

WHAT INDUSTRY ACTUALLY PLANS TO DO ABOUT ITS EMISSIONS

A pilot inventory of ETS enterprises' decarbonization plans,
priced measure by measure with MACC curves



FROM PLANS MADE ALONE TO A NATIONAL PORTFOLIO

144

LARGE ENTERPRISES PARTICIPATE IN EMISSIONS
TRADING

228

INSTALLATIONS WITH A DECADE OF VERIFIED
MRV

> 42%

OF NATIONAL EMISSIONS COVERED BY THE ETS

What was missing

Every enterprise planned decarbonization on its own. The state could not see the aggregate potential; partners could not see a portfolio to finance.

What became possible

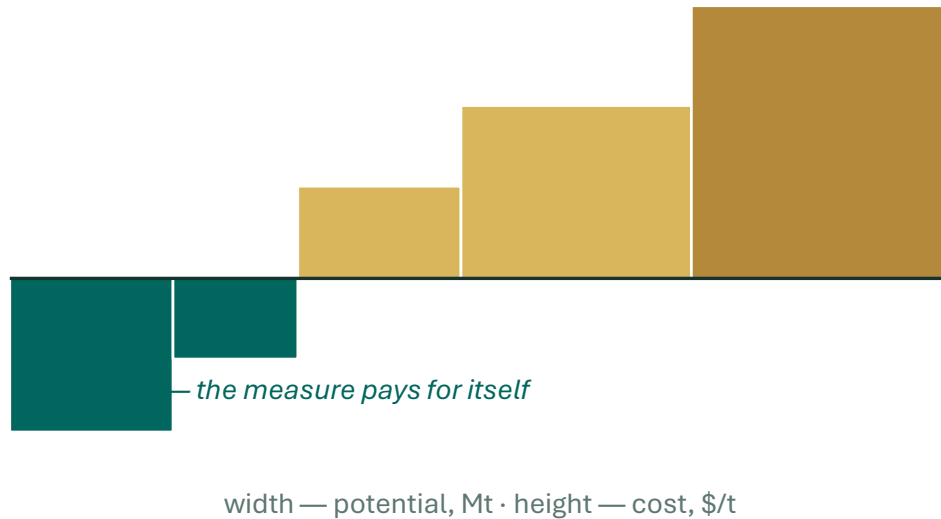
A decade of MRV data made it possible to assemble the plans into one database and price every measure per tonne of CO₂ — a first for the country.



HOW TO READ A MACC CURVE

The marginal abatement cost principle

Measures line up left to right by cost per tonne. The curve answers at a glance: what to do first, what works at a carbon price, what needs support.



Three steps of the pilot



1. Collect

Measures, costs and expected reductions — from enterprises.



