [Silk production](#), [Jute production](#)



## Case study: A textile company with should start decarbonizing its assets to avoid CCTS penalties on 20%-24% emissions differential from BAU

### Emission scenarios with CCTS/ SBTi mandates and cost saving potential



Source: EY-Parthenon Analysis

Note:

1. SBTi targets are aligned as per 1.5 Degree scenario with long term target of 50% emission reduction in 10 years and net zero by 2050
2. Accelerated decarbonization scenario targets 50% emission reduction by 2030 and net zero by 2040
3. The textile sector is projected to grow at 7% annually until FY 2035, after which the growth rate is expected to stabilize at 5% in the long term

The company would have to pay for these emissions in CCTS scheme in case of BAU scenario (eg: if company does not decarbonize)

The company would have an emission differential of 53% by 2030 and 86% by 2040 if compared with SBTi targets

The company would have an emission differential of 67% by 2030 and 96% by 2040 if compared with Accelerated Decarbonization targets

- The company would have to pay for the excess emissions above CCTS benchmark
- The CCTS penalty will differ as the growth rate increases and CCTS benchmark decreases if the company does not decarbonize

- Since the SBTi line is below CCTS emission benchmark, adherence to the same and having an accelerated decarbonization journey can help the company avoid CCTS penalties

Normative carbon pricing: The company is expected to incur a financial implication of ~INR53-59 crore from 2026 to 2030 due to the impact of CCTS if no decarbonization is undertaken

#### Sensitivity Analysis highlighting financial impact FY 26-30 (cr.)

| Sensitivity Table                | Production growth scenario                                 | No Growth | Pessimistic | Normative ( <i>textile growth benchmark</i> ) | Optimistic |
|----------------------------------|------------------------------------------------------------|-----------|-------------|-----------------------------------------------|------------|
| CCTS industry benchmark scenario | %                                                          | 0         | 6%          | 8%                                            | 10%        |
| As-is (Present)                  | As per BEE Gazette                                         | 36-42     | 48-54       | 53-59                                         | 58-64      |
| Industry Weighted Average        | Average of all plants (category wise)<br>(in terms of GEI) | 47-53     | 61-67       | 67-73                                         | 73-79      |
| Pessimistic (stricter targets)   | -5%<br>(GEI target lower Industry weighted avg)            | 60-66     | 78-84       | 85-91                                         | 92-98      |
| Optimistic (lenient targets)     | +5%<br>(GEI target higher than Industry weighted avg)      | 34-40     | 45-51       | 49-54                                         | 54-60      |



#### Insights

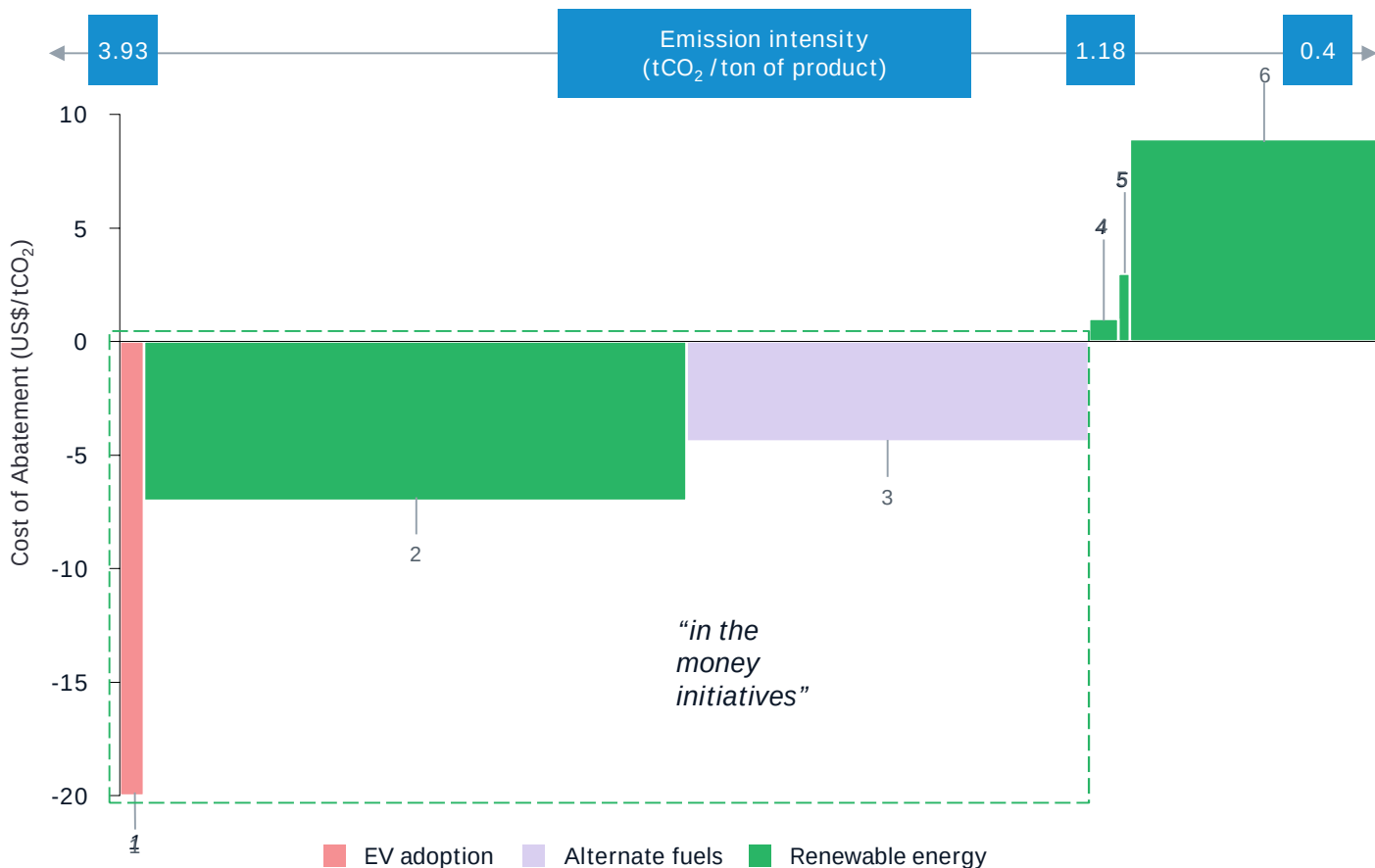
- In the BAU scenario, taking into account an 8% industry growth rate for the textile industry, the company is projected to experience a financial impact of INR53-59 crore from 2026 to 2030, considering the carbon price at US\$10 per ton of CO<sub>2</sub>eq.
- The costs in the table represent the cost of not decarbonizing for the company.

#### Assumptions:

- Eight plants of the company have been considered for analysis in this table (taken directly from the GoI Gazette by BEE).
- The financial impact is calculated cumulatively from 2026 to 2030. The net present value of the impact has been mentioned in the table.
- A carbon price scenario with a normative pricing of US\$10 has been taken into account for the analysis.
- Production growth scenarios have been built basis the textile sector trends in India.
- The "Industry Weighted Average" for GHG emission intensity has been considered for scenario analysis.
- The CCTS benchmark sensitivity scenarios have been built basis +5% and -5% of the "Industry Weighted Average" intensity benchmark.

Source: EY-Parthenon Analysis

Renewable energy and alternate fuels are the most critical levers for decarbonizing the textile sector, together accounting for approximately ~90% of potential emission reductions



|                                  |                                              |                                         |
|----------------------------------|----------------------------------------------|-----------------------------------------|
| 1. Fleet and MHE electrification | 3. Coal replacement with biomass in CPP      | 5. Purchase of green power              |
| 2. RE (rooftop + open access)    | 4. Purchase of renewable energy certificates | 6. Battery energy storage system (BESS) |

Source: EY-Parthenon Analysis

The textile sector should start investing in decarbonization technologies now, as the current abatement cost of – 2.6US\$/tCO<sub>2</sub>e indicates that emission reductions already deliver cost savings

### Indian Refineries: Cost of Abatement v/s Carbon Prices



### Insights

- The textile industry can achieve significant cost savings by abating CO<sub>2</sub> emissions at a cost lower than the carbon price, reducing exposure to carbon pricing.
- Currently, the cost of abatement stands at ~2.6 US\$/tCO<sub>2</sub>e, driven by significant emission reductions through RE adoption and alternative fuels, both of which are “in the money” initiatives.
- This suggests the industry should act now to capture savings of 2.6US\$ per ton of CO<sub>2</sub>, with further cost reductions expected as technologies mature.

