



Carbon Pricing

SPE London Net Zero Event
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COP26: Last chance for carbon trading?

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Leaders at the COP26 climate conference will consider how to create a framework for global cooperation on carbon markets, which could be a key breakthrough for climate change mitigation.

Carbon price rises above €60 to set new record

Tighter rules and potential for greater winter reliance on coal help push up prices

Environment

EU's planned carbon border tax to impact Russia the most -study

Reuters

Free exchange

The EU proposes a carbon tariff on some imports

The effort could prove an instructive example for others—or a cautionary tale

China Launches World's Largest Carbon Emissions Market

Politics & Policy

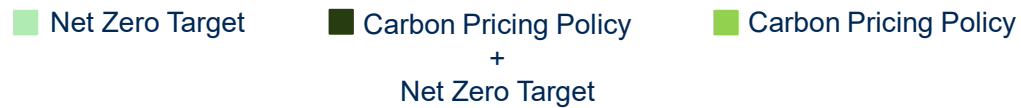
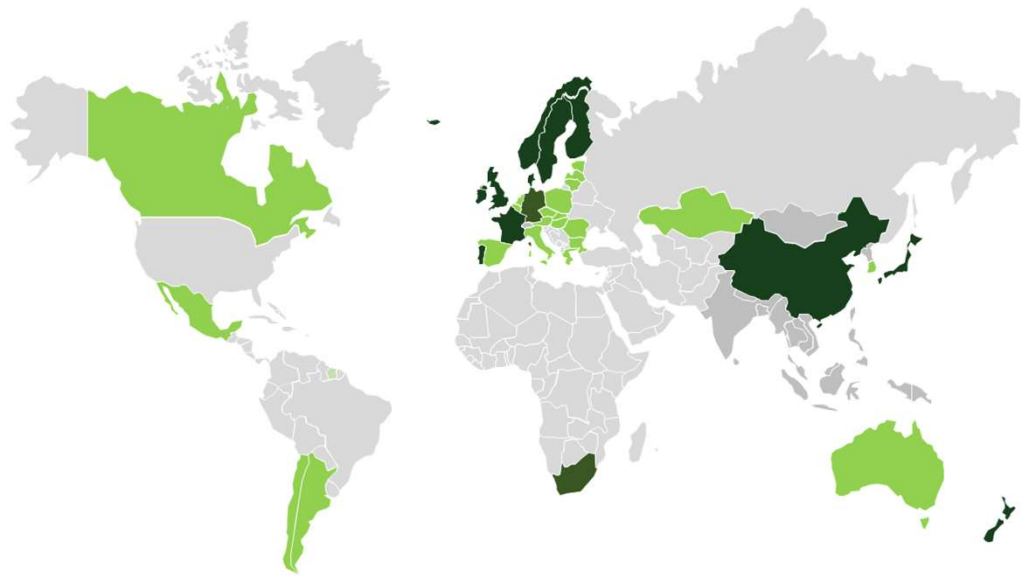
The U.S. Makes Carbon Pricing More Complicated Than It Needs to Be

What happens when a country that's unwilling to impose a direct tax on emissions decides to assess the carbon content of imports?

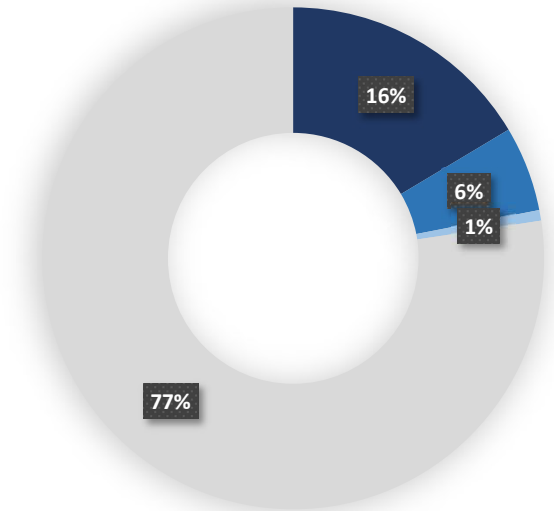
Global Carbon Pricing and Policy Coverage

