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KraneShares

Investing in the Global Carbon Credit Markets

Luke Oliver

Head of Climate Investing
KraneShares

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KraneShares ETC Securities Programme

Investing in the Global Carbon Credit Markets



Introduction to KraneShares

About KraneShares

Krane Funds Advisors, LLC is the investment manager for KraneShares ETFs. The firm is focused on providing investors with strategies to capture China's importance as an essential element of a well-designed investment portfolio. KraneShares ETFs represent innovative, first to market strategies that have been developed based on the firm and its partners' deep knowledge of investing. These strategies allow investors to stay current on global market trends and provide meaningful diversification. Krane Funds Advisors, LLC, is a signatory of the United Nations-supported Principles for Responsible Investment (UN PRI).

In 2018, KraneShares established operations in the United Kingdom (UK) and Europe to better deliver its renowned China-focused ETFs to investors in the region. In addition to launching UK/Europe-specific versions of its most popular US-listed funds, KraneShares also develops strategies tailored to meet the specific needs of its UK/European clients.

In 2024, KraneShares launched an ETC Securities Programme under which KraneShares ETC plc may issue secured exchange-traded commodities.



Investment Case

Investment Thesis

- Carbon portfolio historically provides annualized returns above the S&P 500¹
- Structurally designed for long-term price appreciation due to the markets' increasing supply scarcity²
- Low correlations to major asset classes, including 0.3 to US large cap¹
- Provides alternative return profile with potential inflation and climate risk hedging
- Standardized, liquid market valued at \$900B³, with nearly 3x growth in trading volume in the last 5 years⁴
- Benefits from structured demand from the program's government-mandated participation for high-emitting sectors

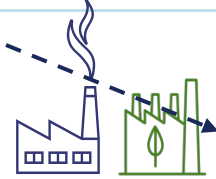



Impact

- Provides potential impact by supporting price discovery and liquidity in carbon markets³ while counterbalancing a portfolio's emissions exposure and energy transition/climate risk
- Cap and trade supports fuel switching and capital directed toward innovation in renewable technology⁵



1. Data from Bloomberg and S&P Dow Jones Indices as of 31/Jan/2024. See slide 20 for supporting data. The performance data quoted represents past performance, and current returns may be higher or lower. Past performance does not guarantee future results. For additional performance and information, please see slide 23.
2. European Commission, "What is the EU ETS?" retrieved 25/Jun/2024.
3. Reuters, "Global carbon markets value hit record \$909 bln last year," 7/Feb/2023.
4. Data from Bloomberg as of 31/Jan/2024. Based on the 5 largest carbon markets. (See slide 17).
5. International Swaps and Derivatives Association, "Role of Derivatives in Carbon Markets," Sep 2021.

Compliance vs. Offset Carbon Credits

	Cap-and-Trade/Emission Trading System (ETS)	Carbon Offset
Unit Type	Permit to emit one metric ton of CO2	Verified reduction of one metric ton of CO2
Purpose	Reduce emissions over time for specified regions/industries through a declining annual cap and additional supply adjustment mechanisms	Balance an entity's carbon footprint by investing in projects that reduce or remove emissions
Examples	EU ETS, California Cap-and-Trade, Regional Greenhouse Gas Initiative (RGGI), UK ETS, Washington state C&T, New Zealand ETS 	Building wind turbines or solar farms, supporting methane reduction projects, reforestation, preserving mangroves, carbon capture and storage technology 
Participation	Mandatory (Compliance)	Voluntary
Issuer/Oversight	Central governments and states, government agencies, non-profit corporation 	Issuers are project developers. Oversight is provided by NGOs/independent verification entities. 
Market Size	\$900 billion ¹	\$2 billion ²
Project-based	No	Yes
Credit Sale	Purchased at auction or (if an entity qualifies) allocated for free	Bought directly from project developers or broker/intermediary

Source: International Carbon Action Partnership, retrieved 31/Dec/2024.

1. Reuters, "Global carbon markets value hit record \$909 bln last year," 7/Feb/2023.

2. Reuters, "Voluntary carbon markets set to become at least five times bigger by 2030," 19/Jan/2023.

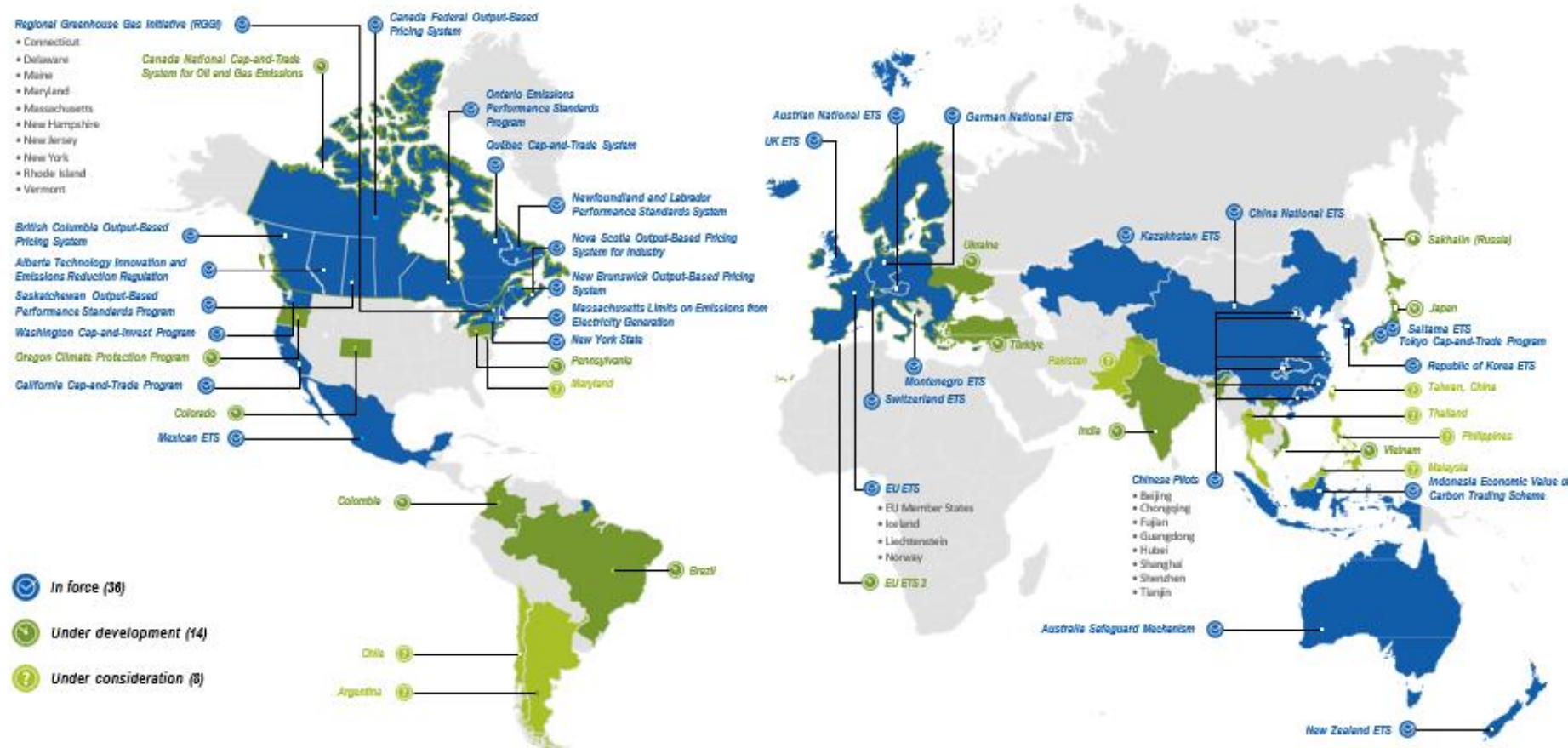
Global Expansion: Compliance carbon a dynamic market expected rapidly expand across regions

Expansion of Carbon Pricing is Critical to Achieve Emissions Targets

70+ carbon pricing programs worldwide, covering ~25% of global emissions

The share of global greenhouse gases (GHGs) under an ETS more than tripled since 2005

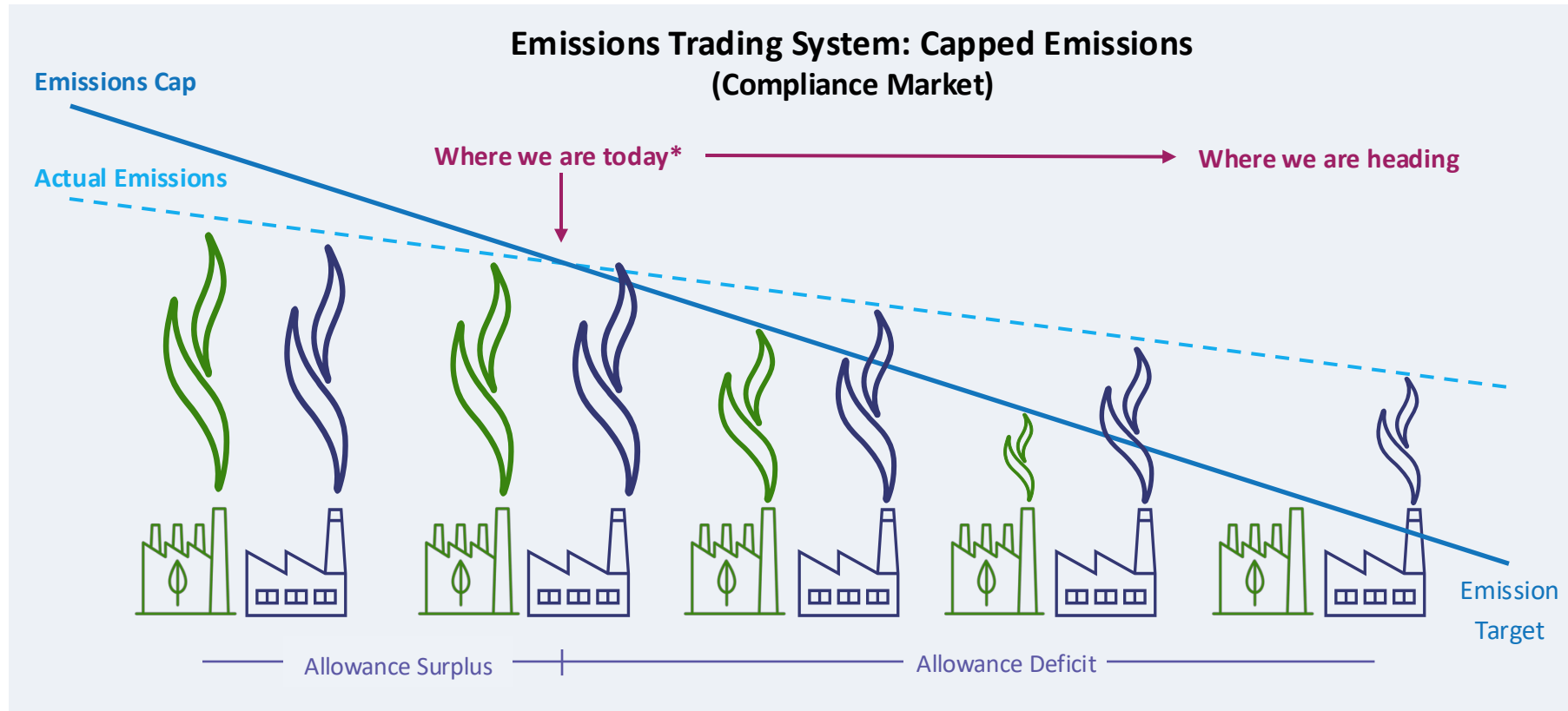
On average, carbon programs cover just 30% of a country's total emissions at a price of \$25/MtCO₂e



Compliance Carbon Market Overview

- Emissions Trading System (ETS), or Cap-and-trade, is a government mandated & regulated, standardized, liquid market valued at \$900B in 2023,¹ while the offsets market consists of non-standardized carbon reduction/removal projects collectively worth \$2B.²

Transparent Supply with Mandated Demand



Mandatory participation for specified industries

Compliance entity examples:



*KraneShares/ CliFi models show that 2024-25 is the year we see allowance surpluses going into deficit in certain defined markets.