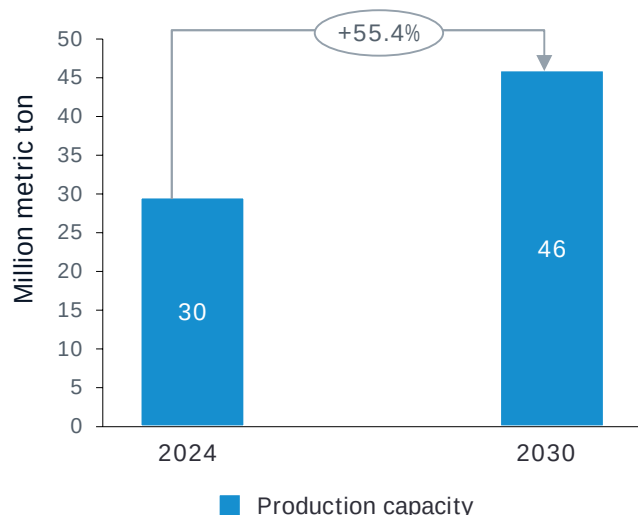
#### Assumptions:

1. A carbon price scenario with a normative pricing of US\$10/tCO<sub>2</sub> in 2026 has been taken into account for the analysis.
2. In pessimistic and optimistic scenarios, the carbon price starts at US\$15 and US\$5, respectively.
3. All identified decarbonization levers are considered at once to plot the blended cost of abatement in each year.

Source: EY-Parthenon Analysis

India's petrochemical sector is set for rapid growth, with capacity rising from 29.6 MMTPA to 46 MMTPA by 2030, US\$87 billion in planned investments, and a projected US\$1 trillion valuation by 2040

### India's petrochemical sector trend (MMTPA)



### Highlights

- The textile industry can achieve significant cost savings by abating CO<sub>2</sub> emissions at a cost lower than the carbon price, reducing exposure to carbon pricing.
- Currently, the cost of abatement stands at ~2.6 US\$/tCO<sub>2</sub>e, driven by significant emission reductions through RE adoption and alternative fuels, both of which are “in the money” initiatives.
- This suggests the industry should act now to capture savings of 2.6US\$ per ton of CO<sub>2</sub>, with further cost reductions expected as technologies mature.

### Parameters

### Description

|                                                       |                                            |
|-------------------------------------------------------|--------------------------------------------|
| Production capacity                                   | ~29.6 MMTPA                                |
| India's rank in chemical and petrochemical production | 6th                                        |
| Petrochemical emission intensity                      | 0.9795 (tCO <sub>2</sub> e/ton of product) |

### CCTS targets

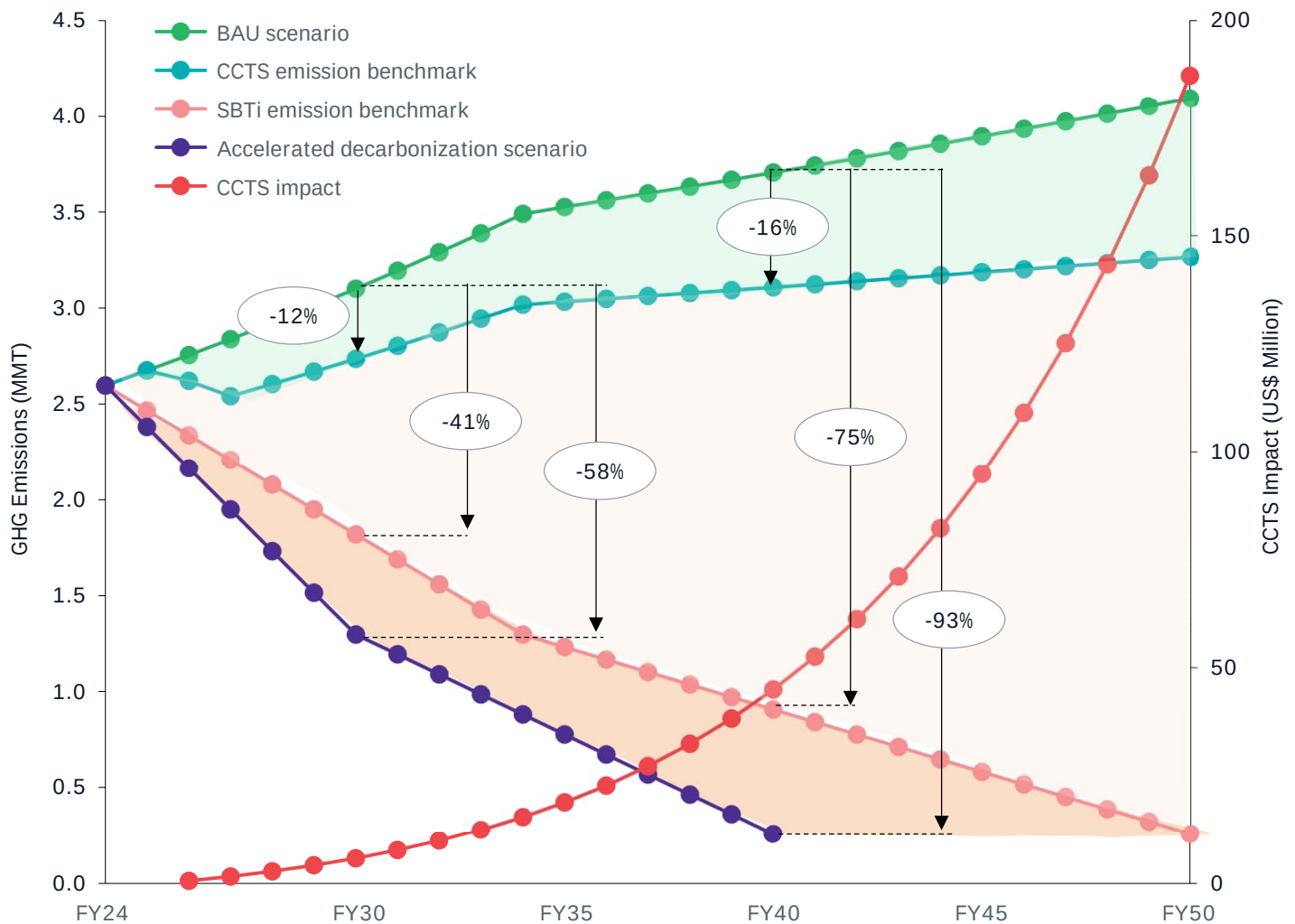
- Sectoral Reduction target
  - An average reduction of 5% from the baseline will be required during the compliance period
  - This would translate to ~1100 KT reduction of CO<sub>2</sub> e by FY27 (assuming constant installed capacity as per FY 2023-2024)



Source: EY-Parthenon Research, [PIB](#)

## Case Study: A petrochemicals production company should start decarbonizing their assets to avoid CCTS penalties on 12-16% emissions differential from BaU

### Emission scenarios with CCTS/ SBTi mandates and cost saving potential



Source: EY-Parthenon Analysis

Note:

1. SBTi targets are aligned as per 1.5 Degree scenario with long term target of 50% emission reduction in 10 years and net zero by 2050
2. Accelerated decarbonization scenario targets 50% emission reduction by 2030 and net zero by 2040
3. The petrochemical sector is projected to grow at 3% annually until FY 2035, after which the growth rate is expected to stabilize at 1% in the long term

The company would have to pay for these emissions under the CCTS scheme in case of BAU scenario (e.g., if company does not decarbonize).

The company would have an emission differential of 41% by 2030 and 75% by 2040 if compared with SBTi targets.

The company would have an emission differential of 58% by 2030 and 93% by 2040 if compared with accelerated decarbonization targets.

- The company would have to pay for the excess emissions above the CCTS benchmark.
- The CCTS penalty will differ as the growth rate increases and the CCTS benchmark decreases if the company does not decarbonize.

- Since the SBTi line is below CCTS emission benchmark, adherence to the same and having an accelerated decarbonization journey can help the company avoid CCTS penalties.