Geographic coverage of Carbon Pricing limited but growing
22% of Global Emissions currently covered by Carbon Pricing

Geographic Coverage of Carbon Pricing Policy & Net Zero Targets

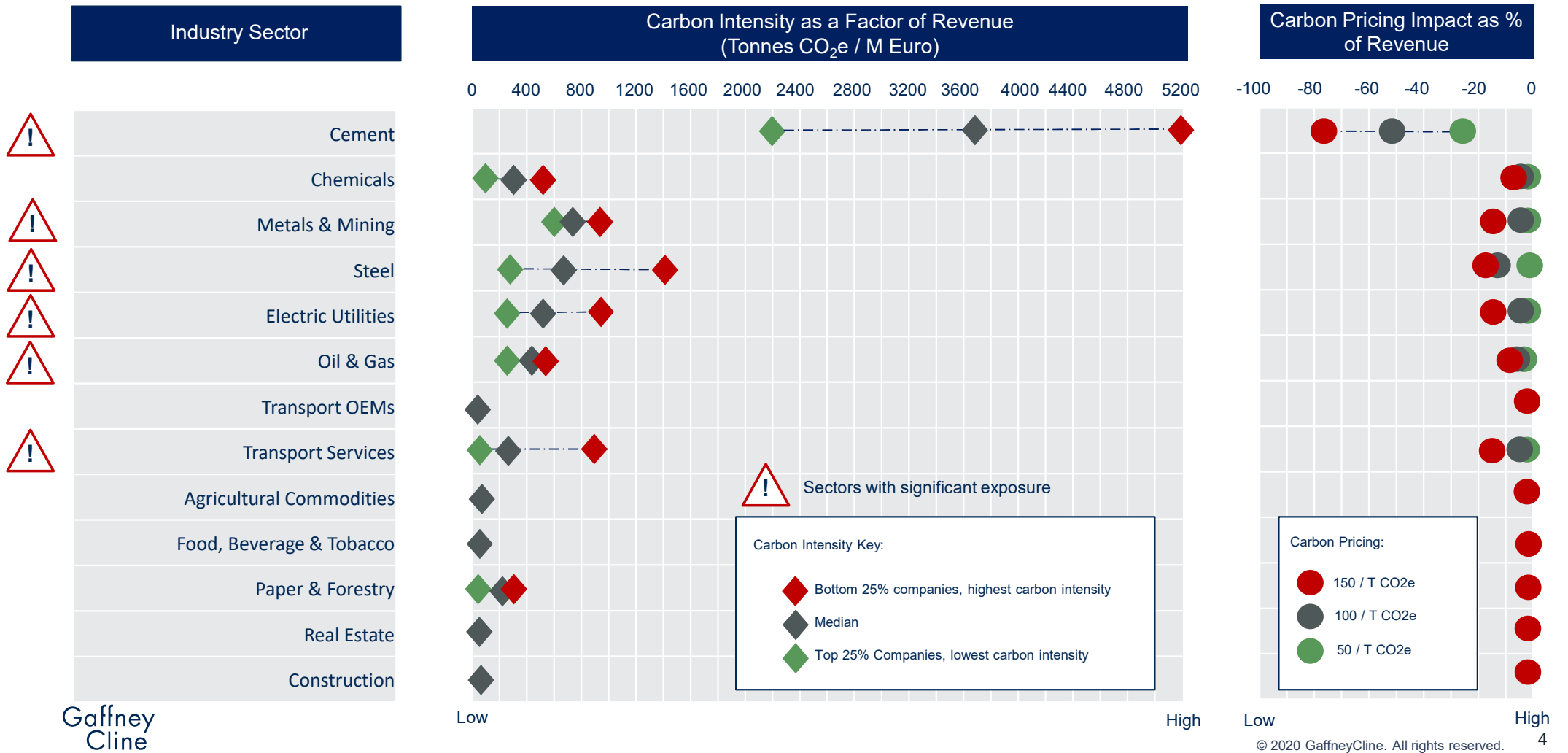


Pricing Mechanism Coverage of Global Carbon Emissions