1. Reuters, "Global carbon markets value hit record \$909 bln last year," 7/Feb/2023.

2. Reuters, "Voluntary carbon markets set to become at least five times bigger by 2030," 19/Jan/2023.

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Impact Mechanism

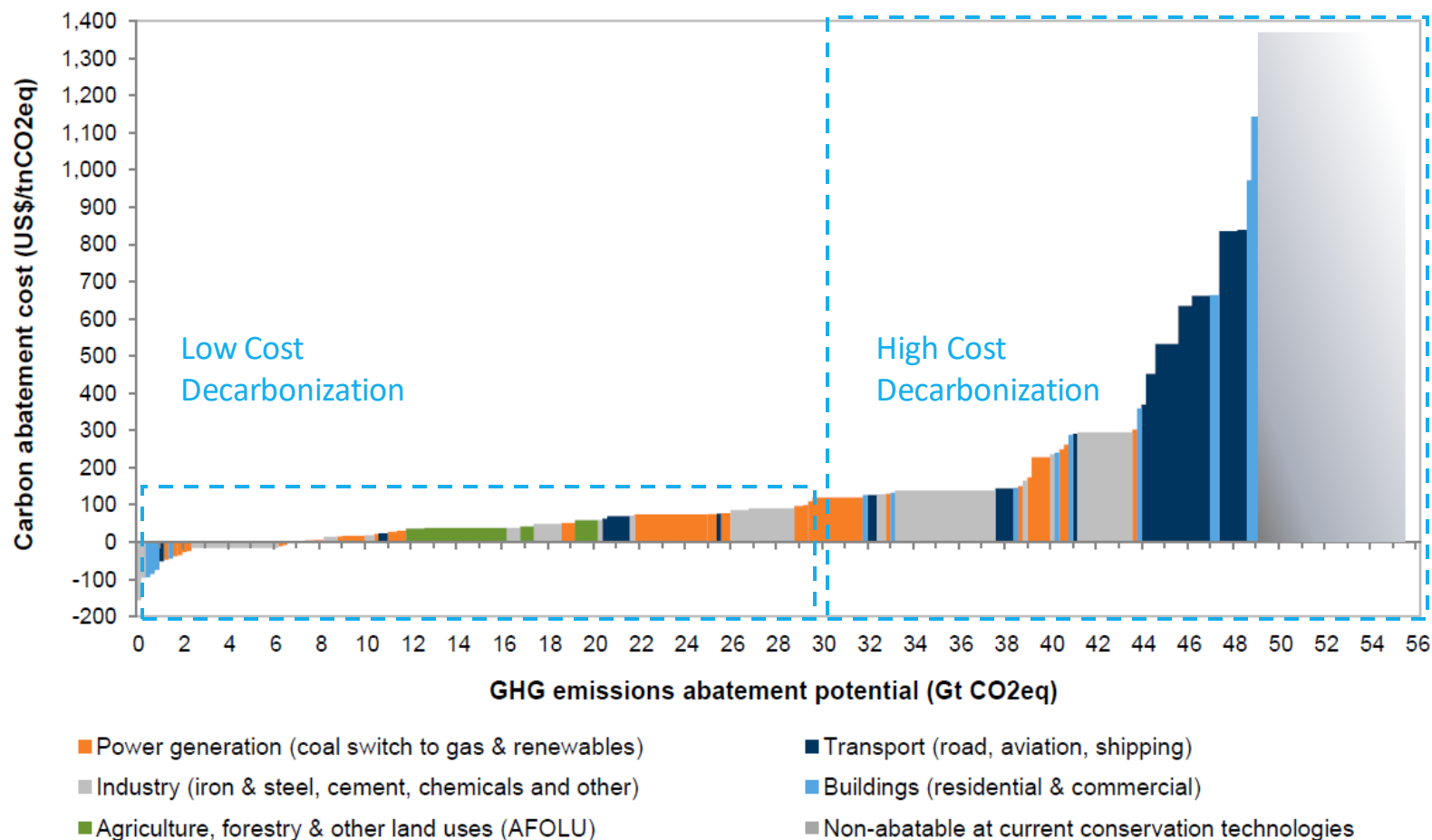
Potential Benefits of Carbon Pricing		
<div> </div> <div>Auction Revenue</div>	<div> </div> <div>Fuel Switching</div>	<div> </div> <div>Accelerating Innovation</div>
<div> <div> <div>Sustainable Communities & Clean Transportation</div> <div>Energy Efficiency for Public Buildings</div> <div>Energy Efficiency & Clean Energy</div> <div>Affordable Housing & Sustainable Communities Program</div> <div>Greenhouse Gas Reduction Fund</div> <div>Power Plant Decommissioning</div> </div> <div> <div>High-Speed Rail</div> <div>Social Climate Fund</div> <div>Wetlands & Watershed Restoration</div> <div>Expansion & Electrification of Public Transit</div> <div>Natural Resources & Waste Diversion</div> <div>Fire Prevention & Urban Forestry Projects</div> <div>Modernization Fund</div> <div>Electric vehicle (EV) Rebates</div> </div> </div>	<div>Coal → Natural Gas → Renewables</div> <div> </div>	<div> <div> <div>Fusion & Modular Nuclear</div> <div>Energy Storage</div> <div>Renewable Technology</div> </div> <div> <div>Aviation Redesign</div> <div>Carbon Capture Use & Storage</div> <div>Energy Intensive Industries</div> </div> </div>

Marginal abatement cost curve (MACC)

Low end: Fuel switching, power generation, and renewable technologies already developed at scale

Middle end: Improved agricultural land and crop management practices, buildings' energy efficiency and energy and material efficiency in industry

High end: Heavy industry de-carbonization

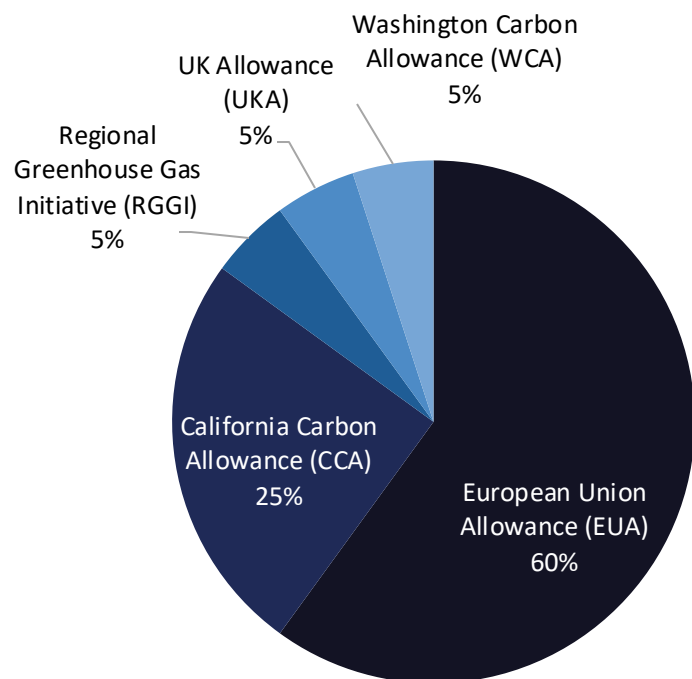


Source: Goldman Sachs, "Carbonomics, Updated cost curve shows diverging trends between power and transport," 27/Nov/2023.

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Why carbon allowance futures? Liquidity and market size

S&P Global Carbon Credit Index Weighting²



Carbon allowance futures markets annual trading volume and market growth^{1*}
July 31, 2014 – December 31, 2024

Year	EUA volume (billions)	UKA volume (billions)	CCA volume (billions)	RGGI volume (billions)	WCA volume (billions)	Total volume	EUA YoY growth	UKA YoY growth	CCA YoY growth	RGGI YoY growth	WCA YoY growth	Total growth
2024	690.4	30.2	72.8	11.5	1.6	806.4	2%	6%	40%	104%	-	5%
2023	680.0	28.5	52.1	5.6		766.3	8%	-13%	17%	-3%		8%
2022	628.9	32.8	44.5	5.8		712.1	-4%	88%	1%	77%		-1%
2021	652.0	17.5	43.9	3.3		716.7	159%	-	108%	120%		161%
2020	251.8	-	21.1	1.5		274.4	23%	-	44%	10%		24%
2019	205.0	-	14.7	1.4		221.0	36%	-	116%	35%		39%
2018	150.8	-	6.8	1.0		158.6	354%	-	31%	81%		307%
2017	33.2	-	5.2	0.6		39.0	11%	-	56%	-57%		13%
2016	30.0	-	3.3	1.3		34.6	-31%	-	-12%	-1%		-28%
2015	43.2	-	3.8	1.3		48.2	-	-	-	-		-
2014	44	-	0.3	-		44.3	-	-	-	-		-

1. Data from Bloomberg as of 31/Dec/2024.

2. Data from S&P Dow Jones Indices. Weightings as of annual rebalance on 2/Dec/2024.

*See end of presentation for definitions.

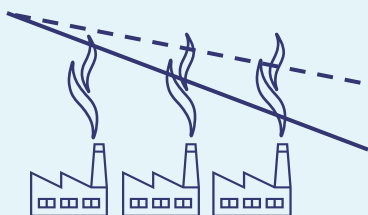
European Carbon Policy Objectives

- New target: 55% reduction in greenhouse gases from 1990 levels by 2030, up from previous policy targets of a 40% cut.
- Impact: 20% total EU ETS Cap balance decrease in 2024-2030.

Fit-for-55 Policy Highlights

Overall, 62% drop in the allowance limit from 2005 levels by the end 2030

Accelerates annual allowance cap reduction rate to 4.3% in 2024, and 4.4% in 2028, up from current 2.2%



Cut to emissions cap
-90 million in 2024 &
-27 million in 2026

REPowerEU €20B initiative funded from frontloading EUAs & Innovation Fund

- 40% will be from frontloaded allowances from auctions in 2023-26, meaning allowances set aside for future auctions will be sold earlier
- 60% will come from the Innovation Fund, which finances projects developing innovative, emissions reduction technologies.