Normative carbon pricing: The company is expected to incur a financial implication of ~INR107-113 crore from 2026 to 2030 due to the impact of CCTS if no decarbonization is undertaken

#### Sensitivity Analysis highlighting financial impact FY 26-30 (cr.)

| Sensitivity Table                | Production growth scenario                              | No Growth | Pessimistic | Normative (Petrochem. growth) | Optimistic |
|----------------------------------|---------------------------------------------------------|-----------|-------------|-------------------------------|------------|
| CCTS industry benchmark scenario | %                                                       | 0         | 1%          | 3%                            | 5%         |
| As-is (Present)                  | As per BEE Gazette                                      | 92-98     | 97-103      | 107-113                       | 117-123    |
| Industry Weighted Average        | Average of all plants (category wise) (in terms of GEI) | 77-83     | 81-87       | 88-94                         | 96-102     |
| Pessimistic (stricter targets)   | -5% (GEI target lower Industry weighted avg)            | 131-137   | 138-144     | 149-155                       | 162-168    |
| Optimistic (lenient targets)     | +5% (GEI target higher than Industry weighted avg)      | 23-29     | 25-31       | 27-33                         | 20-36      |



#### Insights

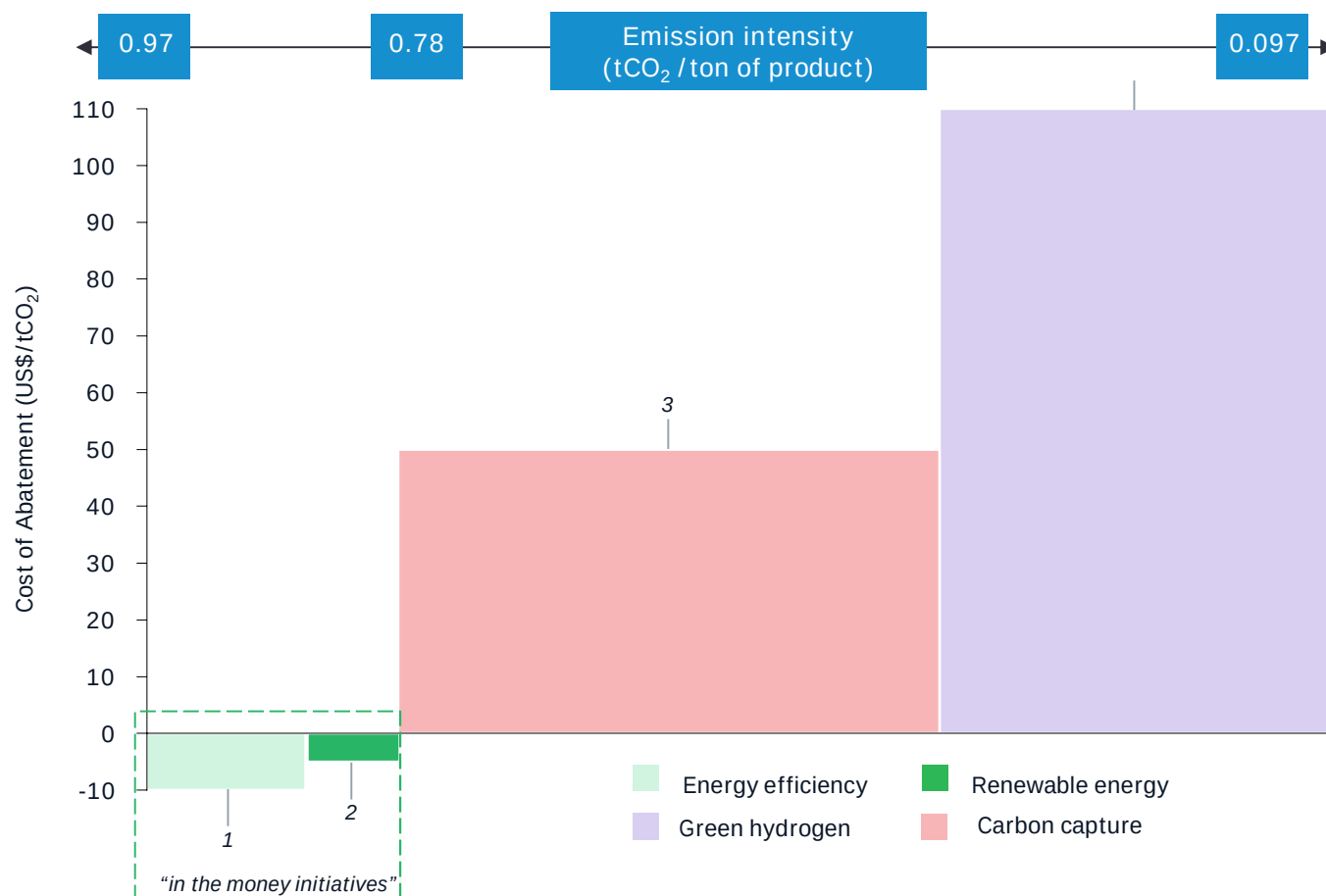
- In the BAU scenario, taking into account a 3% industry growth rate for petrochemical industry, the company is projected to experience a financial impact of INR107-113 crore from 2026 to 2030, considering the carbon price at US\$10 per ton of CO<sub>2</sub>eq.
- The costs in the table represent the cost of not decarbonizing for the company.

#### Assumptions:

- One plant of the company has been considered for analysis in this table (taken directly from the GoI Gazette by BEE).
- The financial impact is calculated cumulatively from 2026 to 2030. The net present value of the impact has been mentioned in the table.
- A carbon price scenario with a normative pricing of US\$10 has been taken into account for the analysis
- Production growth scenarios have been built basis the petrochemical sector trends in India.
- The "Industry Weighted Average" for GHG emission intensity has been considered for scenario analysis
- The CCTS benchmark sensitivity scenarios have been built basis +5% and -5% of the "Industry Weighted Average" intensity benchmark.

Source: EY-Parthenon Analysis

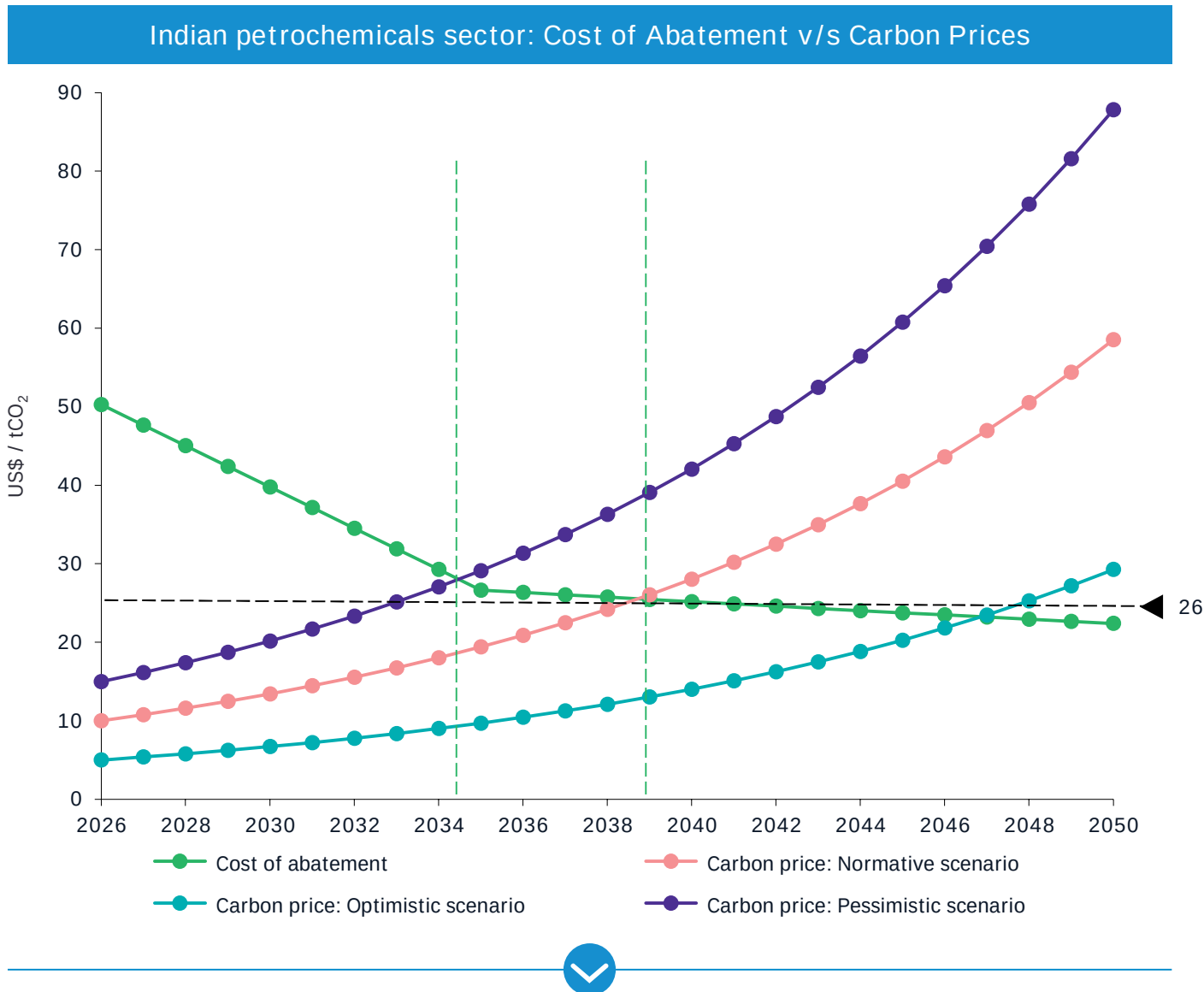
Carbon capture and green hydrogen are the most critical levers for decarbonizing the petrochemical sector, together accounting for ~70% of potential emission reductions



|                              |                                             |
|------------------------------|---------------------------------------------|
| 1. Energy efficiency         | 3. Carbon capture                           |
| 2. Renewable energy adoption | 4. Partial substitution of green H2 as fuel |