Industry Readiness for Carbon Pricing

Heavy Industrial players most highly exposed to future Carbon Pricing



Pricing Mechanisms

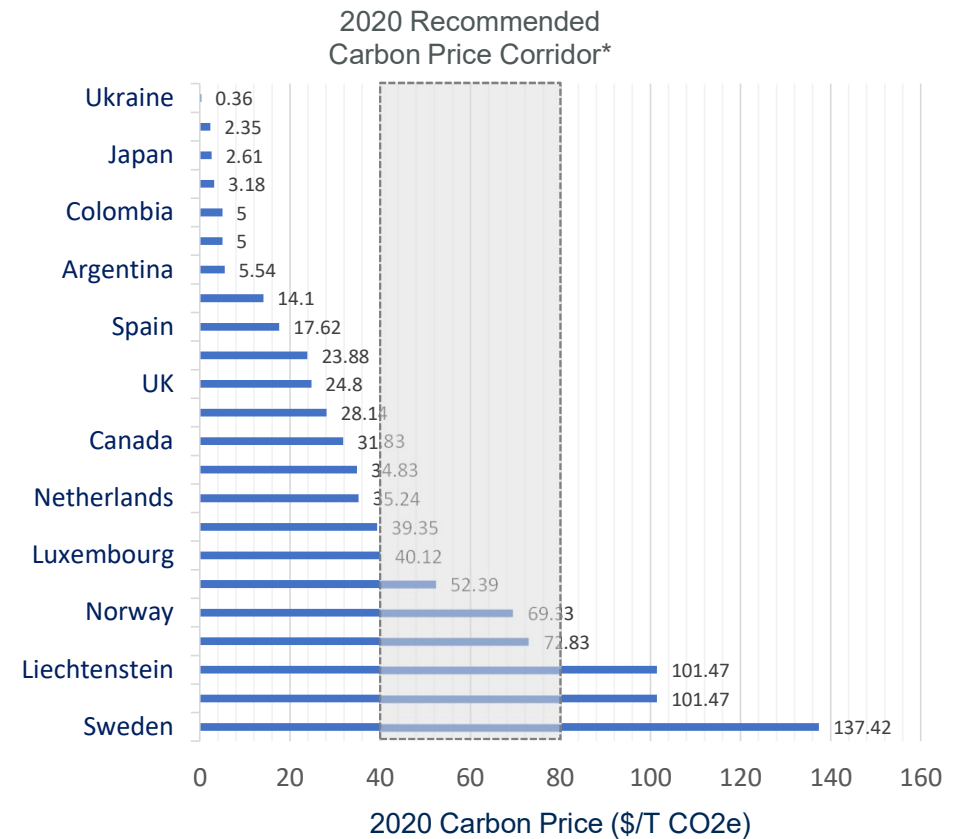
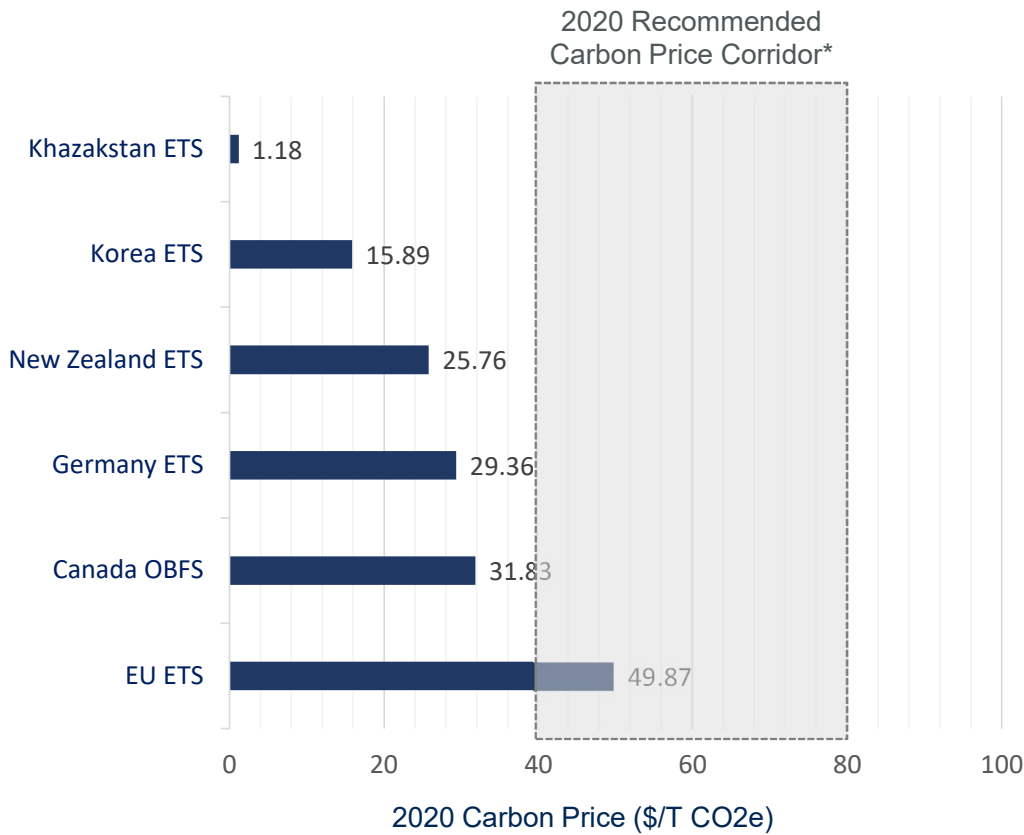
Comparison of Carbon Pricing Mechanisms