2. Price

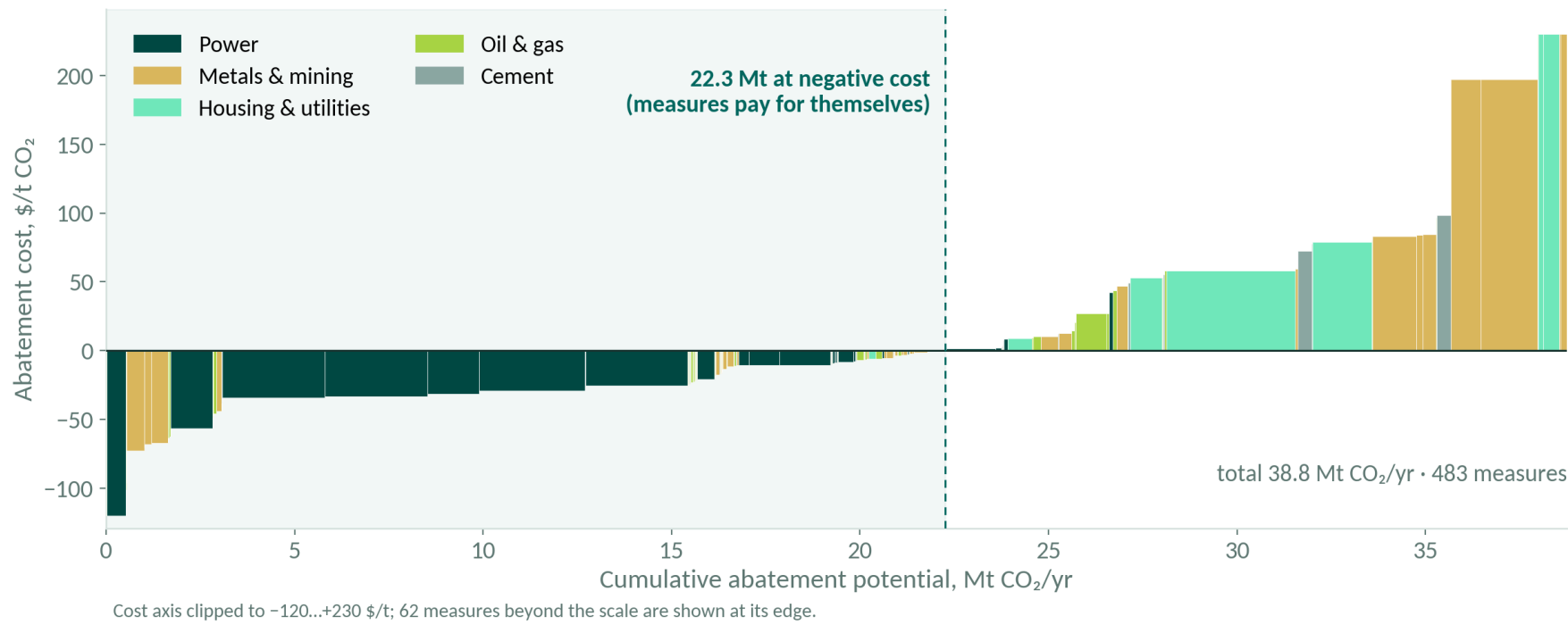
Each measure normalized to \$/t CO₂; 483 measures on one curve.



3. Compare

Potential set against the LT-LEDS and NDC trajectories.