Source: EY-Parthenon Analysis

The petrochemical sector may start investing in decarbonization technologies now, as the cost of abatement is projected to drop below the Indian carbon prices in next 8 to 9 years



## Insights

- By abating CO<sub>2</sub> emissions at a cost lower than the carbon price, the petrochemical industry may realize significant cost savings by overcoming the higher costs tied to carbon prices.
- In a normative scenario, it is projected that by the year 2039, the cost of decarbonization will drop below US\$26/tCO<sub>2</sub>. Concurrently, carbon prices in India are expected to rise above this level.
- As the technologies scale further and matures in upcoming years, the cost of decarbonization decreases further, leading to quicker incentivization for the industry.

### Assumptions:

- A carbon price scenario with a normative pricing of US\$10/tCO<sub>2</sub> in 2026 has been taken into account for the analysis.
- In pessimistic and optimistic scenarios, the carbon price starts at US\$15 and US\$5, respectively.
- All identified decarbonization levers are considered at once to plot the blended cost of abatement in each year.

Source: EY-Parthenon Analysis



“

*India's CCTS is not just a market reform, it is a national reset. By putting a real price on carbon, it compels industries to rethink how they grow, compete, and innovate. This is the moment that will define India's trajectory toward genuine low-carbon leadership.*

Kapil Bansal

“

*India's Carbon Credit Trading Scheme converts climate commitment into economic strength. By turning every tonne of carbon reduced into a tangible asset, it empowers industries to scale innovation, unlock new value, and compete in a rapidly decarbonizing world.*

Reshma RN

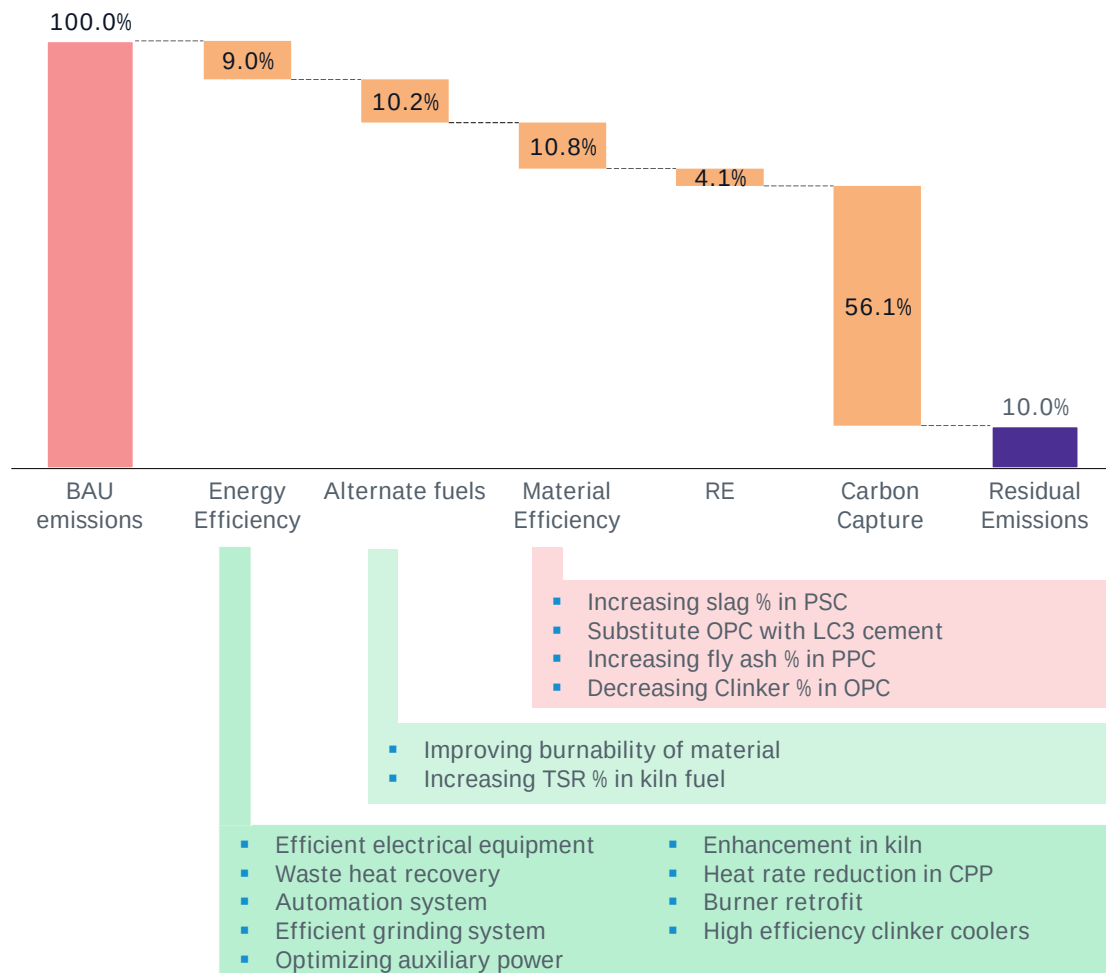


# 4 | Recommendations



## The cement industry needs to prioritize energy efficiency and material efficiency to meet the CCTS targets; focus on carbon capture in the long run to achieve net zero targets