ETS / Cap & Trade most complex to implement but should lead to most efficient carbon pricing

	Carbon Tax	ETS / Cap & Trade	Carbon Credit
Principle	<ul style="list-style-type: none"> • Predefined tax rate targeting specific emission sources 	<ul style="list-style-type: none"> • Market based allowances traded around emissions limit or Cap 	<ul style="list-style-type: none"> • Market based verifiable credits issued which can be monetised to generate income for certified projects
Market Type	<ul style="list-style-type: none"> • Compliance 	<ul style="list-style-type: none"> • Compliance 	<ul style="list-style-type: none"> • Voluntary
Pricing Certainty	<ul style="list-style-type: none"> • Pre-defined tax rate • Stable price • Strong signal for investment 	<ul style="list-style-type: none"> • Market driven price => volatility • Price reflects gap between emissions and cap • Hedging may increase volatility 	<ul style="list-style-type: none"> • Highly dependent upon project quality • Largely dependent upon Corporate demand and project availability
Emission Level Predictability	<ul style="list-style-type: none"> • Uncertain - difficult to predict emission reduction with predefined tax rate 	<ul style="list-style-type: none"> • Good, cap determines upper limit on emissions 	<ul style="list-style-type: none"> • Dependent upon the quality of the project and ongoing management of the Carbon sink

Pricing

< 4% of Global Emissions within Carbon Price Corridor recommended by IPCC



EU ETS

Only regional Environmental Cap & Trade system continued to expand; sector, geographic & emissions coverage



	Current
Established	2005
Scope	1+2 emissions
Coverage	EU States + Iceland + Liechtenstein + Norway + Link to Switzerland
Sectors	<ul style="list-style-type: none"> • Aviation • Power Generation • Energy Intensive Industries
Target	40% by 2030 => *LRF = 2.2% / annum

*LRF is annual Linear Reduction Factor

Proposed Expansions

- **Carbon Border Adjustment Mechanism** expand coverage to trading partners such as; Russia, India, China, UK
 - **Maritime** Intra EU + 50% Extra EU
 - ETS for **Buildings & Transport**
- 61% by 2030 => *LRF = 4.2% / annum**