THE AGGREGATE MACC CURVE OF FIVE SECTORS



38.7

MT CO₂/YR —
DATABASE POTENTIAL

57%

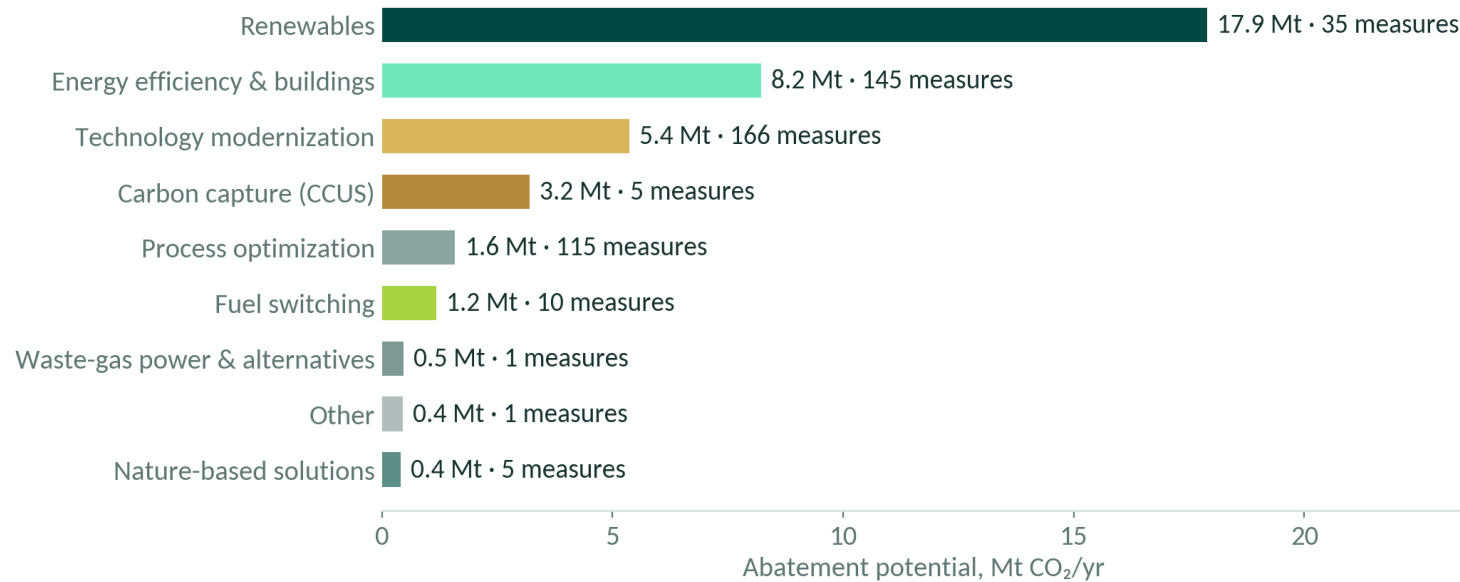
OF VOLUME BELOW
ZERO COST

-\$8.7

WEIGHTED MEDIAN
COST PER TONNE



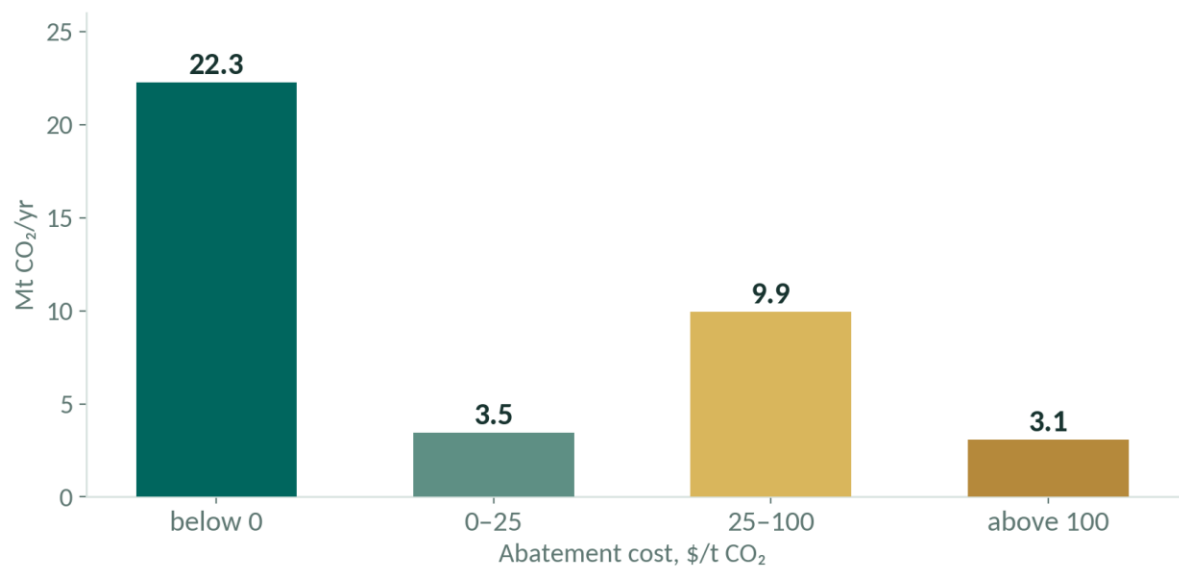
WHAT THE 483 MEASURES ACTUALLY ARE



Abatement potential by technology category

- 1 Renewables carry the volume — 17.9 Mt in just 35 projects.
- 2 The no-regret base: 260+ efficiency and optimization measures across all sectors.
- 3 Carbon capture appears in only 5 measures — the largest at ≈ \$197/t.

THE COST LADDER: WHAT TO DO IN WHAT ORDER



Potential by abatement-cost range, Mt CO₂/yr

below \$0/t — 22.3 Mt

Energy efficiency and methane leaks: self-paying; they need working capital, not subsidies. The report’s conservative estimate: at least 6.2 Mt.