REPowerEU: accelerates Europe's transition away from Russian fossil fuels to low-carbon energy sources

Lowered price-hike mechanism

to automatically release 75 million allowances from the reserve if, for over six months, the average EUA price is higher than 2.4 times the preceding 2 years. (previously had been 3x)

Provides protection from an excessive rise in the price of EUAs over a short period of time

CBAM CO2 tax on imports
Starting in 2026



Phase-out of free allowances

incrementally starting in 2026, 48.5% phased out by 2030 and complete phase-out by 2034



"ETS 2": new, separate market for building heating & road transport
starting in 2027



Social Climate Fund

starting in 2026, funded primarily from the ETS 2 and 25% from participating EU countries

Inclusion of maritime emissions: gradual emissions coverage of shipping sector:

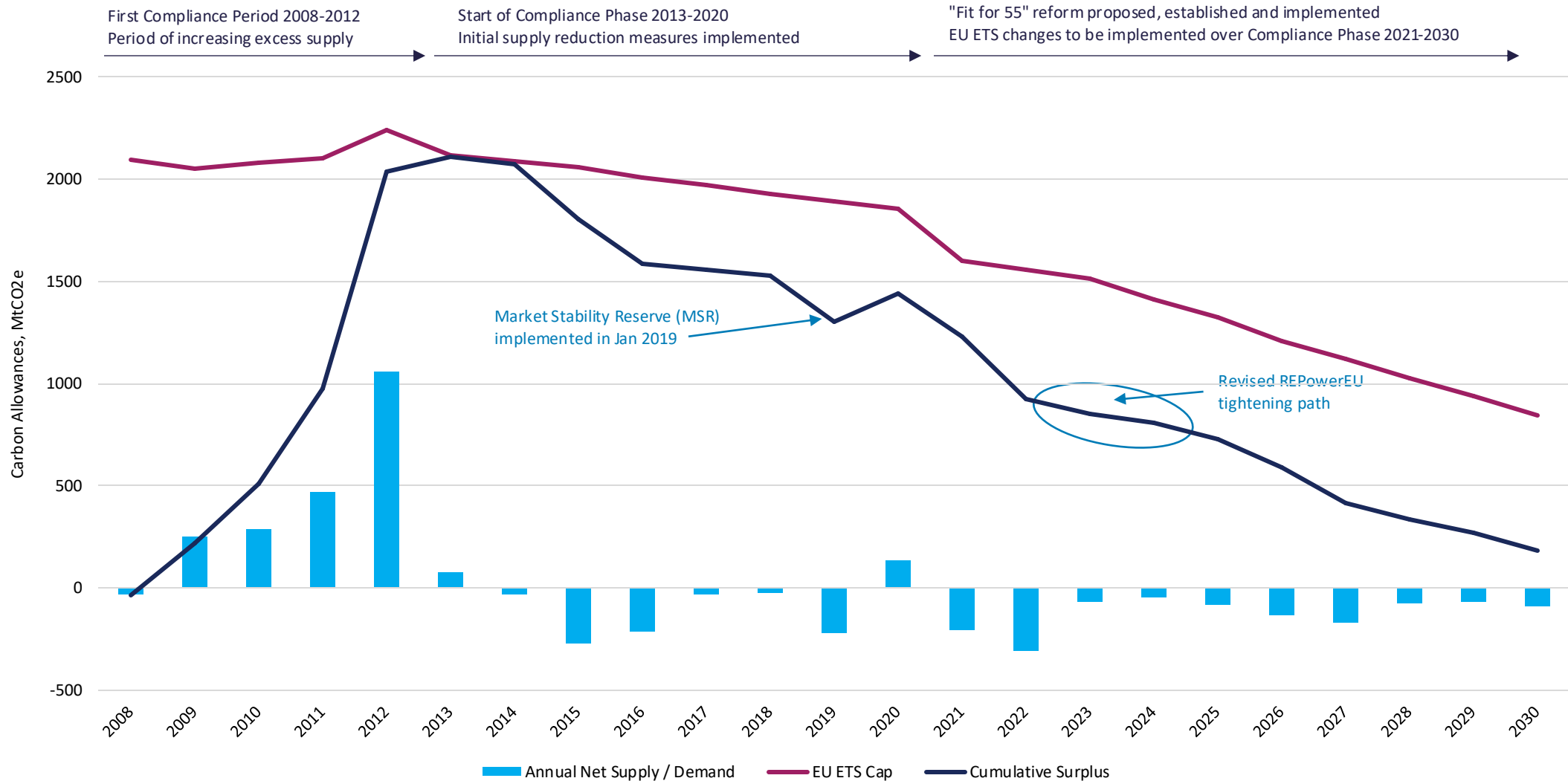
40% by 2024

70% by 2025

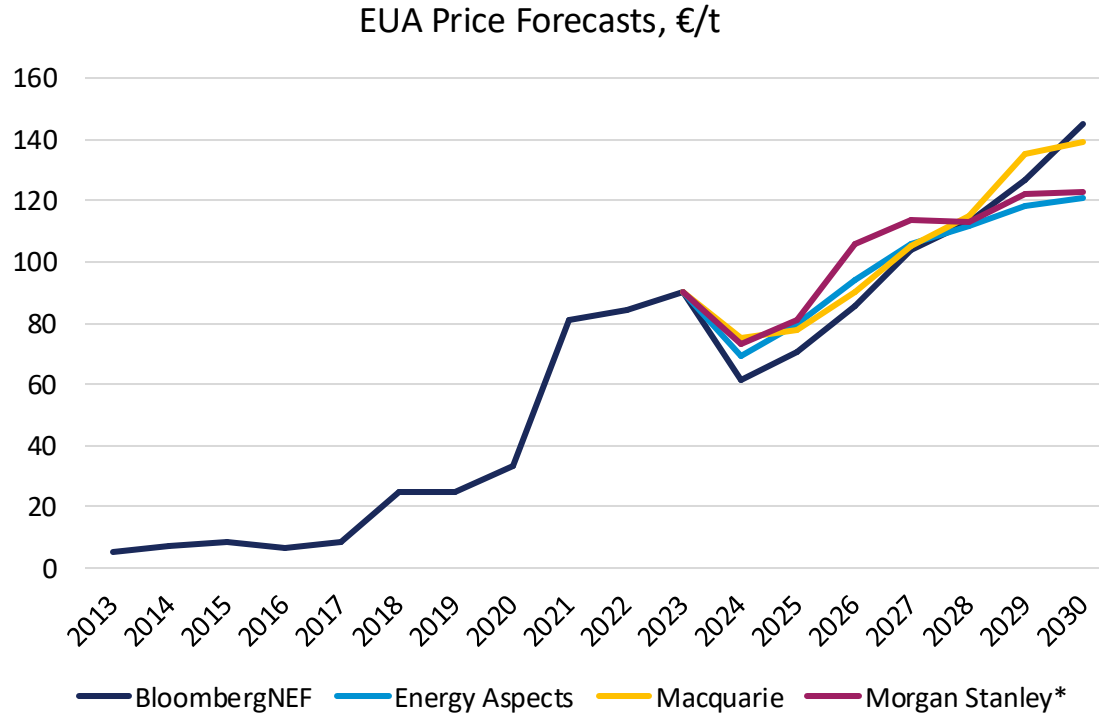
100% by 2026



Supply/Demand Modeling: European Union Allowances (EUAs)



EUA Carbon Forecasts



“[The EU ETS] is the jewel and the workhorse of our climate strategy”

"We are not too worried about the ETS price ... not long ago people on this panel were worried it was too high"

-- Kurt Vandenberghe, Director-General of European Commission's climate arm

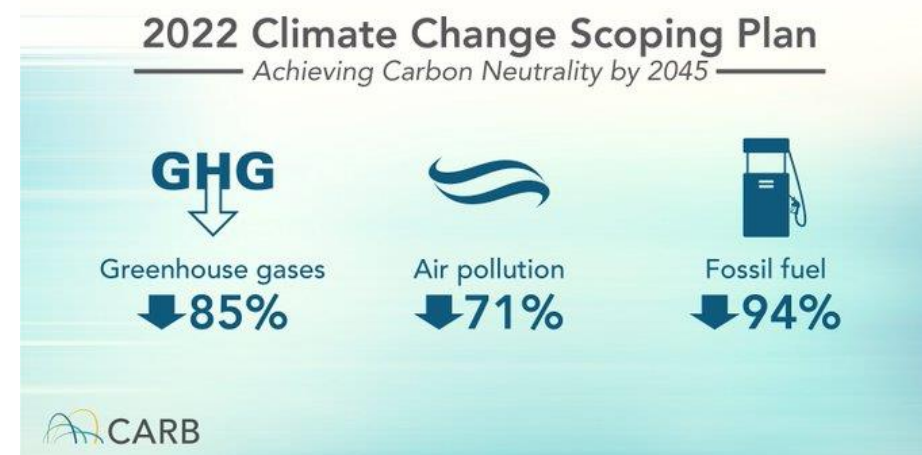
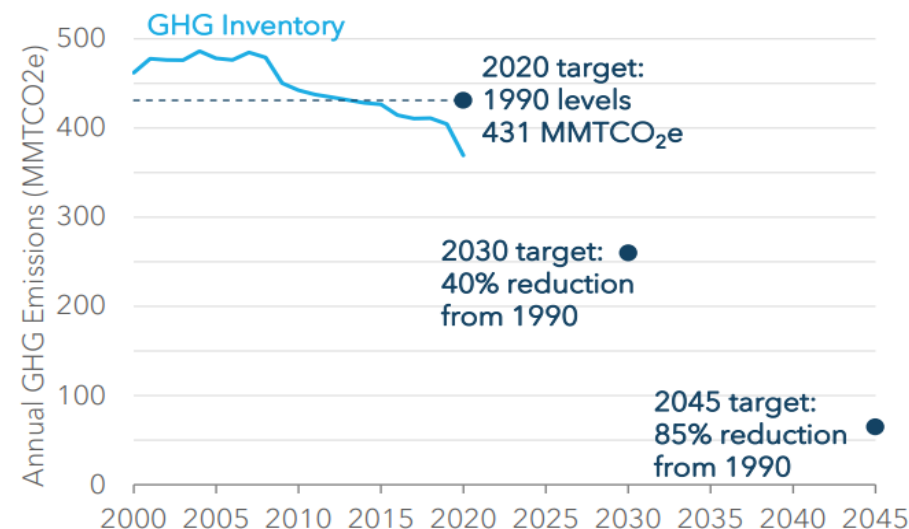
	2025	2026	2030
Veyt	—	€110	€157
BNEF	€91	€104	€149
Macquarie	€93	€120	€146
Energy Aspects	€76	€96	€140
ICIS	€68	€72	€136

Source: Bloomberg New Energy Finance (BNEF), “BNEF Theme: The Outlook for European Carbon Markets” 09/Feb/2024; Macquarie, “Carbon Compendium, Bargains Out There,” 29/Jan/2024; Morgan Stanley, “Buying Opportunity in Carbon EUA”, 26/Feb/2024 (“Base Case”); ICIS, “Long-term EUA price forecasts (base case),” 20/Apr/2024; Energy Aspects, January 2024. Price targets are estimates from the sources indicated and do not indicate any actual investment performance. Prices are annual average, in nominal terms.

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California Carbon Policy Tightening

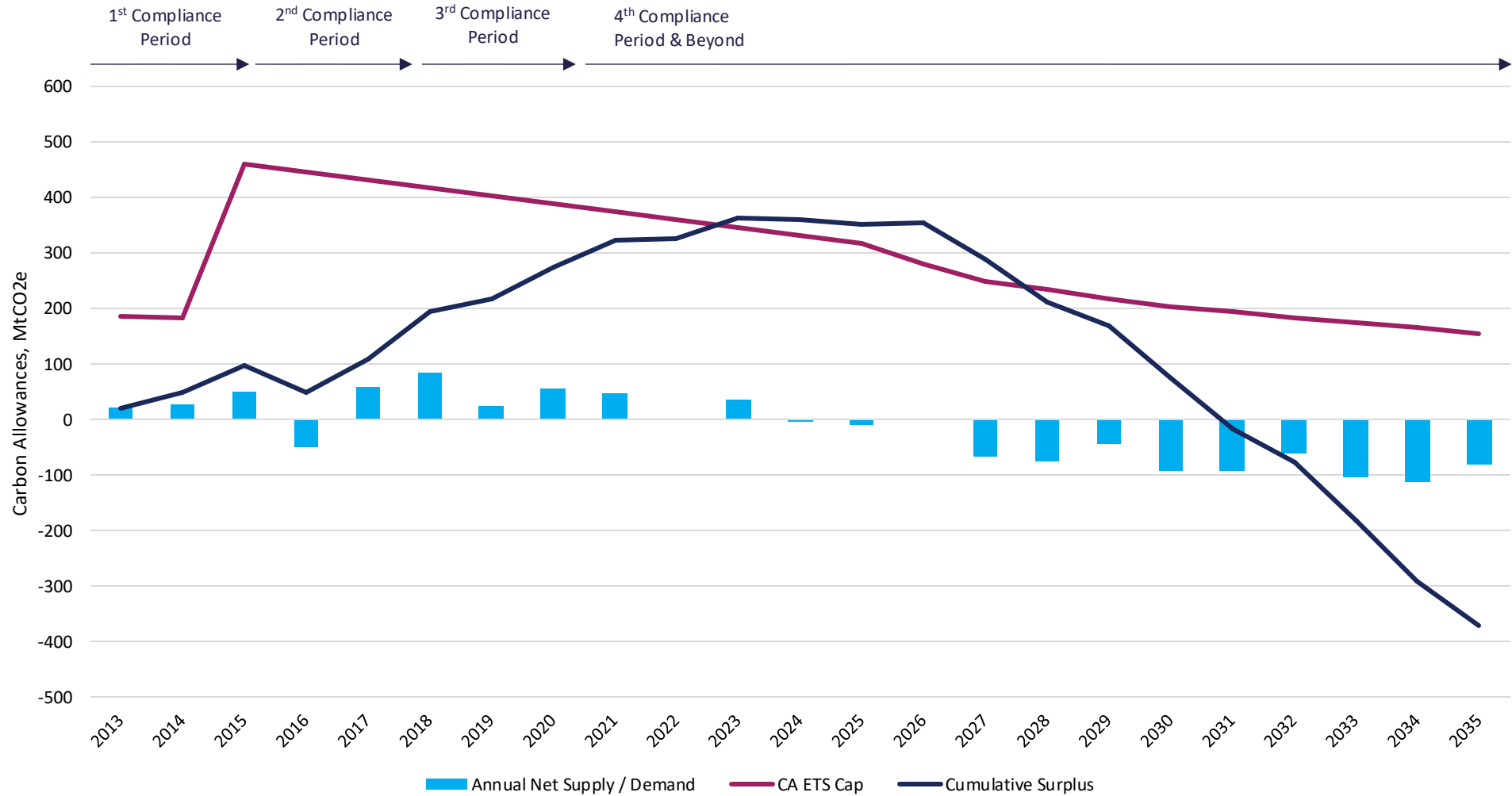
- 180Mt removed from the 2026-30 annual emissions budget to align the allowance cap with the 2022 Scoping Plan's accelerated emissions reduction target of 48% below 1990 levels by 2030 compared to the prior target of 40%¹
- Annual emission caps reduction rate could increase to 9-14% from the current 4% rate²
- Allowances removed from the auctions and free allocation pools of allowances rather than the reserve accounts
- One-time increase in the prices of the cost-containment tier levels
- Overall Impact: CCA market is expected to enter large annual deficits starting from 2027