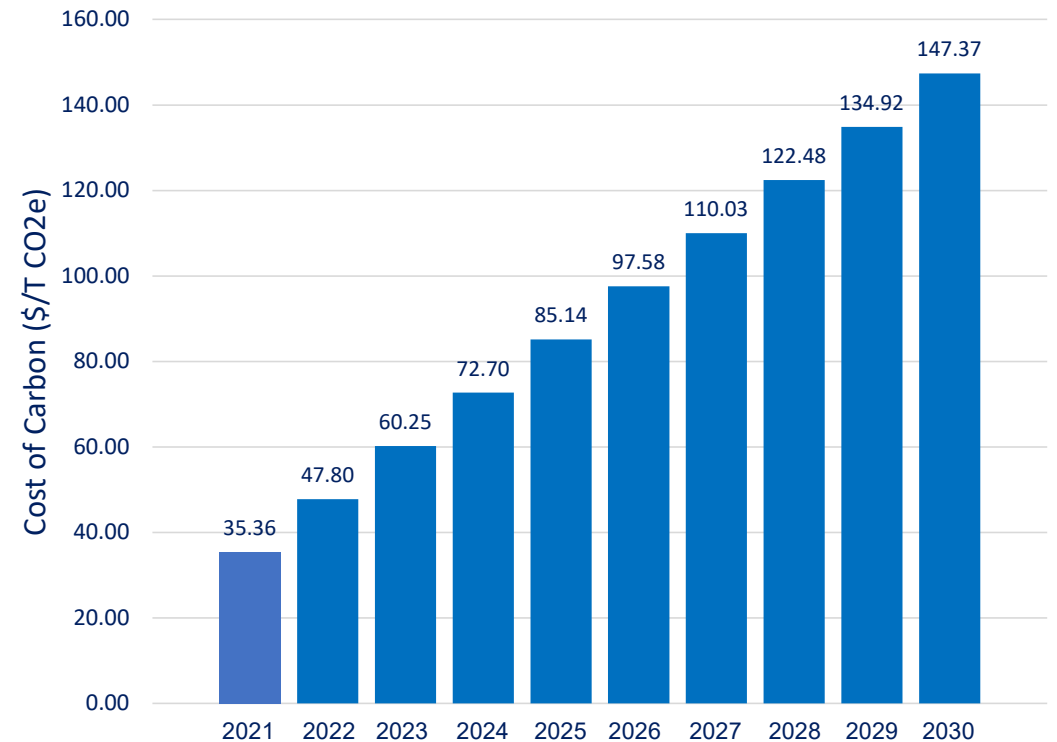


Netherlands Industry Carbon Tax

NL first to introduce Carbon Tax on Industry which has largely lagged on decarbonisation



Overview	
Established	2021
Coverage	Netherlands
Sectors	235 x Industrial Companies
Scope	Decarbonisation of large Industrials
Principle	<ul style="list-style-type: none">> Complementary to EU ETS> Emissions capped as per EU ETS> Tax rate predefined and indexed up to 2030> Tax paid is difference between EU ETS and NL Industry Carbon (indexed) rate
Target	Reduction of 14.3 M T CO ₂ e by 2030