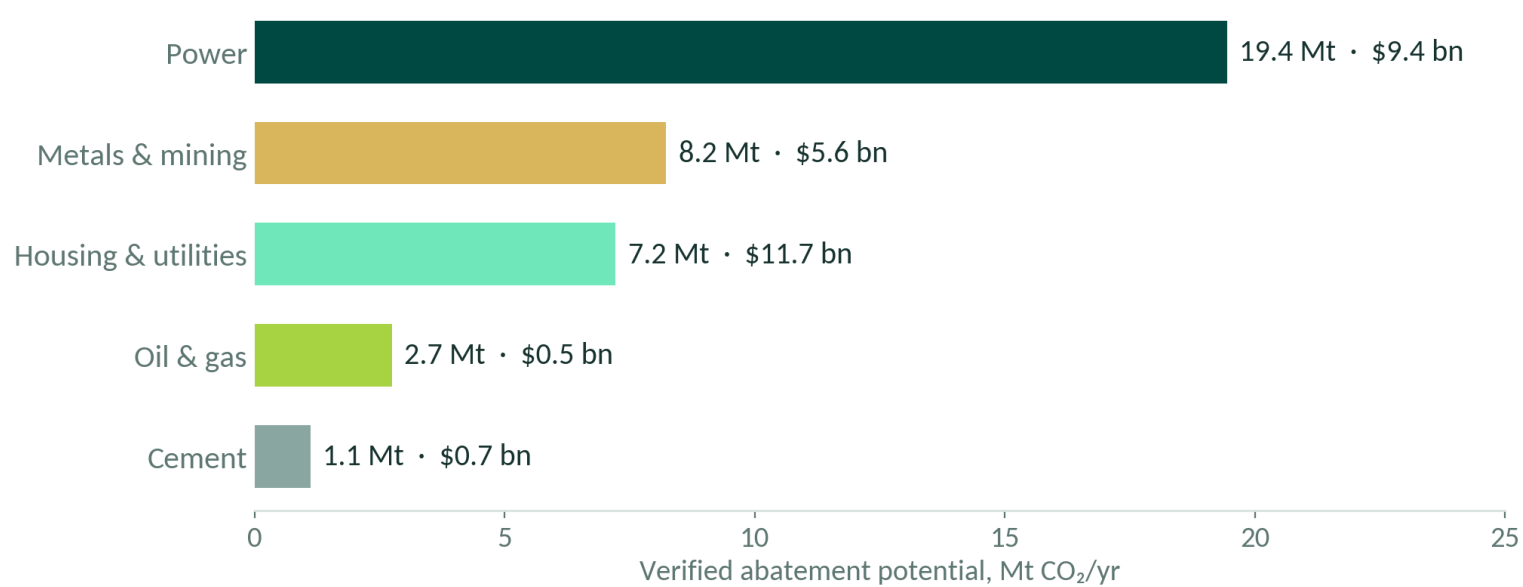
\$0-25/t — 3.5 Mt

Become viable at a moderate carbon price — the market the ETS reform creates from 2026.

above \$25/t — 13.0 Mt

Large renewables and deep modernization: not feasible without blended finance and de-risking.

WHERE THE POTENTIAL — AND THE CAPITAL — SIT



Potential and investment by sector

1

Power holds half the potential: the portfolio's fate is decided in generation.