1. Sources: CLIFI, CARB, "Cap-and-tradeCap-and-trade Program Workshop", 27/Jul/2023

2. NACW, "Plenary: Status and Outlook for North American Compliance Markets", March 2024

Supply & Demand Model: California



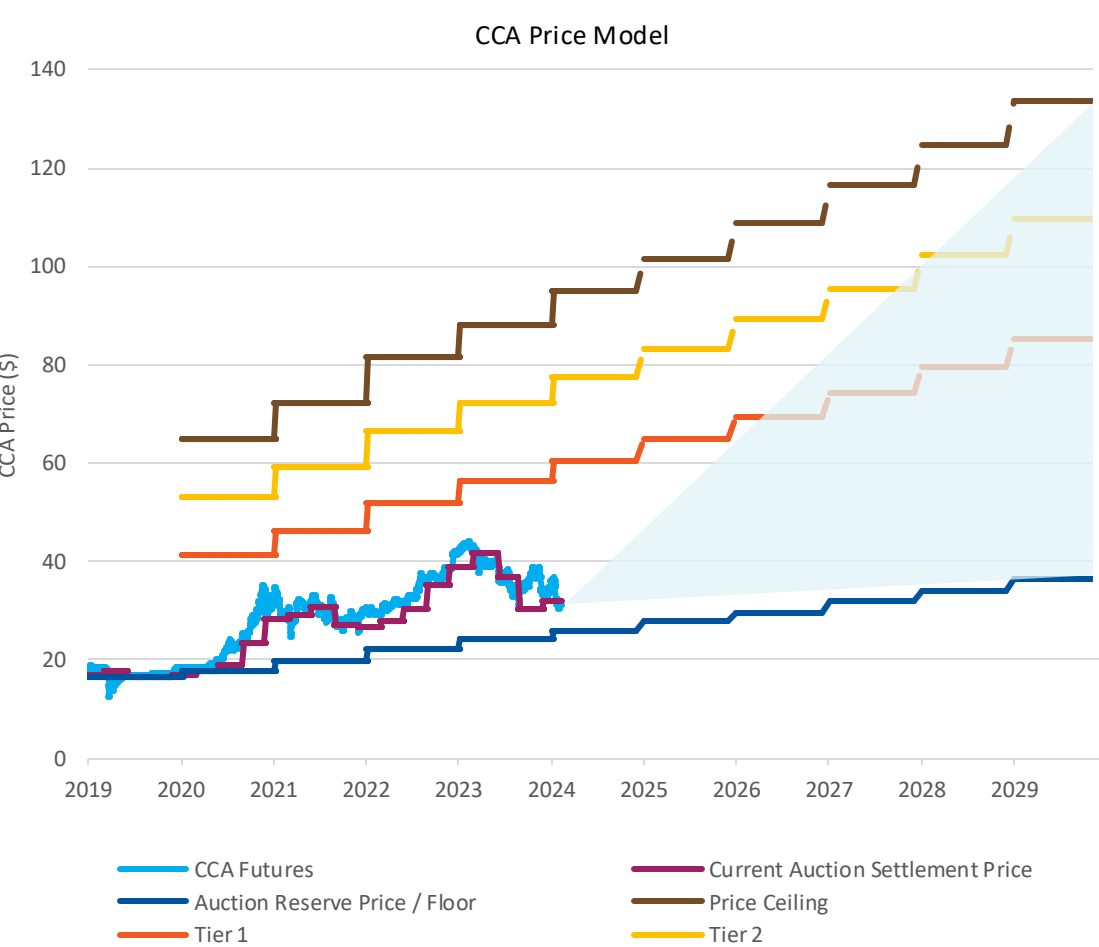
Proprietary CLIFI Model. Last updated 31/Dec/2024. California operates under the Western Climate Initiative (WCI), which administers the shared emissions trading market between California and Québec.

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California's Asymmetric Regime

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The price floor and ceiling levels shape the California carbon allowance (CCA) investment opportunity

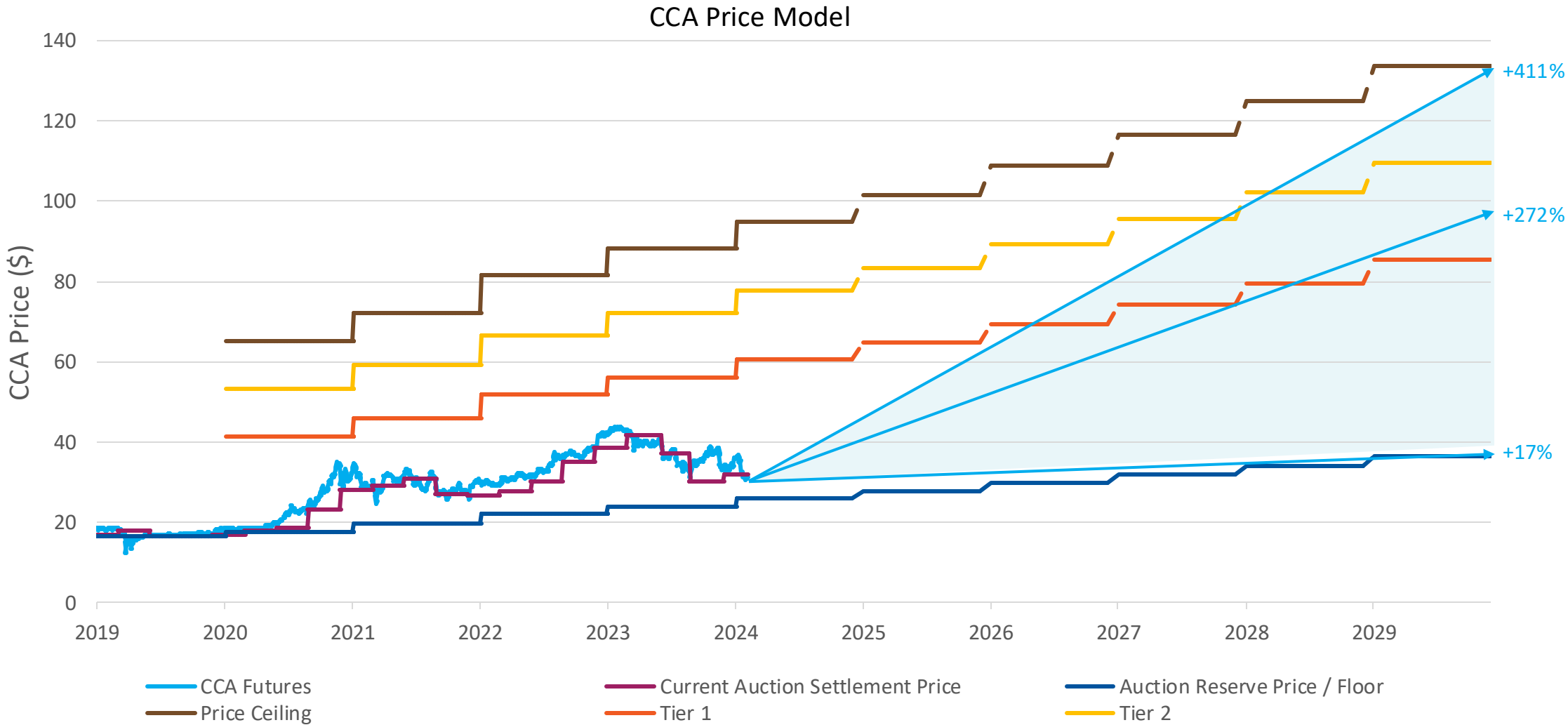


CCA Price Forecasts

CARB	\$134 by 2030	Based on their alternative scenario modeling for the 48% and 55% targets, with prices moving in line with the price ceiling
BNEF	\$79 by 2030	Based on the 48% emissions reduction target and REPowerEU frontloading
cCarbon	+\$90 by 2030	Based on 48% targets, with the expectation that carbon capture, utilization, and storage (CCUS) and new abatement opportunities will lead to greater decarbonization efforts at higher carbon prices
Clear Blue Markets	\$86 by 2030	Based on the assumption that prices will hit the Tier 1 level
Macquarie	\$101 by 2030	Based Option 1 (48% cap trajectory), assume a 180Mt reduction in allowance over the 2026-30 period, which we expect to come from the allocation and auction budgets

Source: Bloomberg New Energy Finance (BNEF), Sep 2024; Macquarie Insights, Jan 2025; cCarbon, "CARB's Nov'23 Workshop indicates CCAs to trade along the price ceiling at \$115 by 2030; high prices may push CARB to tread on a tightrope," 11/17/2023; California Air Resources Board (CARB), Cap-and-Trade Meetings and Workshops, Combined Presentation, retrieved 05/Jan/2024. Clear Blue forecasts retrieved Sep 2024. Price targets are estimates from the sources indicated and do not indicate any actual investment.