### Cement sector Decarbonization levers

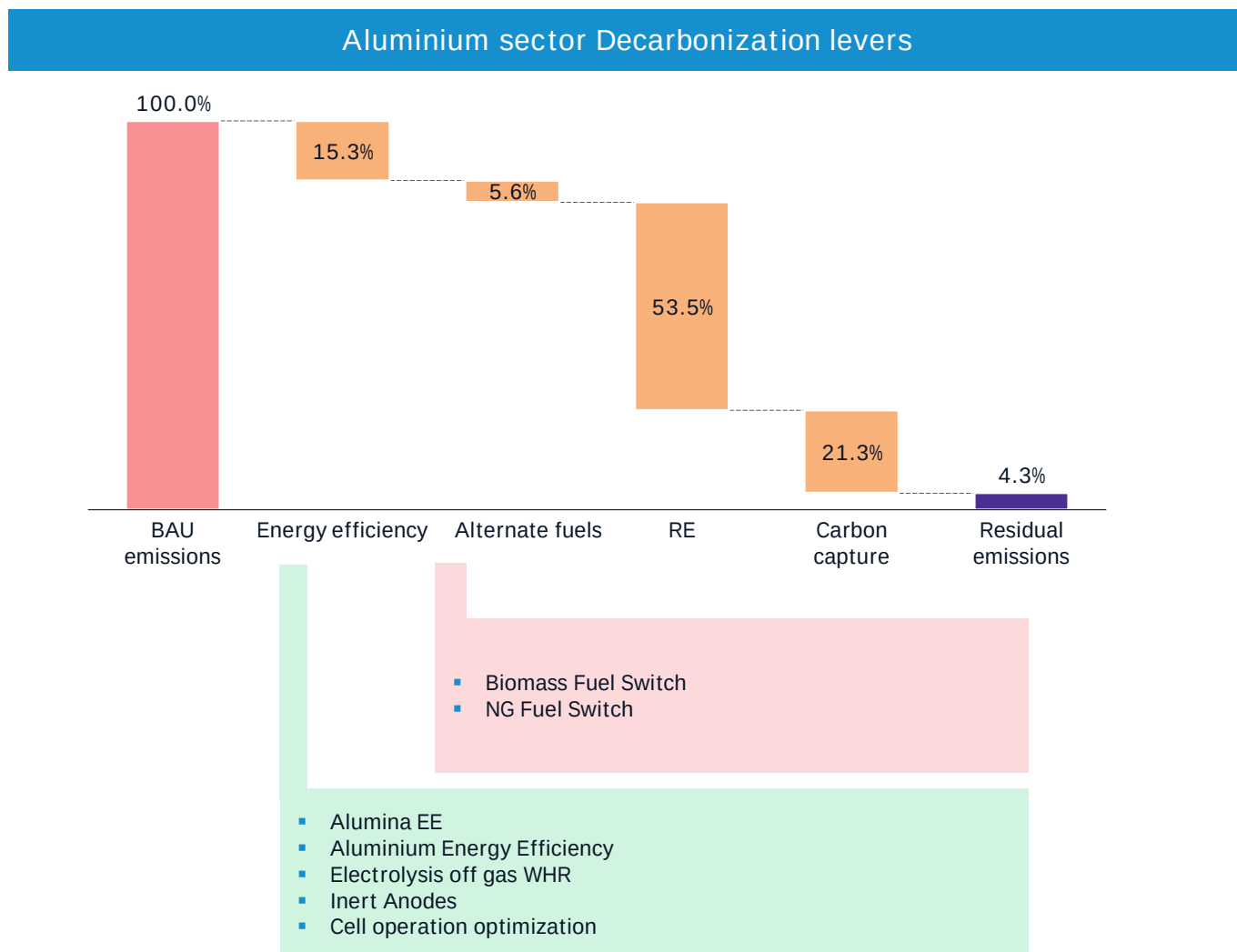


### EY-P recommendations

- Committing to SBTi will help companies mitigate CCTS penalties, as the initial compliance period for CCTS is till FY27. While future targets are unknown, companies committing to SBTi (which requires a 90% emission reduction by 2050) can safely avoid CCTS penalties.
- Indian companies must conduct a thorough impact assessment of the CCTS on their operations, identify specific compliance requirements, and establish internal monitoring and reporting mechanisms.
- Cement companies need to focus on “in the money” initiatives in the short-run to meet the CCTS target intensity, specifically energy efficiency and material efficiency measures.
- Carbon capture is the biggest lever contributing to cement industry decarbonization. The government needs to encourage the early adoption of carbon capture technologies through grants, tax credits, funding for R&D and setting up of Centers of Excellence (CoE).
- Cement companies committing to sustainability targets through SBTi, RE100, etc., and getting ranked highly by CDP can enhance their brand recognition globally and help with green financing.
- Cement companies can leverage green financing to realize their decarbonization initiatives, e.g., Ultratech Cement has committed to SBTi and has set up GHG reduction targets. The company has raised US\$500 million through sustainability-linked loan (SLB).

Source: EY-Parthenon Analysis

## Aluminum industry needs to prioritize Energy efficiency, Alternate fuels adoption to meet the CCTS targets; focus on RE adoption in the long-run to meet Net Zero targets



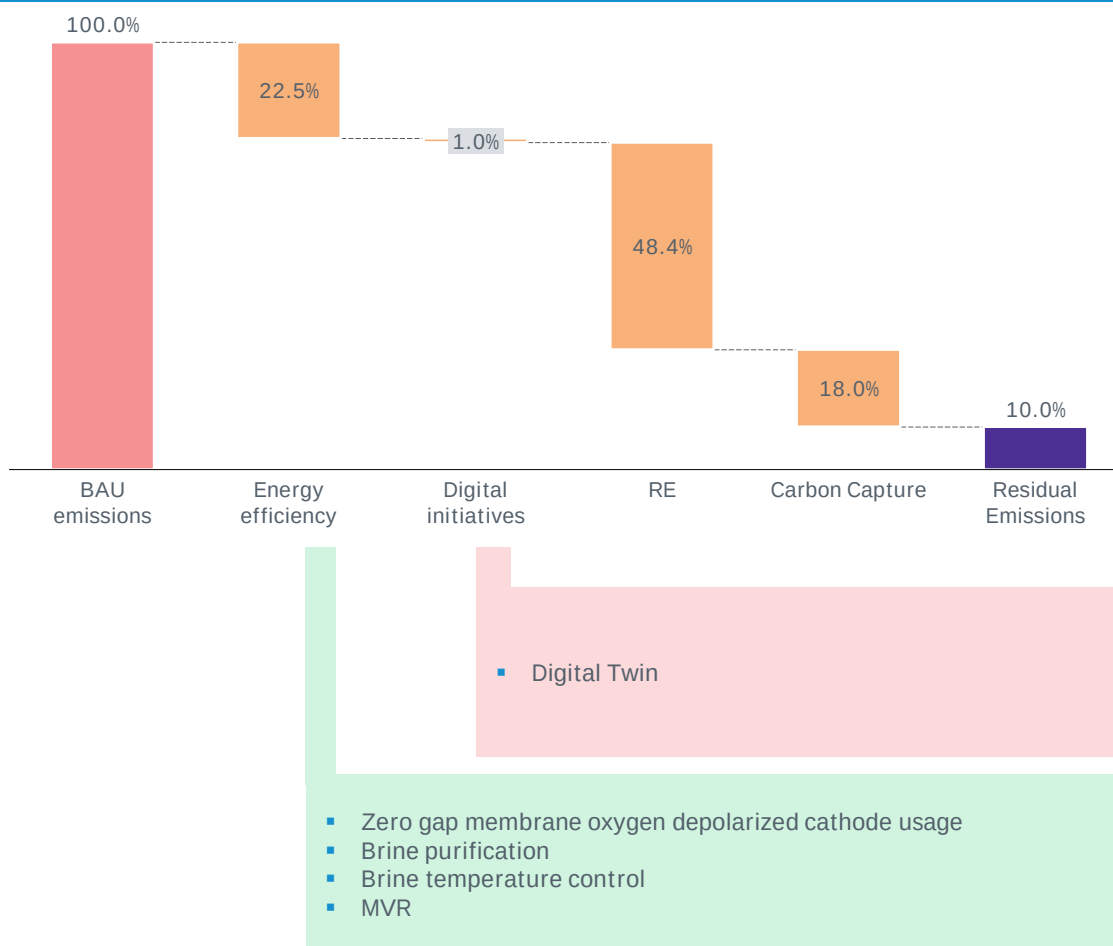
### EY-P Recommendations

- Committing to SBTi will help companies mitigate CCTS penalties, as the CCTS initial compliance period is till FY27, future targets are unknown, companies committing to SBTi (which requires a 90% emission reduction by 2050) can safely avoid CCTS penalties
- Indian companies must conduct a thorough impact assessment of the CCTS on their operations, identify specific compliance requirements, and establish internal monitoring and reporting mechanisms
- Aluminium companies need to focus on "In the money" initiatives in the short-run to meet the CCTS target intensity – Energy efficiency and Alternate fuel adoption
- Most Indian Aluminium companies have captive coal-based power plant, which might not make transition to RE power a cost saving measure, replacing end of life CPP assets with RE can be the way forward for aluminium industry
- Govt. needs to encourage earlier adoption of carbon capture technologies through grants, tax credits and funding R&D and setting up Centre of Excellences (CoE)
- Hindalco is recognized as the World's Most Sustainable Aluminium Company as per S&P Dow Jones Sustainability Indices (DJSI) owing to its sustainable practices and commitments

Source: EY-Parthenon Analysis

## Chlor Alkali industry needs to prioritize Energy efficiency, Digital twin initiatives to meet the CCTS targets; focus on RE adoption and Carbon capture in the long-run to meet Net Zero targets