2

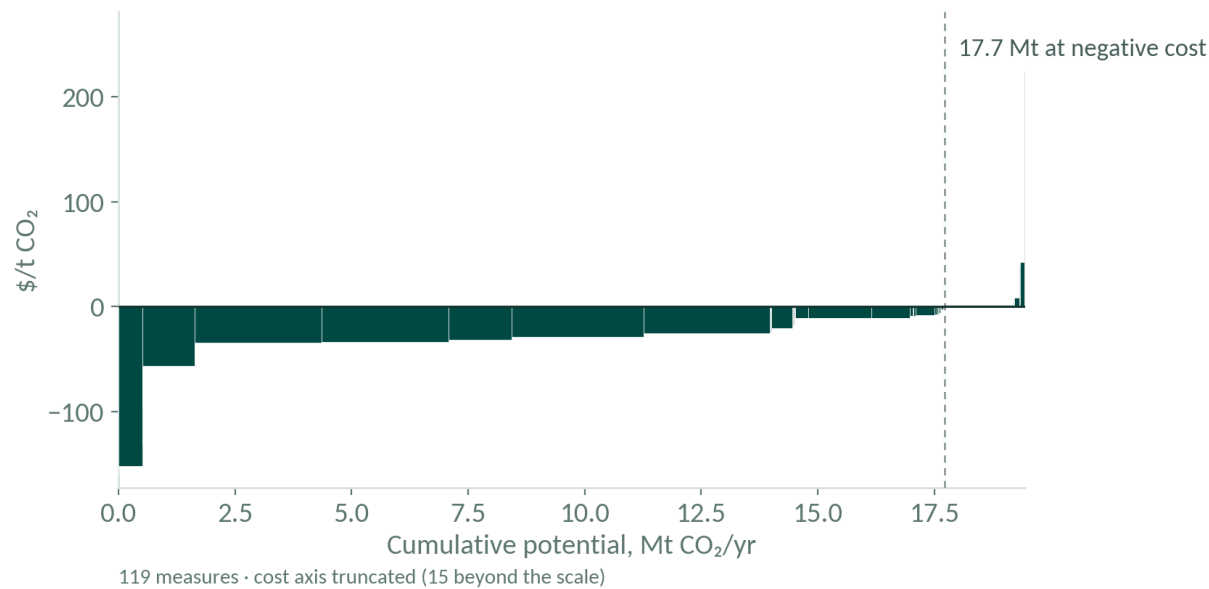
Housing & utilities is the most capital-intensive: \$11.7 bn for 7.2 Mt.

3

Oil & gas offers the cheapest tonnes: \$0.5 bn for 2.7 Mt.



POWER: HALF OF THE PORTFOLIO



19.4 Mt/yr

the largest sectoral potential — half of the portfolio

\$9.4 bn

investment across 119 measures in the database

85–90%

of the potential is utility-scale renewables

KEY TECHNOLOGIES IN THE PLANS

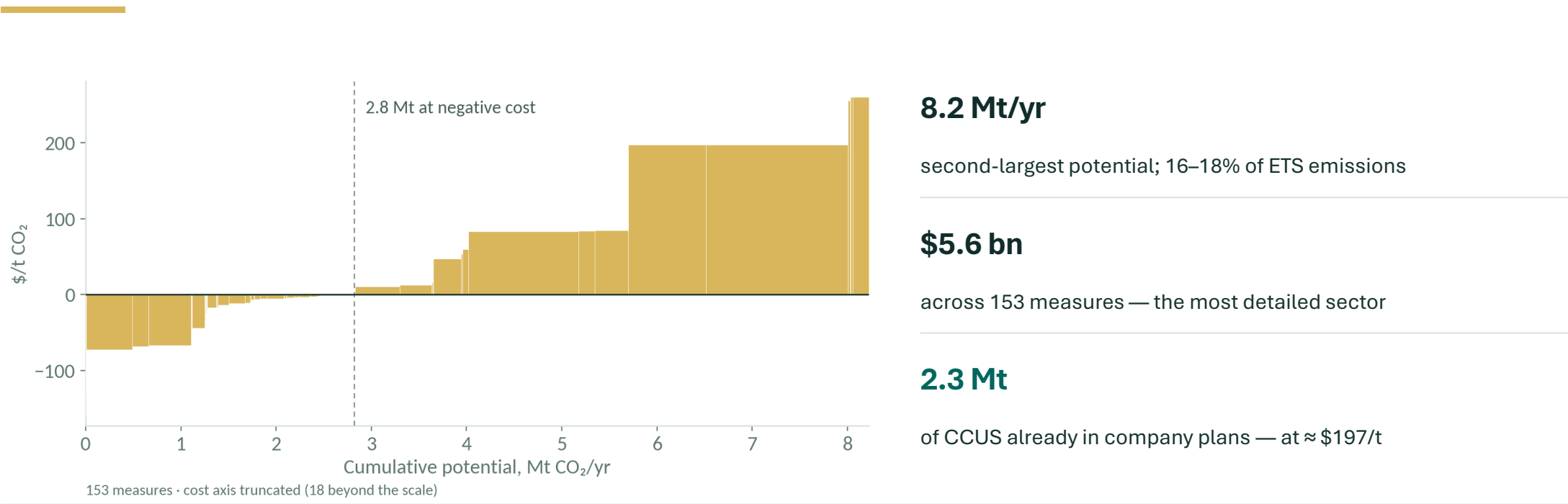
Four ~1 GW-class wind farms with Masdar, ACWA Power, Total Eren and CPI — 2.7–2.8 Mt each, at negative cost per tonne