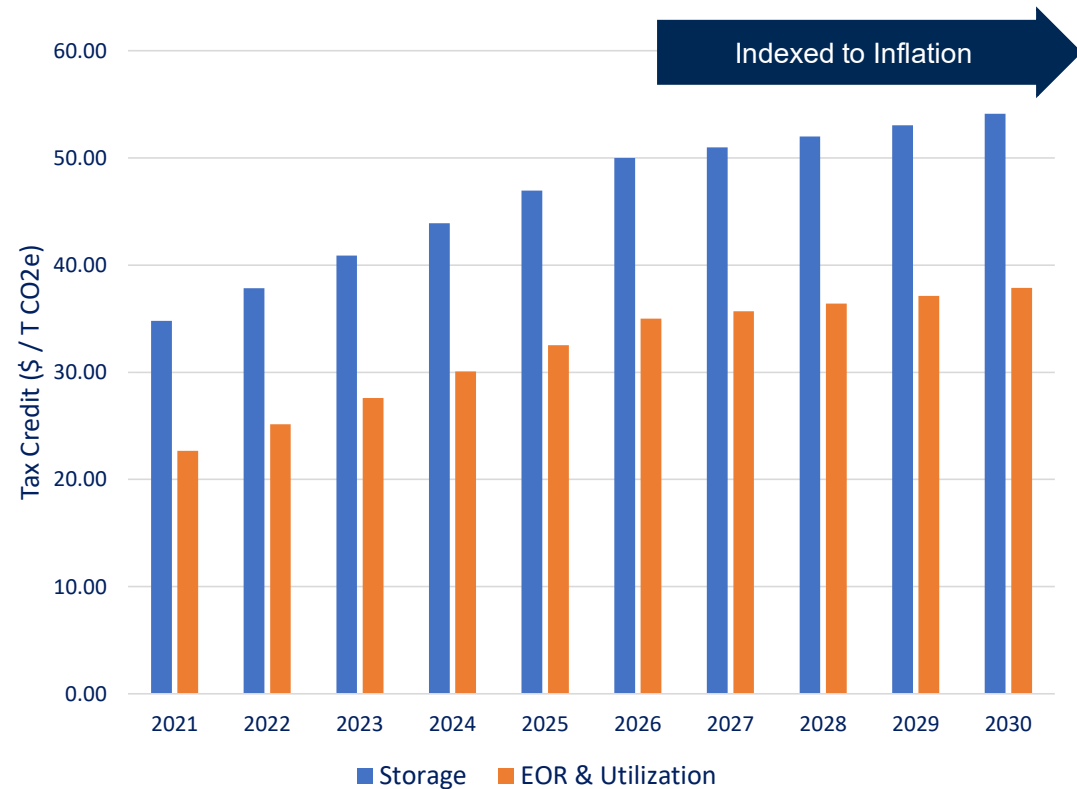


US Federal Tax Credit Section 45Q – CCUS

Tax Credit stimulating huge interest in the development of CCUS in the US



Overview	
Established	2008 last updated December 2020
Coverage	US
Sectors	Incentivize investment in CCS
Scope	CCS construction start before January 2026
Principle	<ul style="list-style-type: none"> > Owners of carbon capture equipment may claim credits over 12 years from first operation > Credit is indexed to 2026 then increased by inflation index > Credit value dependent upon Storage, EOR or Utilisation
Target	Reduction of 75M T CO ₂ e



note: further enhancements to 45Q are underway to increase credit to \$85 / T CO₂e