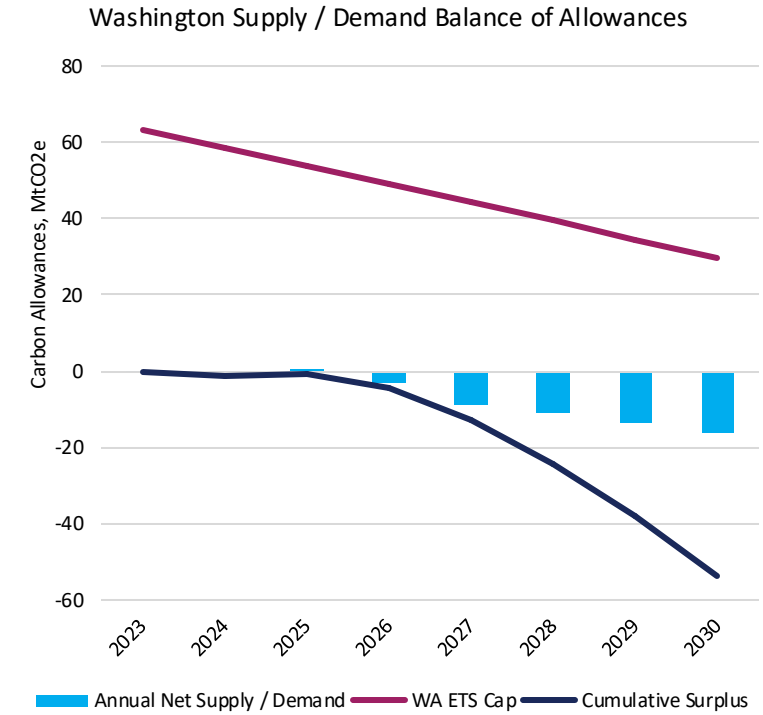
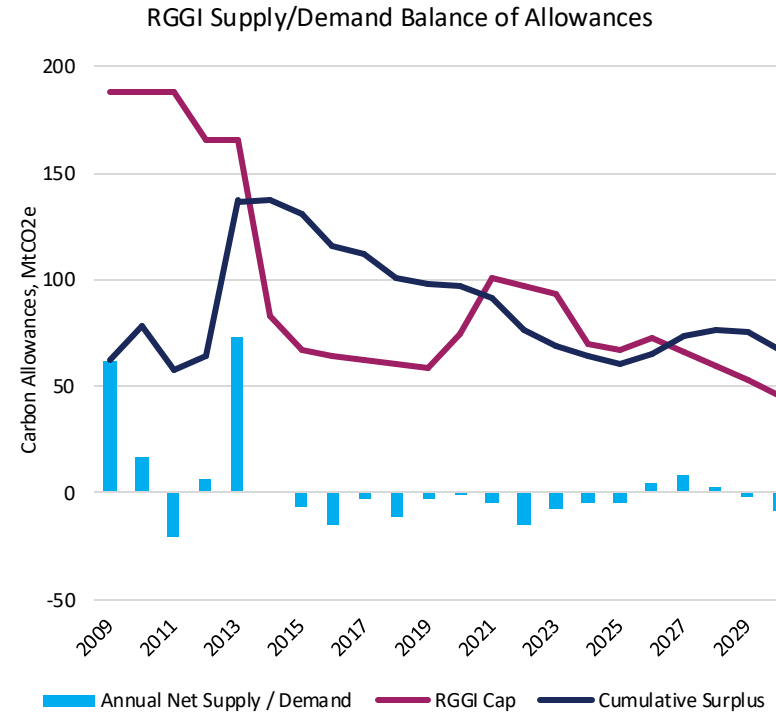
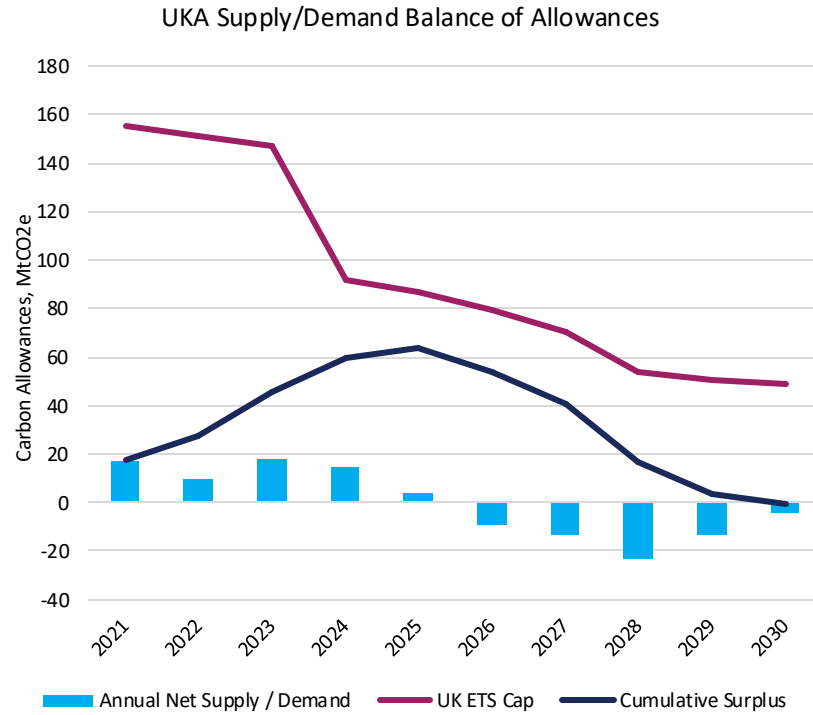
California Opportunity








Data from Bloomberg and KraneShares analysis, as of 31/Jan/2025.

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Supply/Demand Modeling: United Kingdom, Northeast US Power (RGGI), Washington State



High Level Overview

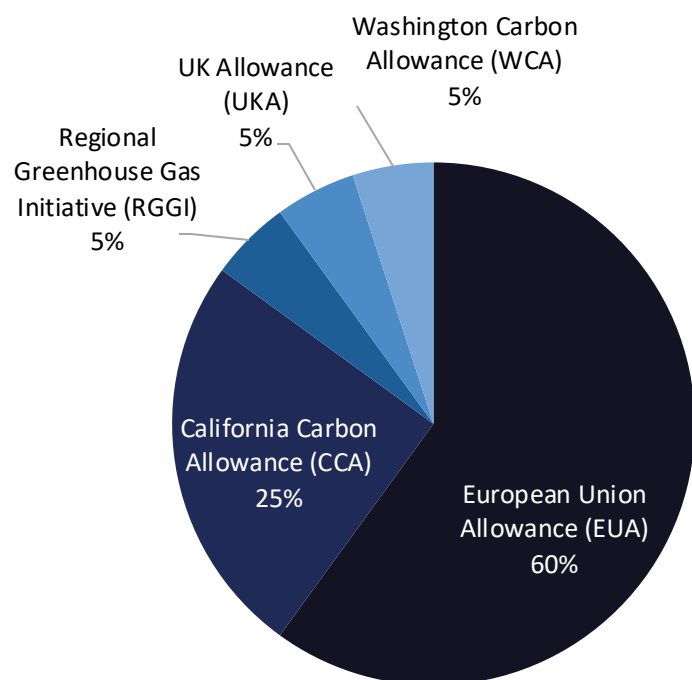
	European Union ETS	California Carbon Allowance (CCA) Market	United Kingdom ETS	Regional Greenhouse Gas Initiative (RGGI) Northeast US Power	Washington State Carbon Allowance (WCA) Market
Start of Operation	2005	2012	2021	2009	2023
Region	EU + Iceland, Liechtenstein & Norway	California linked with Quebec	United Kingdom	10 Northeastern US states	Washington State
Regional Emissions Coverage	45%	80%	25%	14%	70%
Sector Coverage					
Cap	1,325.6 MtCO ₂ e	317.71 MtCO ₂ e	86.7 MtCO ₂ e	66.59 MtCO ₂ e	53.8 MtCO ₂ e
Annual Cap Reduction Rate	4.3% (2024-27), 4.4% (2028-30)	~4% (2021-2030)	Consistent with net zero by 2050	~3% of the 2020 cap (2021-2030)	7% (2023-2026)
Annual Traded Volume (2024)	\$690.4B	\$72.8B	\$30.2B	\$11.5B	\$1.6B
Total Revenue (Cumulative)	\$206.0B	\$27.0B	\$18.7B	\$7.1B	\$2B

Source: International Carbon Action Partnership, retrieved 31/Dec/2024

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Why carbon allowance futures? Liquidity and market size

S&P Global Carbon Credit Index Weighting²



Carbon allowance futures markets annual trading volume and market growth^{1*}
July 31, 2014 – December 31, 2024

Year	EUA volume (billions)	UKA volume (billions)	CCA volume (billions)	RGGI volume (billions)	WCA volume (billions)	Total volume	EUA YoY growth	UKA YoY growth	CCA YoY growth	RGGI YoY growth	WCA YoY growth	Total growth
2024	690.4	30.2	72.8	11.5	1.6	806.4	2%	6%	40%	104%	-	5%
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2016	30.0	-	3.3	1.3		34.6	-31%	-	-12%	-1%		-28%
2015	43.2	-	3.8	1.3		48.2	-	-	-	-		-
2014	44	-	0.3	-		44.3	-	-	-	-		-

1. Data from Bloomberg as of 31/Dec/2024.

2. Data from S&P Dow Jones Indices. Weightings as of annual rebalance on 2/Dec/2024.

*See end of presentation for definitions.

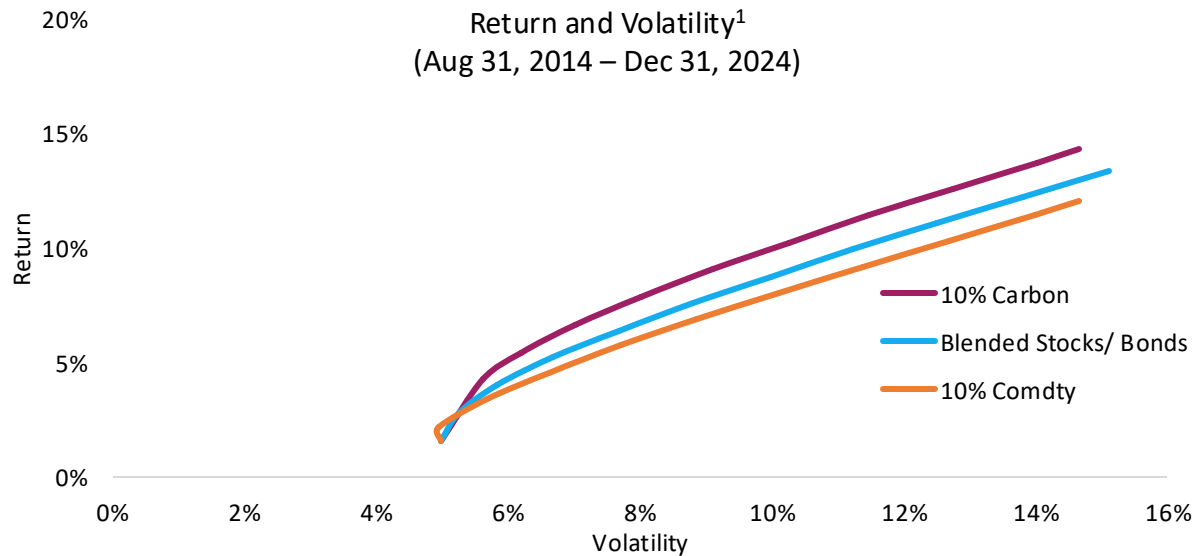
Performance Comparison

Performance of carbon allowances versus major asset classes¹

Aug 31, 2014 – Dec 31, 2024

	Carbon Allowances*	Equities	Bonds	Commodities	Real Estate
Annualized Return (%)	19.30%	13.32%	1.51%	-1.18%	6.49%
Annualized Volatility (%)	28.04%	15.11%	4.95%	22.08%	18.22%
Sharpe Ratio	0.71	0.80	-0.02	-0.02	0.34

Blended Portfolios
Return and Volatility¹
(Aug 31, 2014 – Dec 31, 2024)



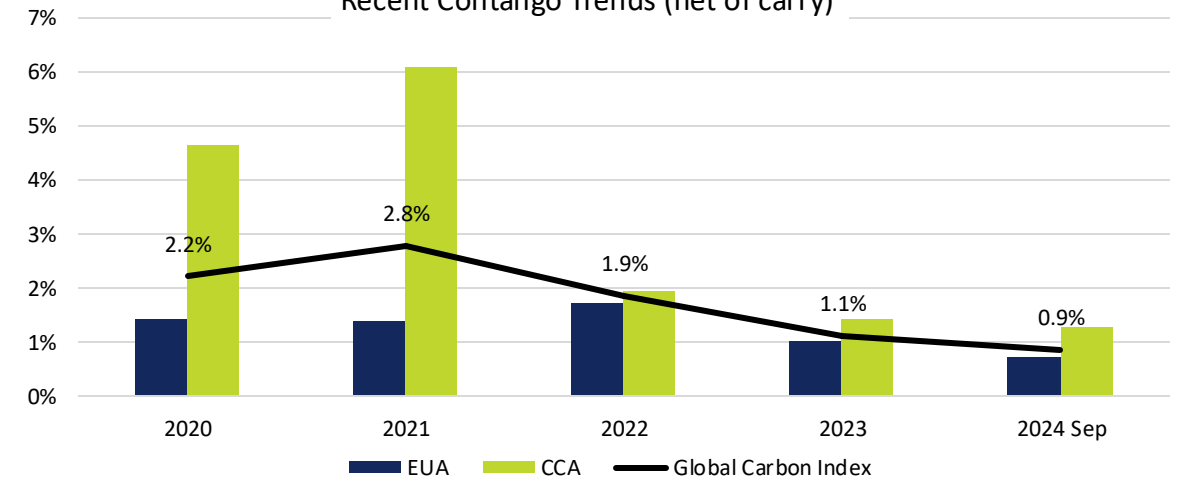
Correlation (Monthly)¹ Aug 31, 2014 – Dec 31, 2024