57 process-optimization measures at existing thermal plants

Hydropower cascade projects — more than 2.4 Mt combined

Boiler and turbine modernization — ≈ 0.7 Mt across 32 measures

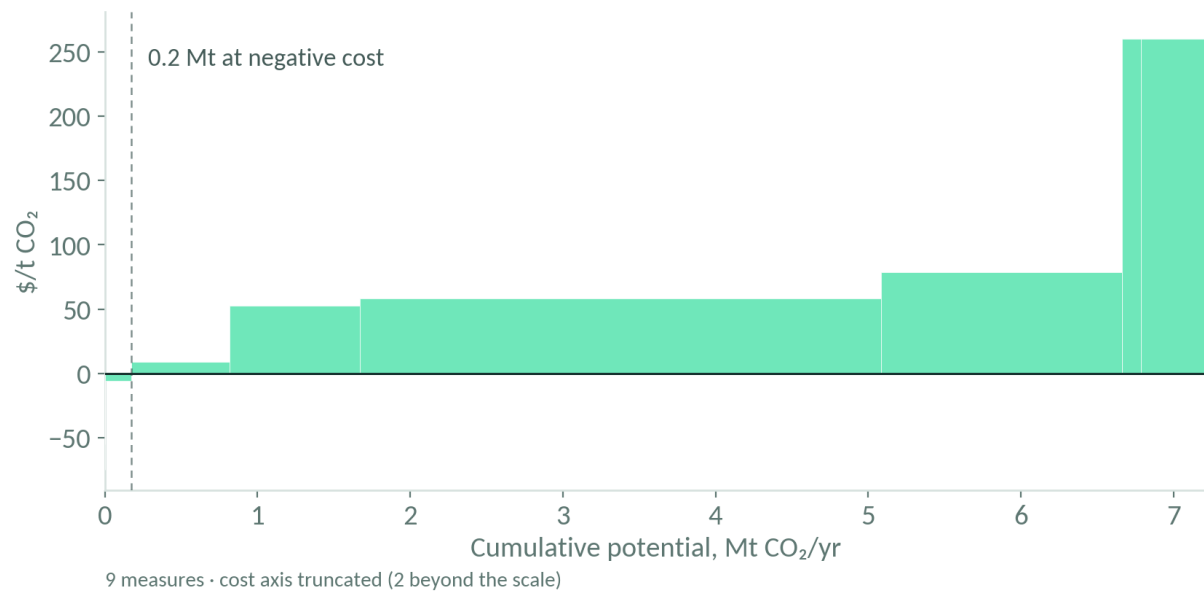
METALS & MINING: TECHNOLOGICAL DEPTH



KEY TECHNOLOGIES IN THE PLANS

- Bayer hydrogarnet alumina processing — 1.16 Mt, \$0.7 bn
- Two CCUS projects — 2.3 Mt at ≈ \$197/t, the far right of the curve
- Ferroalloy off-gas utilization for 80 MW of power — 0.47 Mt
- Online sinter-composition analyzers — 0.48 Mt at -\$73/t