### Chlor Alkali sector Decarbonization levers



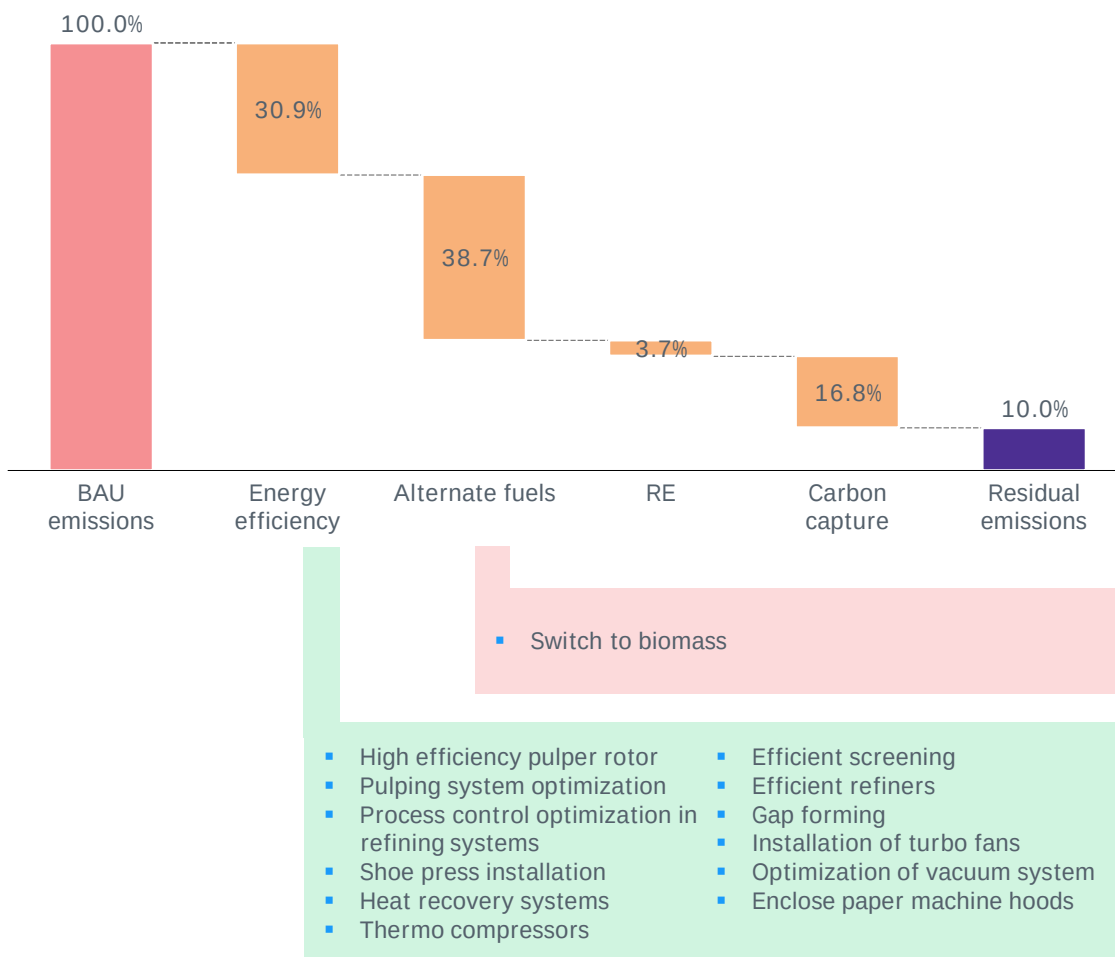
### EY-P Recommendations

- Committing to SBTi will help companies mitigate CCTS penalties, as the initial compliance period for CCTS is until FY27. Future targets are unknown, but companies committing to SBTi (which requires a 90% emission reduction by 2050) can safely avoid CCTS penalties.
- Indian companies must conduct a thorough impact assessment of the CCTS on their operations, identify specific compliance requirements, and establish internal monitoring and reporting mechanisms.
- Chlor-alkali companies need to focus on “in the money” initiatives in the short run to meet the CCTS target intensity, specifically energy efficiency and digital twin initiatives.
- RE adoption and carbon capture are going to be the biggest levers contributing to the decarbonization of the chlor-alkali sector.
- Most Indian chlor-alkali companies have captive coal-based power plants in conjunction with associated chemical companies, which might not change to RE a cost-saving measure. Replacing end-of-life CPP assets with RE can be the way forward.
- The government needs to encourage the early adoption of carbon capture technologies through grants, tax credits, funding for R&D and setting up of Centers of Excellence (CoE).

Source: EY-Parthenon Analysis

## Paper & Pulp industry needs to prioritize Energy efficiency, Low carbon fuel switch (Biomass) to meet the CCTS targets; focus on Carbon capture in the long-run to meet Net Zero targets

### Paper & Pulp sector Decarbonization levers

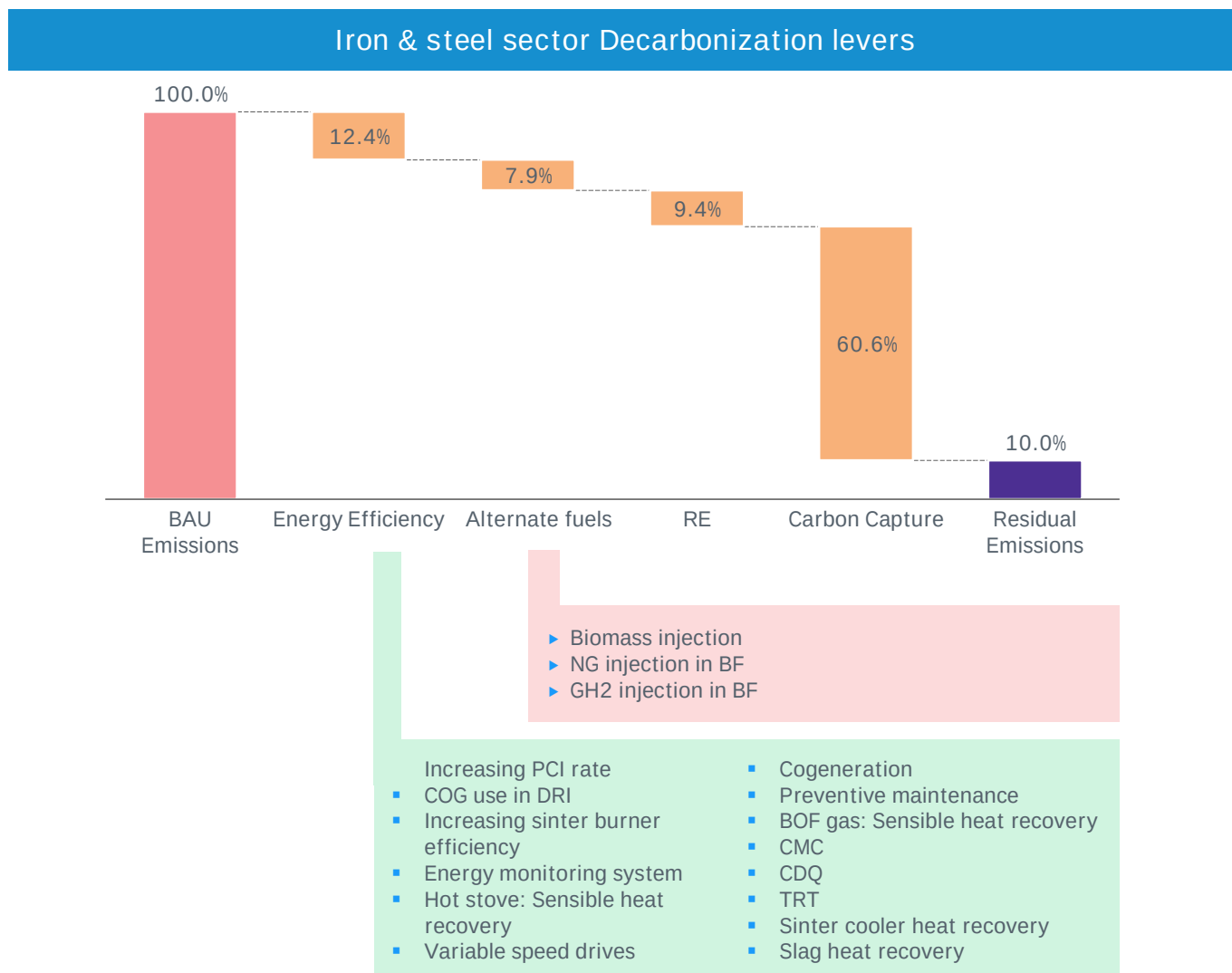


### EY-P Recommendations

- Committing to SBTi will help companies mitigate CCTS penalties, as the initial compliance period for CCTS is till FY27. Future targets are unknown, but companies committing to SBTi (which requires a 90% emission reduction by 2050) can safely avoid CCTS penalties.
- Indian companies must conduct a thorough impact assessment of the CCTS on their operations, identify specific compliance requirements, and establish internal monitoring and reporting mechanisms.
- Paper companies need to focus on “in the money” initiatives in the short run to meet the CCTS target intensity, specifically energy efficiency and switch to low carbon fuels like biomass.
- Companies should understand the mechanisms for generating and trading carbon credits under CCTS, as this can be a revenue source for companies with low carbon intensity.
- The government needs to encourage the early adoption of carbon capture technologies through grants, tax credits, funding for R&D and setting up of Centers of Excellence (CoE).
- Companies committing to sustainability targets through SBTi, RE100, etc., and getting ranked highly by CDP can enhance their brand recognition globally and help with green financing.