Insights & Experience

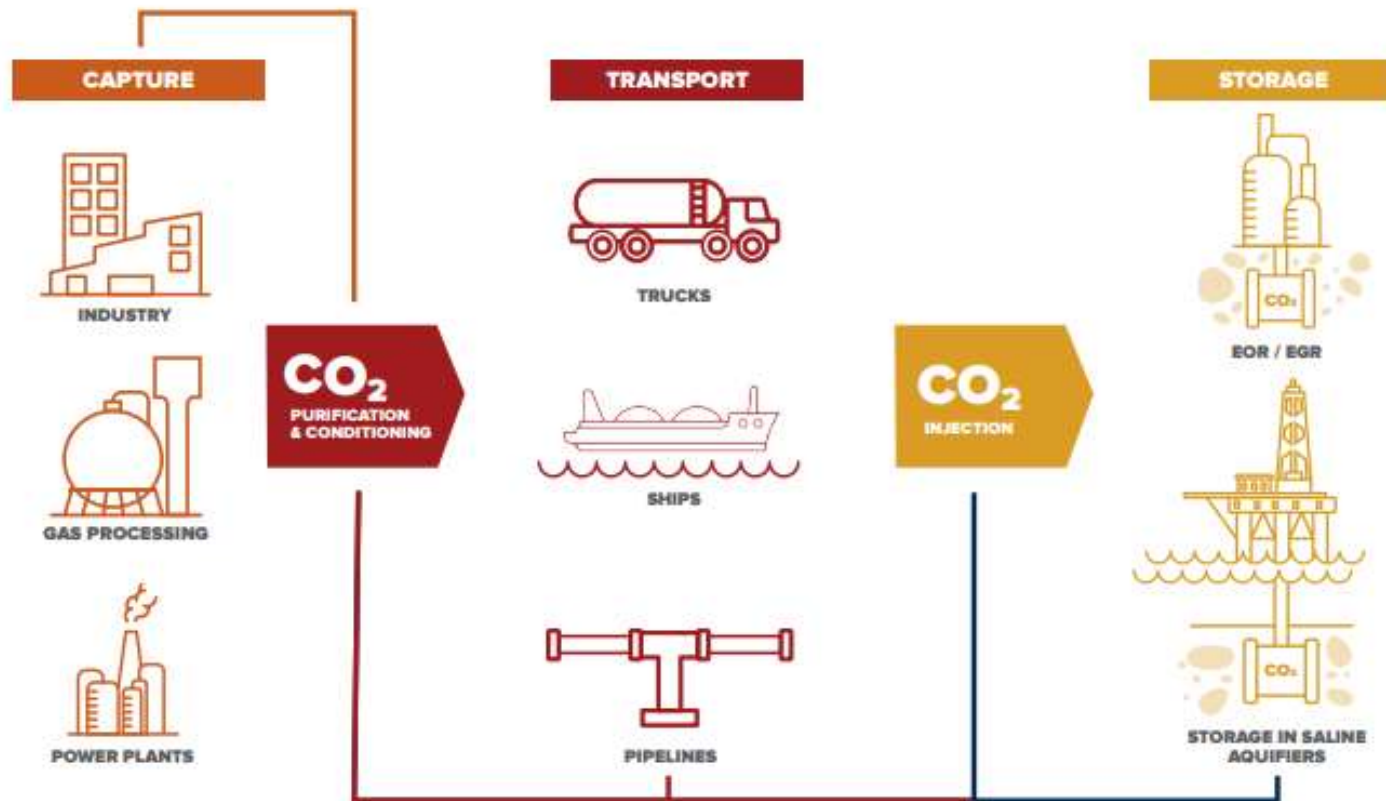
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Client Impact from Carbon Pricing + GaffneyCline Support

Increasingly Carbon pricing integral to Client decision making

Client Carbon Pricing Impact	GC Support
Competitiveness of future oil & gas production	Assessing carbon intensity of oil & gas production Cost benchmarking of production with Carbon Price scenarios
Abatement of GHG emissions from production	Techno-economic assessment GHG abatement solutions Establishing marginal cost curve / Carbon Price breakeven
Investment opportunity in H ₂ Production	Techno-economic assessment of H ₂ production & transport Carbon price scenarios for project investment
Investment opportunity in CCUS	Techno-economic assessment of carbon capture, transportation, storage and utilisation Carbon price scenarios for project investment

GaffneyCline Example – Assessing viability of Carbon Capture



GaffneyCline Example – Assessing viability of Carbon Capture

Opportunity to capture Carbon emissions in proximity to an existing pipeline with 45Q tax credit support

- **Screen & Identify potential CO₂ sources** from industrial CO₂ emitters within a radius of pipeline.
- **Assess techno-economics for capture of specific CO₂ sources** with support of 45Q tax credit mechanism
- **Validate storage potential** by reference to capacity, injectivity and integrity of the sequestration medium, using SRMS methodology
- **Regional mapping** for sequestration potential and high-grading
- **Evaluate financial investment case;** determining the total volume and costs of CO₂ that could be viably captured, injected and transported by pipeline to permanent storage

GaffneyCline Example – Carbon Source Complexity

Lower cost capture for higher intensity, higher pressure CO2 emitters

Sources CO₂ capture ready

Sources requiring additional process to extract CO₂

Industry	Point Source	Typical Partial Pressure CO ₂ (Wet) kPA	Gas Stream Pressure
Natural Gas Processing	Natural Gas Processing	5000	900 - 8200
Fertiliser	Coal Gasification Syngas	2500	3000 - 6000
Fertiliser	Natural Gas Reforming Syngas	1200	2000 - 3000
Petrochemicals	Ethylene Oxide Production	92	Atm
Chemicals	Steam Methane Reforming (PSA Tail Gas)	48	200 - 300
Power	Coal Fired Power Plant	14.2	Atm
Petroleum Refining	Fluid Catalytic Cracking	14.2	Atm
Power	Biomass/Waste Fired Power Plant	12.2	Atm
Power/Industrial	Natural Gas Power (Open Cycle)	8.1	Atm
Power	Natural Gas Combined Cycle (NGCC)	4.6	Atm