HOUSING & UTILITIES: THE MOST CAPITAL-INTENSIVE



7.2 Mt/yr

from nine aggregated national programmes

\$11.7 bn

investment — 42% of the portfolio’s capital

22 M Gcal

of heat + 175 GWh of power saved annually

KEY TECHNOLOGIES IN THE PLANS

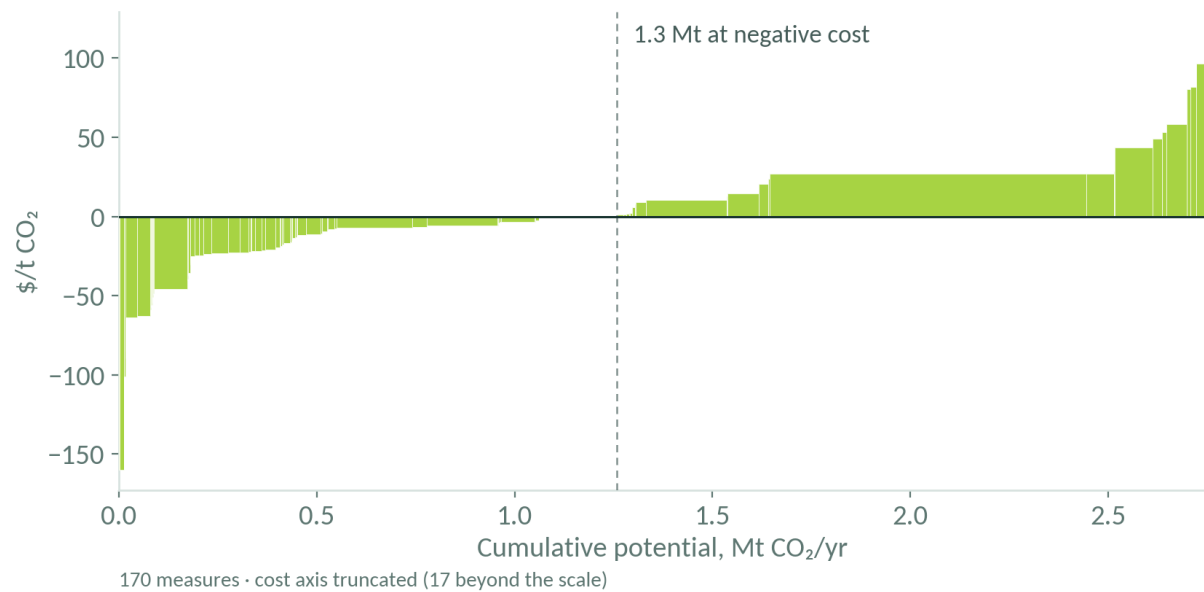
Large-scale heat pumps in district heating — 3.4 Mt, \$3.0 bn