Source: EY-Parthenon Analysis

## Iron and steel industry needs to prioritize Energy efficiency, Low carbon fuel switch (Biomass) to meet the CCTS targets; focus on Carbon capture in the long-run to meet Net Zero targets



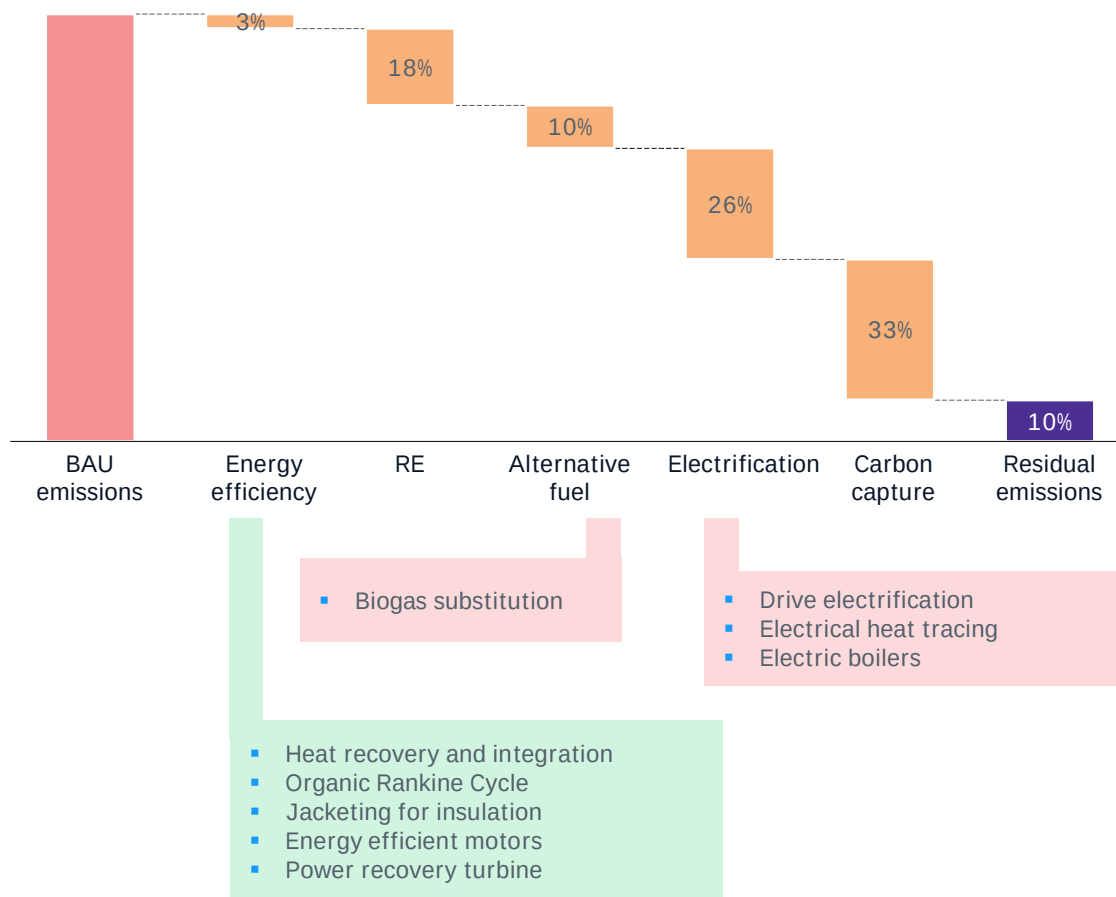
### EY-P Recommendations

- Committing to SBTi will help companies mitigate CCTS penalties, as the initial compliance period for CCTS is till FY27. Future targets are unknown, but companies committing to SBTi (which requires a 90% emission reduction by 2050) can safely avoid future CCTS penalties.
- Indian steel companies must conduct a thorough impact assessment of the CCTS on their operations, identify specific compliance requirements, and establish internal monitoring and reporting mechanisms.
- Iron and steel companies should first focus on “in the money” initiatives like energy efficiency in the short run to meet the CCTS target intensity .
- Companies should understand the mechanisms for generating and trading carbon credits under CCTS, as this can be a revenue source for companies with low carbon intensity.
- The government needs to encourage the early adoption of carbon capture technologies through grants, tax credits, funding for R&D and setting up of Centers of Excellence (CoE), as this can reduce 60% of the sector's emissions.
- Companies committing to sustainability targets through SBTi, RE100, etc., and getting ranked highly by CDP can enhance their brand recognition globally and avail green financing.

Source: EY-Parthenon Analysis

## Indian refiners should prioritize energy efficiency, drive electrification, RE adoption to meet the CCTS targets; focus on electric boilers & carbon capture in the long-run to meet Net Zero targets

### Refineries Decarbonization levers



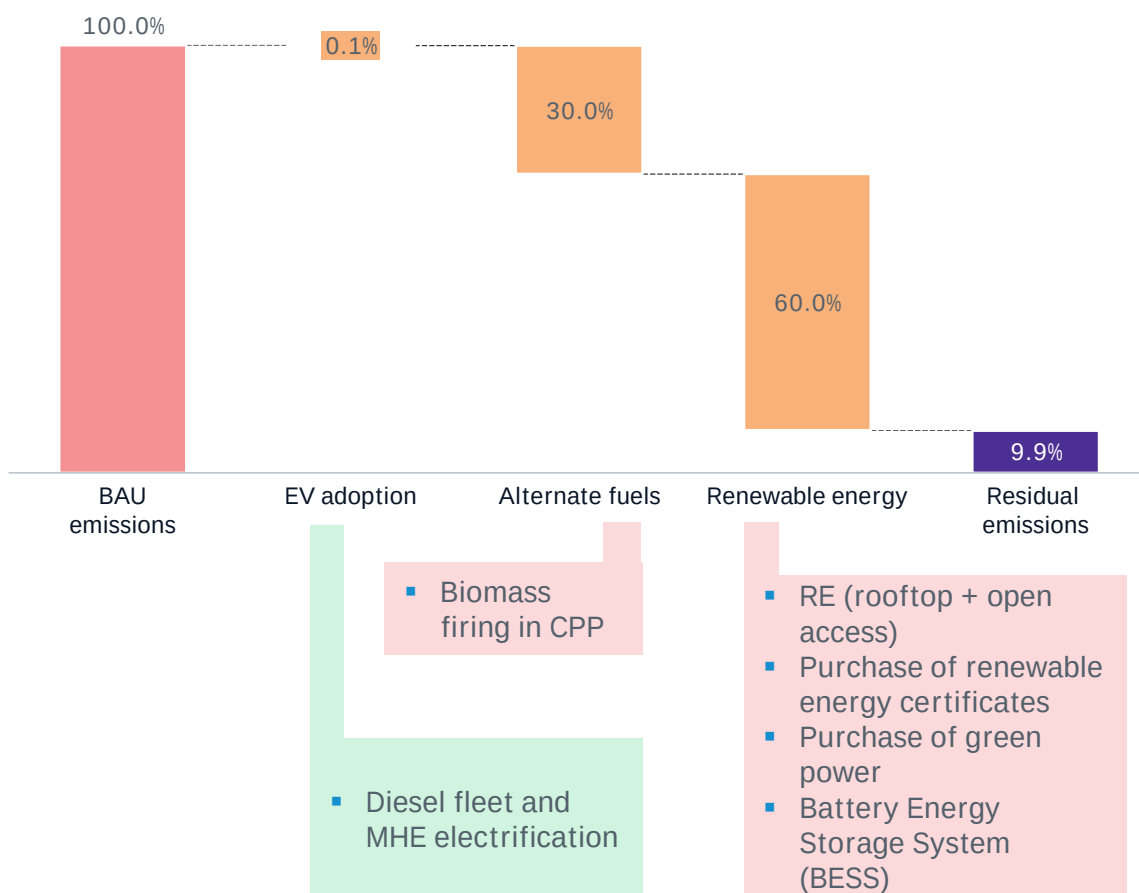
### EY-P Recommendations

- Setting net zero targets will help refineries mitigate CCTS penalties, as the initial compliance period for CCTS is until FY27. Future targets are unknown, but companies committing to net zero (which requires a 90% emission reduction) can safely avoid future CCTS penalties.
- Indian refineries must conduct a thorough impact assessment of the CCTS on their operations, identify specific compliance requirements, and establish internal monitoring and reporting mechanisms.
- The companies should first focus on “in the money” initiatives like energy efficiency, RE adoption in the short run to meet the CCTS target intensity.
- Companies should understand the mechanisms for generating and trading carbon credits under CCTS, as this can be a revenue source for companies with low carbon intensity.
- The government needs to encourage the early adoption of carbon capture technologies through grants, tax credits, funding for R&D and setting up of Centers of Excellence (CoE), as this can reduce 33% of the sector's emissions.
- Companies committing to sustainability targets through net zero, RE100, etc., and getting ranked highly by CDP can enhance their brand recognition globally and avail green financing.