Correlation	US Equities	Bonds	Commodities	Real Estate	Gold	Oil
Carbon Allowances*	0.292	0.071	0.293	0.247	-0.053	0.270

Correlation (Monthly)¹ Dec 31, 2019– Dec 31, 2024

	EUA	CCA	RGGI	UKA
EUA	1			
CCA	0.107	1		
RGGI	0.143	0.186	1	
UKA	0.592	-0.024	0.124	1

Recent Contango Trends (net of carry)²



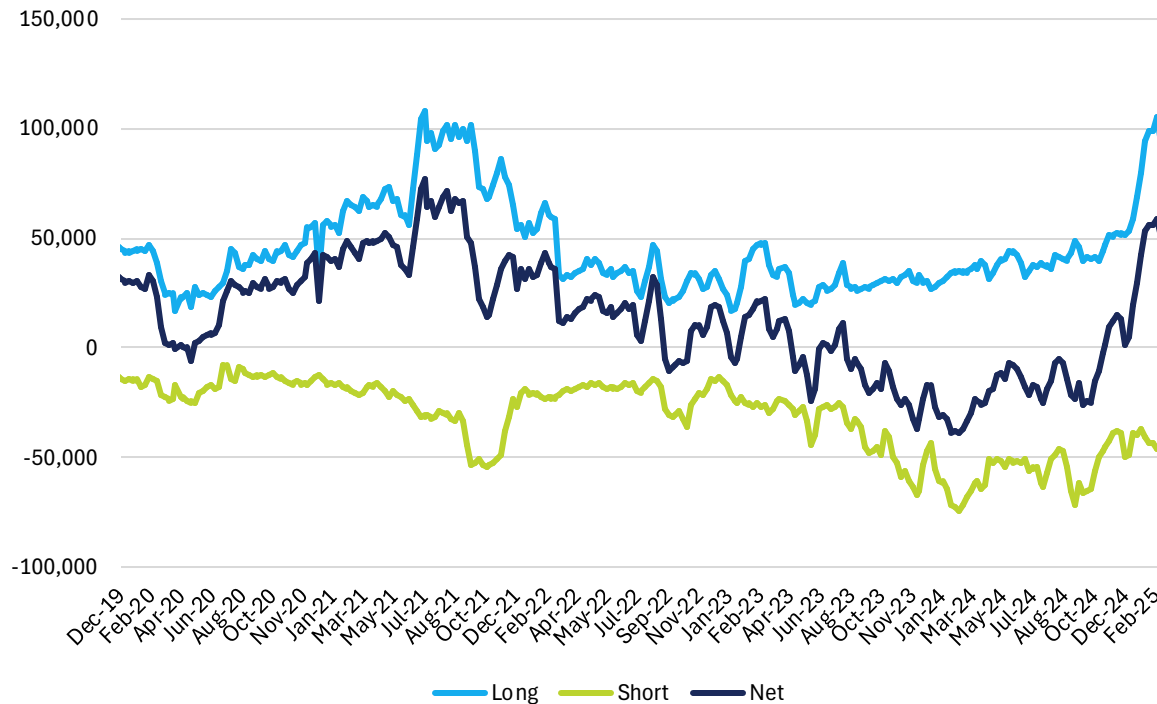
1. Data from Bloomberg and S&P Indices as of 31/Aug/2014-31/Dec/2024. *Carbon allowances: five largest carbon allowance markets (weighted by volume) versus major asset classes. See end of presentation for material differences between asset types and definitions; Equities: S&P 500 ; Bonds: The Agg; Commodities: The S&P GSCI ; Real Estate: MSCI US REIT Index. Index returns are for illustrative purposes only and do not represent actual Fund performance. Index returns do not reflect any management fees, transaction costs or expenses. Indexes are unmanaged and one cannot invest directly in an index. Past performance does not guarantee future results.

2. Source: CLIFI and ICE as of 11/Sep/2024.

Investment Fund Positioning

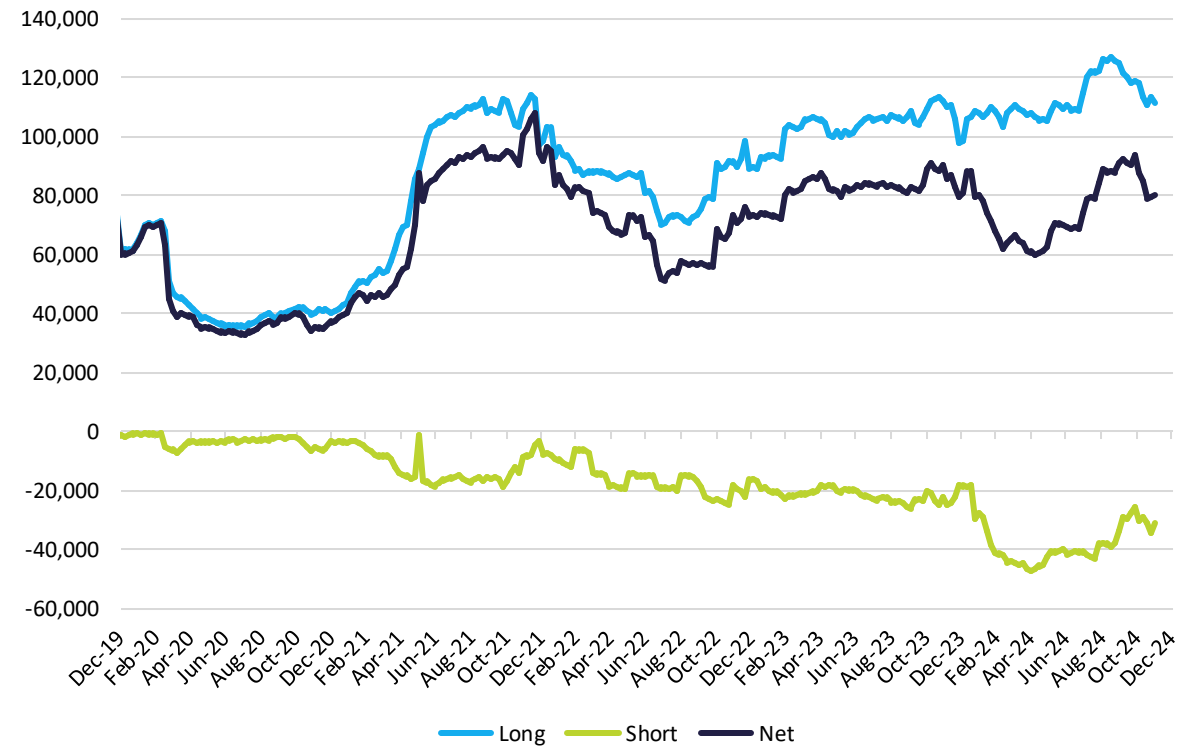
The historically high net negative positioning trend in EUAs among investment funds began earlier in 2023 but started to come off in Q4 2024 with fund positioning turning net positive signaling strong signs of supportive sentiment for the market.

Investment Funds EUA Positioning



Data from ICE as of 28/Feb/2025.

Managed Money CCA Positioning



Data from ICE as of 13/Jan/2024.

Investment funds: “Entities holding investments directly in the commodity derivatives market as a form of collective investment scheme, including hedge, pension and exchange-traded funds.”

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KraneShares Global Carbon Strategy ETC Securities

The above ETC Series was issued by KraneShares ETC PLC on 3 October 2024. It is included for discussion here solely for the purpose of illustrating the types of ETC Series that can be developed and issued under the KraneShares ETC Securities Programme. Nothing in this document or the related discussions shall constitute investment advice or a recommendation to buy or sell any particular investments.

Investment Strategy:

The performance of the ETC is linked to specified reference index comprised of futures contracts (“Futures Contracts”) in respect of major global carbon allowances. The reference index is designed to measure the performance of a portfolio of liquid carbon credit futures that require “physical delivery” of emission allowances issued under cap and trade regimes. An emission allowance or carbon credit is a unit of emissions (typically one ton of CO₂) that the owner of the allowance or credit is permitted to emit (a “Carbon Allowance”). A cap and trade regime seeks to gradually reduce such emission allowances or carbon credits over time to incentivise companies to reduce greenhouse gas emissions in an effort to curb climate change. The Reference Index for the ETC is the S&P Global Carbon Credit Index which tracks the most traded carbon credit futures contracts.

KRBN Performance History as of 31/Dec/2024:

	Cumulative % Data as of month end: 31/Dec/2024				Cumulative % Data as of quarter end: 31/Dec/2024			
	1 Mo	3 Mo	6 Mo	Since Inception	1 Yr	3 Yr	5 Yr	Since Inception
Security NAV	-0.08%	—	—	2.72%	—	—	—	2.72%
Index	—	—	—	—	—	—	—	—

The performance data quoted represents past performance. Past performance does not guarantee future results. The investment return and principal value of an investment will fluctuate so that an investors shares, when sold or redeemed, may be worth more or less than their original cost and current performance may be lower or higher than the performance quoted. For performance data current to the most recent month end, please visit www.kraneshares.eu/krbn.

Diversification does not ensure a profit or guarantee against a loss. Index returns are for illustrative purposes only. Index performance returns do not reflect any management fees, transaction costs or expenses. Indexes are unmanaged and one cannot invest directly in an index.

The information provided in this slide is for information purposes only in order to outline the capabilities of the KraneShares ETC Securities Programme. This slide, including all information contained herein, is not provided for the purposes of marketing or selling the above ETC or any security. This slide, including all information contained herein, is not intended to be used for making investment decisions by either select intermediaries or their underlying clients.

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Key Fund Information

Exchange	MIL, XETRA
Listing Date	3/Oct/2024
Index Name	S&P Global Carbon Credit Index
Investment Structure	ETC
Base Currency	USD

Holdings and Exposures of the KraneShares Global Carbon Strategy ETC Securities

Carbon Allowance Futures as of 31/Dec/2024	Identifier	Position	Current Exposure(\$)	% NAV
European Union Allowance (EUA) 2025 Future	MOZ25 Comdty	86	6,500,849	54.44%
California Carbon Allowance (CCA) Vintage 2025 Future	BCYZ25 Comdty	63	2,287,530	19.16%
European Union Allowance (EUA) 2026 Future	MOZ26 Comdty	8	622,044	5.21%
California Carbon Allowance (CCA) Vintage 2026 Future	KBCZ26 Comdty	16	617,600	5.17%
Regional Greenhouse Gas Initiative (RGGI) Vintage 2025 Future	JELZ25 Comdty	24	603,840	5.06%
Washington Carbon Allowance (WCA) Vintage 2025 Future	WKCZ25 Comdty	10	552,000	4.62%
UK Allowance (UKA) 2025 Future	UKEZ5 Comdty	12	540,734	4.53%
			11,724,597	98%

Collateral and Currency Management as of 31/Dec/2024	Identifier	Position	Current Exposure(\$)	% NAV
Euro FX Futures	ECH5 Curncy	50	6,492,813	54.37%
USD Cash & Equivalents**	USD	4,174,897	4,174,897	34.96%
EURO	EUR	790,792	818,863	6.86%
BRITISH STERLING POUND	GBP	362,788	454,354	3.81%
			11,940,926	100%

Any stock, options or futures symbols displayed are for illustrative purposes only and are not intended to portray recommendations, or an invitation or inducement to trade a particular financial instrument or to engage in an investment activity. There is a substantial risk of loss in trading futures and options. Past performance is not indicative of future results.