Automated heat substations — 0.64 Mt at just \$9/t

Thermal retrofit of apartment blocks — ≈ 2.4 Mt combined

Overhaul of utility networks bundled with the retrofits

OIL & GAS: QUICK WINS ON METHANE



2.7 Mt/yr

across 170 measures; ≈ 14% of ETS emissions

\$0.5 bn

the lowest capital intensity per tonne

0.9 Mt

of capture measures, incl. Cryocap FG/Oxy at \$10/t

KEY TECHNOLOGIES IN THE PLANS

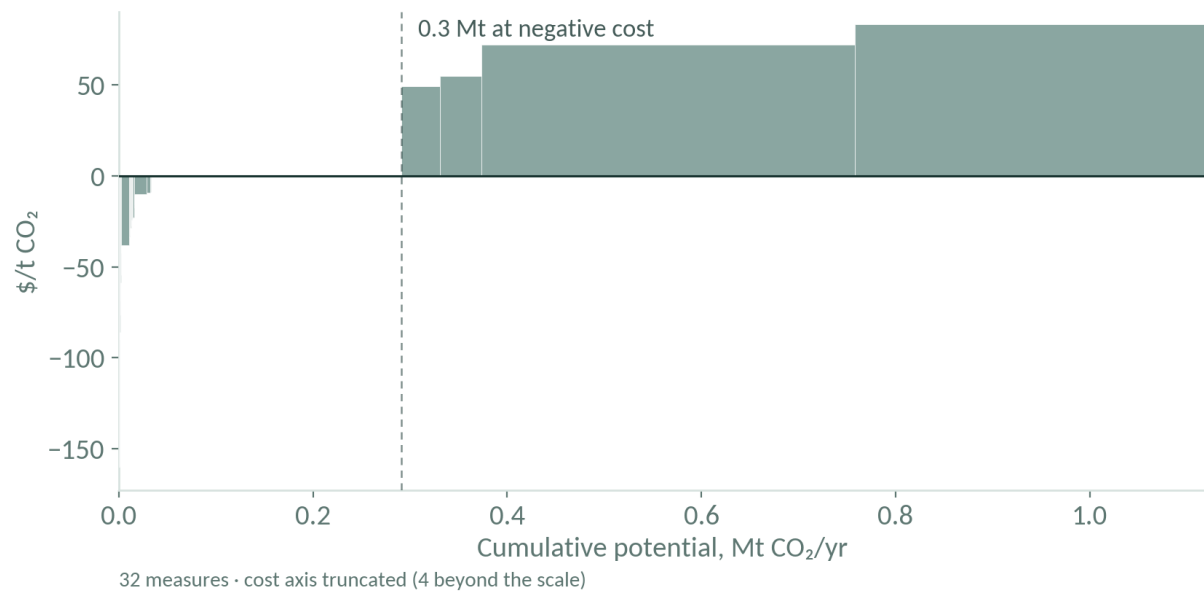
CO₂ capture from flue gas (Cryocap FG/Oxy) — 0.2 Mt at \$10/t

Tank-farm and equipment modernization — 50 measures

Gas recovery and recompression in networks — 0.19 Mt below \$0/t

Corporate afforestation programme — 0.8 Mt, T81.4 bn

CEMENT: TWO PROJECTS DECIDE EVERYTHING



1.1 Mt/yr

across 32 measures in the sector

\$0.7 bn

required (≈ ₹349.5 bn)

> 85%

of the potential sits in two structural projects

KEY TECHNOLOGIES IN THE PLANS

- High-efficiency vertical mills (clinker factor) — 0.38 Mt
- Coal-to-gas fuel switching at the kilns
- A new dry-process line replacing the wet process — 0.36 Mt
- Process optimization incl. a full plant carbon inventory — 0.26 Mt

THE “SECOND WAVE” IS BARELY IN THE PLANS

The database shows what enterprises can finance today. The technologies that take the country from 39 Mt to neutrality are almost absent — this is where partnership matters most.

	CCUS at scale	Only 5 capture measures (3.2 Mt); the two largest sit at $\approx$ \$197/t — unbankable without support.
	Green hydrogen	One prospective measure — H ₂ calcination kilns (2030–2035); no hydrogen supply chain yet.
	Process electrification	High-temperature industrial heat remains fossil-based; no electrification projects in the database.
	Low-carbon steel & cement	No DRI steelmaking or clinker-substitution projects — the CBAM-critical technologies.

Three barriers keep the second wave out: access to technology, cost of capital, and the absence of de-risking instruments.

A GAP OF ACCESS, NOT AMBITION

The “first wave” — present in the plans

Energy efficiency, waste heat, fuel switching, own renewables — mature solutions financeable domestically.

The “second wave” — almost absent

CCUS, hydrogen, process electrification, low-carbon steel and cement. Barriers: technology, cost of capital, de-risking.

Enterprises are willing. The constraint is project bankability, not intent.



≈ 39 Mt

A VERIFIED MINIMUM: THE SUM OF PLANS FALLS SHORT OF THE NDC TRAJECTORY

\$27.9 bn

NEEDED NOW — AGAINST ≈ \$610 BN OF NET INVESTMENT NEEDS TO 2060

≈ 6 mo

FROM INVENTORY TO A PORTFOLIO READY FOR FINANCING TALKS

TECHNOLOGY AND FINANCE: FIVE TRACKS



CCUS

Joint feasibility studies at 1–2 pilot installations; sharing CO₂-storage regulation practice.



Industrial heat & H₂

Pilots in electrification and hydrogen-ready equipment.



Low-carbon materials

Clinker substitution, DRI in steel — protecting CBAM-exposed exports.



Methane — the fast track

Measurable and cheap; works towards –42% by 2035.



Blended finance

Guarantees, first-loss tranches, tenge hedging; GCF funding via DBK.