Source: EY-Parthenon Analysis

The textile sector should adopt biomass and open access RE in the short term, and gradually increase RE coverage through RECs, green power, and BESS in the long term

### Textiles Sector Decarbonization levers

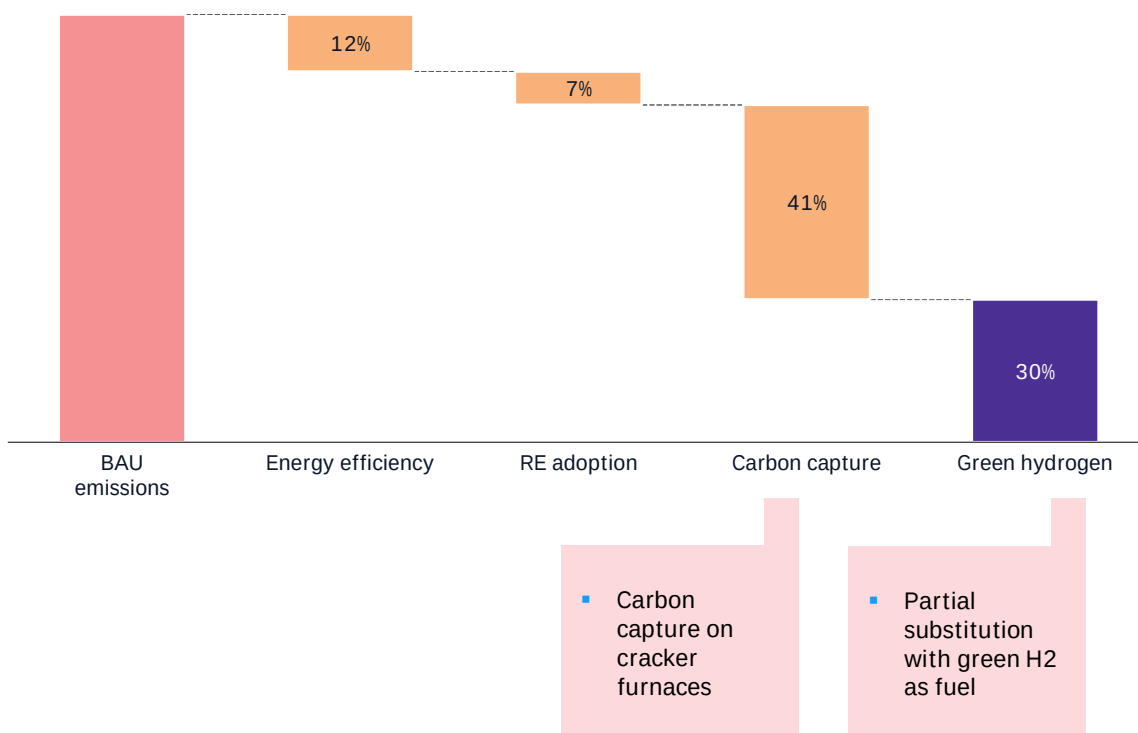


### EY-P Recommendations

- Setting Net Zero targets will help refineries mitigate CCTS penalties, as the CCTS initial compliance period is till FY27, future targets are unknown, companies committing to Net Zero (which requires a 90% emission reduction) can safely avoid future CCTS penalties
- Indian refineries must conduct a thorough impact assessment of the CCTS on their operations, identify specific compliance requirements, and establish internal monitoring and reporting mechanisms
- The companies should first focus on “In the money” initiatives like Energy efficiency, RE adoption in the short-run to meet the CCTS target intensity
- Understand the mechanisms for generating and trading carbon credits under CCTS, this can be a revenue source for companies with low carbon intensity
- Govt. needs to encourage earlier adoption of carbon capture technologies through grants, tax credits and funding R&D and setting up Centre of Excellences (CoE) as it can reduce 33% of the emissions of the sector
- Companies committing to sustainability targets through Net Zero, RE100 etc. and getting ranked highly by CDP can enhance their brand recognition globally and avail green financing

## Petrochemical industry needs to prioritize Energy efficiency, RE adoption to meet the CCTS targets; focus on Carbon capture and green H2 in the long-run to meet Net Zero targets

### Petrochemicals Sector Decarbonization Levers



### EY-P Recommendations

- Committing to SBTi will help companies mitigate CCTS penalties, as the CCTS initial compliance period is till FY27, future targets are unknown, companies committing to SBTi (which requires a 90% emission reduction by 2050) can safely avoid future CCTS penalties
- Indian petchem companies must conduct a thorough impact assessment of the CCTS on their operations, identify specific compliance requirements, and establish internal monitoring and reporting mechanisms
- Companies should first focus on “In the money” initiatives like energy efficiency and RE adoption in the short-run to meet the CCTS target intensity
- Understand the mechanisms for generating and trading carbon credits under CCTS, this can be a revenue source for companies with low carbon intensity
- Govt. needs to encourage earlier adoption of carbon capture and green H2 through grants, tax credits and funding R&D and setting up Centre of Excellences (CoE) as together they can reduce 71% of the emissions of the sector
- Companies committing to sustainability targets through SBTi, RE100 etc. and getting ranked highly by CDP can enhance their brand recognition globally and avail green financing

Source: EY-Parthenon Analysis

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## About CMAI

The Carbon Markets Association of India (CMAI) is an industry body dedicated to accelerating the net zero transition in India and globally by facilitating collaboration among stakeholders, including government, industry and civil society.

As a leading non-governmental, not-for-profit, industry-led organization, CMAI has supported over 3,500 projects, resulting in the reduction of 220 million tons of GHG emissions through its members. Our active involvement in global climate negotiations ensures that we remain at the forefront of environmental action.

We aim to ensure that all stakeholders – including farmers, MSMEs, large industries, think tanks, financial institutions and policymakers – formulate strategic steps that empower the country's stride toward a net zero future. CMAI works closely with government bodies to influence policy, engage thought leaders and enhance industry competitiveness through specialized services and strategic global partnerships. CMAI is also working with countries such as Japan, the Republic of Korea, Brazil, Iceland and Singapore, among others, to advance Article 6 collaborations.

CMAI works closely with key ministries and institutions such as the Ministry of Environment, Forest and Climate Change (MoEFCC), Ministry of Power (MoP), Ministry of New and Renewable Energy (MNRE), NITI Aayog, the Ministry of Railways, the Ministry of Agriculture & Farmers Welfare, Government of India, and the State Water and Sanitation Mission, Government of Uttar Pradesh, providing policy advocacy and knowledge support on climate and sustainability initiatives. CMAI plays a pivotal role in national initiatives such as the Carbon Credit Trading Scheme (CCTS) and the Green Credit Programme (GCP), supporting the development of frameworks aligned with global standards while promoting climate justice. CMAI also serve as a technical committee member for the implementation of the Extended Producer Responsibility (EPR) guidelines notified under the Plastic Waste Management (PWM) Rules of the Central Pollution Control Board (CPCB) and for the development of the Ecomark Rules for product labelling.

Beyond carbon markets, CMAI supports sectoral decarbonization through our strategic partners – the SAF Association, India Clean Cooking Alliance and Climate Law Association (EPR Alliance and ANT). CMAI continues to lead efforts toward global decarbonization and serves as a key reference point for both Indian industries and the international business community. Prominent members of CMAI include Adani Group, Reliance Industries, Jindal Steel Limited, L&T, Mahindra, Xpansiv and Glencore, among others.

India Climate Week is a flagship event of CMAI to accelerate the net zero transition. We successfully conducted the first edition in February 2025 and will be hosting the second edition from 12-17 March 2026 in New Delhi.

### Credentials links:

<https://www.thehindubusinessline.com/companies/association-of-re-agencies-of-states-cmai-ink-mou-to-develop-carbon-market-in-india/article66397977.ece>

<https://timestech.in/icea-signs-mou-with-cmai-towards-carbon-mitigation-measures/>

<https://economictimes.indiatimes.com/industry/renewables/industry-body-cmai-inks-info-sharing-pact-with-association-of-renewable-energy-agencies-of-states/articleshow/97125363.cms>