Holdings, carbon allowance futures, and collateral are subject to change.

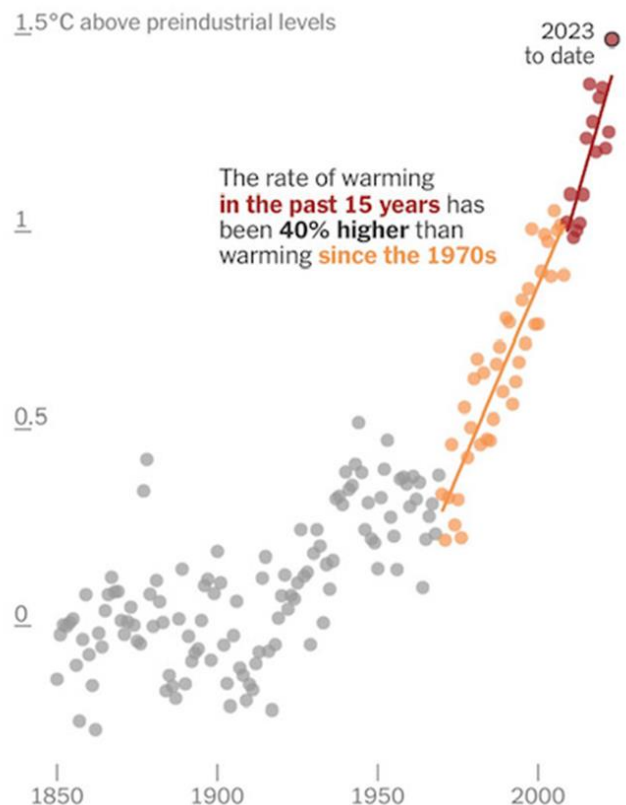
**Includes USD cash deposits & cash in margin accounts (\$ 10,667,709), and implied short USD exposure from Euro FX futures.

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The Problem

Global warming may have accelerated in the past 15 years

Annual average temperatures since 1850



Source: NY Times, "I Study Climate Change. The Data Is Telling Us Something New." 13/Oct/2023.

The Investment Solution

Economists forecast the largest capital cycle in history to address climate change.¹ To capture the investment opportunity, investors should consider being long the following three exposures:

KraneShares Sustainable Investment Suite

Carbon Allowances



Global Carbon

Transition Equities



China Clean Tech



Electric Vehicles

1. McKinsey & Company, "The net-zero transition," January 2022, retrieved 31/Dec/2024.

Part II: Deep Dive into the Carbon Allowance Markets

EU Emissions Trading System (ETS)

The EU ETS is the oldest emissions cap-and-trade program, first launched in 2005. It covers ~40% of the total EU emissions, including activities from the power sector, manufacturing industry, and aviation (including flights from the EU to the United Kingdom). In 2020, Switzerland linked with the EU ETS. Since inception, stationary installations have seen an emission reduction of around 43%.

Market Outlook:

- A 55% cut in GHGs by 2030 vs. 1990 levels, rather than a 40% cut that was previously agreed
- Supply will continue to be reduced with an accelerated cap reduction factor of 4%, up from previous 2.2% while the Market Stability Reserve's (MSR) 24% intake rate will remain
- REPowerEU—a €20 billion initiative that aims to speed up Europe's transition away from Russian fossil fuels to low-carbon energy sources—will be funded partially from the frontloading of auction allowances. This approach introduces a supply of additional allowances now but results in a steeper tightening in the future
- Establishment of the Carbon Border Adjustment Mechanism (CBAM) puts tariff on goods imported into EU to account for carbon leakage. See case study at end of presentation for more details

EUA ETS Overview	
Start of Operation	2005
Sector Coverage	Domestic Aviation, Industry, Power
Currency	Euro
Auction Frequency	Weekly
Cap	1,325.6 MtCO ₂ e
Annual Cap Reduction	4.3% in 2024, known as the Linear Reduction Factor (LRF) 4.4% starting in 2028
TNAC	1,111.7 MtCO ₂ e
Total revenue since start	\$206.0 billion since 2013
Governing Organization	European Commission & relevant EU member state authorities
Evaluation / ETS Review	The European Commission publishes annual reports on the functioning of the European carbon market (2021 report).
GHG Reduction Targets	BY 2030: At least 55% below 1990 GHG levels (Fit for 55 Proposal) BY 2050: Climate neutrality

*TNAC: total number of allowances in circulation, determine how many additional allowances will be placed in the Market Stability Reserve (MSR) through reduced auctioning. TNAC as of 31/Dec/2024.

EU Emissions Trading System (ETS)

Market Stability Reserve (MSR)

- In 2019, EU introduced the MSR to address the current allowance surplus, and to improve the market's resilience to future shocks.
- The MSR will reduce auction volume by around 267 million allowances between September 2024 and August 2025.

Market Stability Reserve (MSR)		
TNAC	1,111.7 MtCO ₂ e (2023)	Total number of allowances in circulation (TNAC). The Commission publishes the TNAC in June each year.
Current Thresholds	TNAC > 833 MtCO ₂ e	24% (12% beyond 2023) of its volume is withdrawn from future auctions and placed into the reserve over a period of 12 months
	TNAC < 400 MtCO ₂ e	100 million allowances are taken from the reserve and injected into the market through auctions
Cancellation Provision	400 MtCO ₂ e	Maximum holding limit in MSR. The provision started in 2024 to remove excess allowances.

Note, Swiss allowance supply is not considered in the TNAC, and Swiss auction quotas are not affected by the MSR.

Source: International Carbon Action Partnership, "EU Emissions Trading System (EU ETS) Factsheet," retrieved 31/Dec/2024

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EU ETS Market Top Buyers

Company name	Total Covered Emissions	% of Annual Cap
PGE GiEK S.A. Oddział Elektrownia Bełchatów	33,161,232	2.08%
Kraftwerk Neurath	22,075,757	1.38%
Kraftwerk Niederaußem	16,105,086	1.01%
Kraftwerk Jänschwalde	15,183,517	0.95%
Kraftwerk Weisweiler	14,490,397	0.91%
Kraftwerk Schwarze Pumpe	11,834,111	0.74%
ELEKTROWNIA KOZIENICE	11,593,312	0.73%
Kraftwerk Lippendorf	11,051,209	0.69%
PGE GiEK S.A. Oddział Elektrownia Opole	10,737,219	0.67%
PGE GiEK S.A. Oddział Elektrownia Turów	10,193,504	0.64%
Voestalpine Stahl Linz	9,399,356	0.59%
Kraftwerk Boxberg Werk IV	8,559,191	0.54%
Integriertes Hüttenwerk Duisburg	7,830,046	0.49%
ArcelorMittal France-Dunkerque	7,274,573	0.46%
Kraftwerk Boxberg Werk III	6,974,582	0.44%

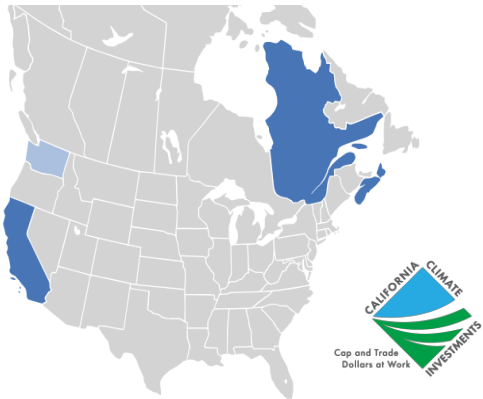
Source: euopea.eu, as of 31/Aug/2022, retrieved 31/Dec/2024.

California Carbon Allowance Market (CCA)

The CCA market launched in 2012, and now covers ~75% of the state's GHG emissions. California joined the Western Climate Initiative (WCI) in 2007 and linked its program with Québec's in January 2014.

Market Outlook:

- 2022 Scoping Plan increased the emissions reduction target to 48% below 1990 levels. Results in annual cap reduction factor rising to 9% from the current ~4%
- 2023 reserve price increased to \$24.04, up from \$22.21 while the ceiling price increased to \$88.22 from \$81.50. Implies 8.2% natural upside tailwind (increase of 5%+CPI) without changes in demand/supply
- Provides potential hedge against inflation through a price floor that is pegged to inflation rates, i.e., the price floor rises 5% plus Consumer Price Index (CPI), see Case Study 1 slide for more details



CCA Overview	
Start of Operation	2012
Sector Coverage	Transport, Buildings, Industry, Power
Currency	US Dollar
Auction Frequency	Quarterly
Cap	317.71 MtCO ₂ e
Annual Cap Reduction	Between 2021-2030, the cap declines by about 13.4 MtCO ₂ e each year, averaging about 4% per year, to reach 200.5 MtCO ₂ e in 2030
TNAC*	~300 MtCO ₂ e
Total Revenue Since Start	\$27.0 billion
Governing Organization	California Air Resources Board (CARB)
Evaluation / ETS Review	CARB is required to update their "California Climate Change Scoping Plan" at least every five years and provide annual reports to committees of the legislature and the board
GHG Reduction Targets	By 2030: 40% reduction from 1990 GHG levels By 2045: Achieve carbon neutrality

*TNAC: total number of allowances in circulation, a term specific to the EU ETS but is a measure of the allowance surplus.

TNAC as of 31/Dec/2024

International Carbon Action Partnership, "USA - California Cap-and-Trade Program Factsheet," retrieved 31/Dec/2024

California Carbon Allowance Market (CCA)

CCA Market Stability Mechanism (2025)		
Auction Reserve Price (Floor Price)	\$25.87 per allowance	The auction reserve price increases annually by 5% plus inflation, as measured by the Consumer Price Index.
Allowance Price Containment Reserve (APCR)	Allowances from each annual cap are placed in the APCR, where they are distributed into two price tiers and a price ceiling. Two-thirds of the allowances are distributed evenly across the two price tiers with the remaining third, plus unsold allowances that have been transferred into the APCR, placed into the price ceiling.	
Cost Containment Reserve	Tier 1: \$60.47 (66,811,000 credits)	Tier prices increase by 5% plus inflation (as measured by the Consumer Price Index)
	Tier 2: \$77.70 (89,537,000 credits)	It allows covered entities access to allowances at set prices as a hedge against higher costs.
Price Ceiling	\$94.92	At the price ceiling, a compliance entity can purchase CCAs (or, if no allowances remain, “price ceiling units”) up to the amount of its current unfulfilled emissions obligation. The revenues from the sale of price ceiling units will be used to purchase additional emissions reductions on a ton for ton basis. Price ceiling sales only occur when no allowances remain at the two lower tiers and an entity cannot meet its obligation with its existing account.

Source: International Carbon Action Partnership, “USA - California Cap-and-Trade Program Factsheet,” retrieved 31/Dec/2024; Prices are for 2024, as listed by the California Air Resource Board, Cost Containment Information, retrieved 31/Dec/2024.

CCA Market Top Buyers		
Company name	Total Covered Emissions	% of Annual Cap
Chevron U.S.A., Inc.	12,339,195	4.09%
MARATHON PETROLEUM COMPANY, LP	10,859,257	3.60%
Southern California Gas Company	6,437,755	2.14%
Phillips 66 Company	5,643,777	1.87%
Pacific Gas and Electric Company	5,580,448	1.85%
PBF Energy Western Region, LLC	4,984,949	1.65%
Valero Marketing and Supply Company	3,603,171	1.20%
Shell Energy North America (US), LP	2,603,064	0.86%
Calpine Energy Services, LP	2,273,012	0.75%
BP Products North America, Inc.	2,171,380	0.72%

Source: CARB, as of 31/Aug/2022, retrieved 31/Dec/2024.