Low Complexity & Cost

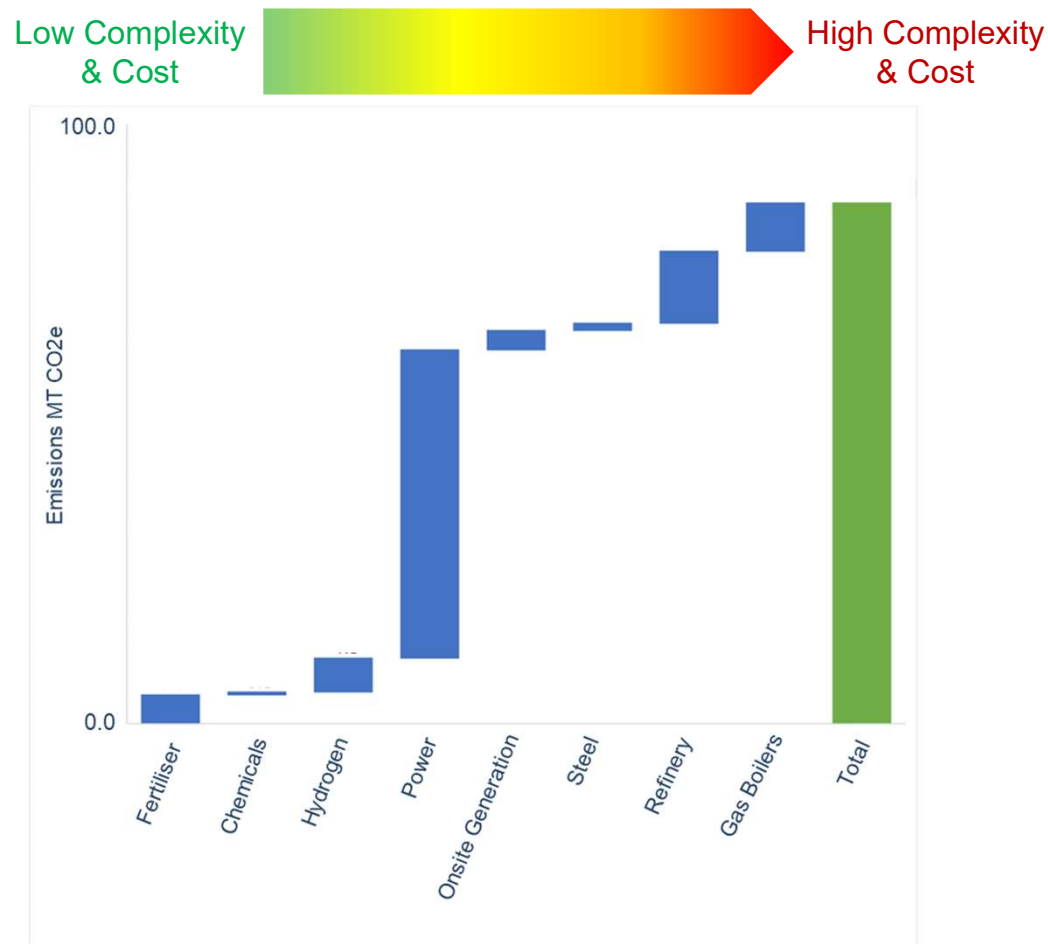


High Complexity & Cost

CO₂ capture cost and complexity increase as partial pressure of CO₂ decreases

GaffneyCline Example – Potential Carbon Source Volumes

Availability of CO2 concentrated around higher capture cost emitters



Carbon Pricing – Key Conclusions

- Geographic coverage of Carbon Pricing limited but growing
- Heavy Industrial energy consumers most highly exposed to future Carbon Pricing
- < 4% of Global Emissions within Carbon Price Corridor recommended by IPCC
- Increasingly Carbon pricing integral to Client decision making
- Emerging investment case for carbon mitigation including CCUS

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