United Kingdom ETS

The UK ETS began operating as a stand-alone program in January 2021, prior to that it was part of the EU ETS since 2005. The market’s design is similar to that of the current EU ETS. The program covers energy-intensive industries, the power sector, and aviation within the UK and European Economic Area (EEA0). Collectively, the program represents roughly one-third of total UK emissions.

Market Outlook:

- Regulators are considering reducing the cap to align with the UK’s net zero target, supporting market prices
- To achieve the UK’s aggressive targets, UKA prices will need to rise to higher levels to incentivize abatement, which should ensure strong policy support for the program.



UK ETS Overview	
Start of Operation	2021
Sector Coverage	Domestic Aviation, Industry, Power
Currency	British Pound
Auction Frequency	Every 2 Weeks
Cap	86.7 MtCO2e
Annual Cap Reduction	Aligned with net zero
TNAC	107.8 MtCO2e (2023)
Total Revenue Since Start	\$18.7B
Governing Organization	UK states 'government, environmental, and transport bodies
Evaluation / ETS Review	Two mandatory whole-system reviews under Phase 1: the first by 2023 and second by 2028 with program changes expected to be implemented by 2026 and 2031, respectively.
GHG Reduction Targets	BY 2030: At least a 68% reduction in UK net GHG emissions from 1990 levels BY 2035: Limit UK net GHG emissions to 965 MtCO2e over 2033-37 BY 2050: Net-zero UK GHG emissions

Source: International Carbon Action Partnership, “UK Emissions Trading System (UK ETS) Factsheet,” retrieved 31/Dec/2024.

United Kingdom ETS

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UK ETS

UK ETS Market Stability Mechanism (2025)

Transitional Auction Reserve Price (ARP)	£22 (\$24.17) No further changes to the level of the ARP are planned before it is likely withdrawn as the UK ETS matures
Supply Adjustment Mechanism (SAM)	<ul style="list-style-type: none"> Not yet implemented but expected to be established in the future Will be broadly based on the EU ETS Market Stability Reserve (MSR) Currently, the transitional ARP helps ensure minimum price continuity
Cost Containment Mechanism (CCM)	<ul style="list-style-type: none"> Designed to avoid spikes in allowance prices by auctioning additional allowances. If the CCM is triggered, regulators can decide if and how to intervene Intervention includes: redistributing allowances between the current year's auctions; bringing forward allowances from future years; drawing from the Market Stability Mechanism Account; or the auctioning of up to 25% of remaining allowances in the NER <p>Triggers</p> <ul style="list-style-type: none"> 2021: CCM is triggered if, for three consecutive months, the UK ETS carbon price is double the 2-year average allowance price 2022: CCM is triggered if, for three consecutive months, the UK ETS carbon price is 2.5 times the 2-year average allowance price

Source: International Carbon Action Partnership, "UK Emissions Trading System (UK ETS) Factsheet," retrieved 31/Dec/2024.

UK ETS Market Top Buyers

Company name	Total Covered Emissions	% of Annual Cap
Port Talbot Steelworks	6,643,839	4.39%
Pembroke Power Station	4,993,364	3.30%
Scunthorpe Integrated Iron & Steel Works	4,679,901	3.09%
Ratcliffe on Soar Power Station	3,633,660	2.40%
Staythorpe Power Station	3,011,979	1.99%
VPI Immingham	2,742,865	1.81%
Saltend Cogeneration Company Limited	2,729,311	1.80%
Didcot B Power Station	2,502,719	1.65%
Esso Petroleum Company Limited	2,363,983	1.56%
Grain CCGT-CHP Station	2,239,895	1.48%

Source: GOV.UK Inc., as of 31/Aug/2022, retrieved 31/Dec/2024.

Regional Greenhouse Gas Initiative (RGGI)

RGGI, the first mandatory GHG emissions trading system (ETS) in the United States, currently consists of eleven states along the Northeastern U.S. The system started operating in 2009 with ten states (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont). Virginia then joined in 2021. RGGI covers emissions from the power sector.

To date, RGGI has undergone two review processes that have led to tighter caps and design adjustments; its third program evaluation is currently under review . Going forward, the RGGI cap will reduce by 30% compared to 2020 levels over 2021-2030. Since its inception, RGGI emissions have reduced by more than 50%, which is twice that of the national rate, and raised over \$4 billion in revenue to invest in local communities.

Market Outlook:

- The RGGI third program review should result in a tightening of supply, supporting upward price pressure
- Emission budget is expected to tighten by 17% between 2026-2030
- Potential expansion of the RGGI market into new states is also bullish for prices



RGGI Overview	
Start of Operation	2009
Sector Coverage	Power
Currency	US Dollar
Auction Frequency	Quarterly
Cap	66.59 MtCO2
Annual Cap Reduction	~3% of the 2020 cap between 2021 and 2030
TNAC	-
Total Revenue Since Start	\$7.2 billion
Governing Organization	Statutory and/or regulatory authority of each RGGI state and Environmental and energy agencies for each RGGI state
Evaluation / ETS Review	2012 Model Rule 2017 Model Rule Third review expected to conclude in 2024
GHG Reduction Targets	By 2030: 30% cut in power sector emissions compared to the 2020 CO2 emissions cap (2017 Model Rule)

RGGI Market Design

RGGI Market Stability Mechanism (2025)	
Auction Price Floor	\$23.20 per short ton, increasing by 2.5% per year (to reflect inflation).
Cost Containment Reserve (CCR)	<ul style="list-style-type: none"> Since 2014, RGGI operates with a CCR, which consists of a quantity of allowances in addition to the cap which are held in reserve and only released to the market when certain trigger prices are reached. Beginning in 2021, allowances provided within the CCR will be equal to 10% of the regional cap. The trigger price is \$17.03, increasing by 7% per year thereafter. It had previously increased by 2.5% per year starting from \$10 between 2017 and 2020. The CCR was triggered in 2014 and 2015, where all 15 million allowances were sold from the CCR. At the last quarterly auction of 2021, the CCR was also triggered, where 3.9 million of the available 11.9 million allowances were sold.
Emissions Containment Reserve (ECR)	<ul style="list-style-type: none"> In 2021, RGGI implemented an ECR, where allowances are withheld from auction if certain trigger prices are reached, up to an annual withholding limit of 10% of the emission budgets (i.e., the share of each state in the regional cap) of participating states. Allowances withheld will not be re-offered for sale, effectively adjusting the cap downward. The trigger price is \$7.86, increasing by 7% per year thereafter Note, Maine and New Hampshire do not participate in the ECR.

Source: International Carbon Action Partnership, "USA - Regional Greenhouse Gas Initiative (RGGI) Factsheet," retrieved 31/Dec/2024.

RGGI Market Top Buyers

Company name	Total Covered Emissions	% of Annual Cap
Brandon Shores	9,596,143	10.90%
Astoria Energy	7,969,166	9.06%
Lake Road Generating Company	6,941,834	7.89%
East River	6,397,403	7.27%
Independence	6,134,584	6.97%
Bethlehem Energy Center (Albany)	6,020,815	6.84%
Morgantown	5,813,118	6.61%
CPV St. Charles Energy Center	5,100,162	5.80%
Northport	5,037,301	5.72%
CPV Towantic Energy Center	4,908,313	5.58%

Source: RGGI Inc., as of 31/Aug/2022, retrieved 31/Dec/2024.

Washington State Carbon Allowance (WCA) Market

- WCA market started with a very tight (balanced) supply/demand, which is one of the main reasons why WCA prices tended to be higher than CCAs.
- Due to high demand and projected deficits, it is expected that APCR reserve will be fully depleted each year through the end of the first compliance phase (2023-2026). This may lead to prices rising above Tier 1 level and be somewhere between Tier 1 and Price Ceiling within the next few years, potentially as early as 2026 level
- Earliest possible linkage with California/WCI is likely 2027

WCA Market Stability Mechanism (2025)

Auction Floor Price	\$25.85 per allowance	The auction reserve price increases annually by 5% plus inflation, as measured by the Consumer Price Index.
Allowance Price Containment Reserve (APCR)	The APCR serves as ‘speed bumps’ to prevent prices from rising too quickly, consisting of two pre-defined [tier] price levels that release additional allowances if reached. The APCR was frontloaded, with 5% of the caps in the first and second compliance periods (2023-2030) set aside at the outset of the program.	
	Tier 1: \$60.43 Tier 2: \$77.63	Tier prices increase by 5% plus inflation (as measured by the Consumer Price Index) It allows covered entities access to allowances at set prices as a hedge against higher costs.
Price Ceiling	\$94.85	If there are no units remaining in the APCR, price ceiling units are made available to covered entities. Price unit sales only occur following the request of a covered entity, which must be at least ten days before the compliance deadline.

WCA Overview

Start of Operation	2023
Sector Coverage	Transport, Buildings, Industry, Power
Currency	US Dollar
Auction Frequency	Quarterly
Cap	53.8MtCO ₂ (2025)
Annual Cap Reduction	7% (2023-2026)
Total Revenue Since Start	\$2 billion
Governing Organization	Department of Ecology, Western Climate Initiative (WCI)
Evaluation / ETS Review	Starting Dec 2027, and every four years afterwards, the Department of Ecology is required to submit a comprehensive review of the program to the legislature
GHG Reduction Targets	By 2030: 45% reduction from 1990 GHG levels By 2040: 70% reduction from 1990 GHG levels
Offset Use	Max 5% of an entity’s compliance obligation from projects not located on federally recognized tribal land; an additional 3% can be met from projects located on federally recognized tribal land

Source: International Carbon Action Partnership, “USA - Washington Cap-and-invest Program,” retrieved 31/Dec/2024.

Carbon Border Adjustment Mechanism (CBAM) expands carbon pricing to international trade

- CBAM acts as a tariff on foreign companies by requiring energy-intensive producers to pay the EUA price on goods imported into the region to establish a more level playing field across borders. The gradual introduction of the CBAM is aligned with the phase-out of free allowances.
- It will also indirectly bring more foreign companies into the program as they could potentially hedge the tariffs in the EUA market, creating greater price discovery dynamics.
- It doubly raises revenues through both importers paying the new tariff and EU industrials paying for previously free allowances.

Before CBAM

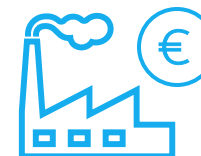


EU gave companies an adjusted discount (share of free allowances) to keep them competitive with non-EU companies

After CBAM Implementation



Remove free pass and introduce tariff on imports indexed to the weekly price of EUAs



Deductions are allowed if importer can prove that carbon price was already paid in production process



CBAM
Certificate

80% holding requirement for YTD emissions at the end of each quarter

Cannot be banked indefinitely or traded

Transitional Phase started in October 2023; Stage 1 goes into effect in January 2026

Stage 1 high-risk carbon leakage sectors covered: cement, iron & steel, aluminum, fertilizers, electricity, and hydrogen

CBAM coverage may increase from 5% of global exports in the initial stage to 31% by 2030

Stages of CBAM Coverage:		
	Sectors	Free Allowance Phase-out
Stage 1 (2026)	Carbon Intensive & High Risk of Carbon Leakage: Cement, iron and steel, aluminum, fertilizers, electricity, hydrogen	Proportion of free allowances declines at a rate of 2.5% in 2026 to 100% (no free allowances) by 2030
Stage 2 (2026-2030)	Max. Carbon Leakage Coverage: Chemicals, plastics, rubber, glassware	Currently no phase-out but will set a new benchmark calculating allocations for 2026-30
Stage 3 (Post-2030)	Finished goods (All Imports): Machinery, autos + Required reporting and taxation of upstream Scope 3 emissions	Likely see full phase-out of free allowances by 2030, prior CBAM inclusion

Free Allocation Process:

- The free allocation for each compliance entity is calculated based on product specific benchmarks, which reflect the average emissions of the top performing 10% of entities within their respective subsectors
- Roughly 43% of EUAs are provided for free each year, 51% are auctioned, and the remaining are placed in the market stability reserves and buffers

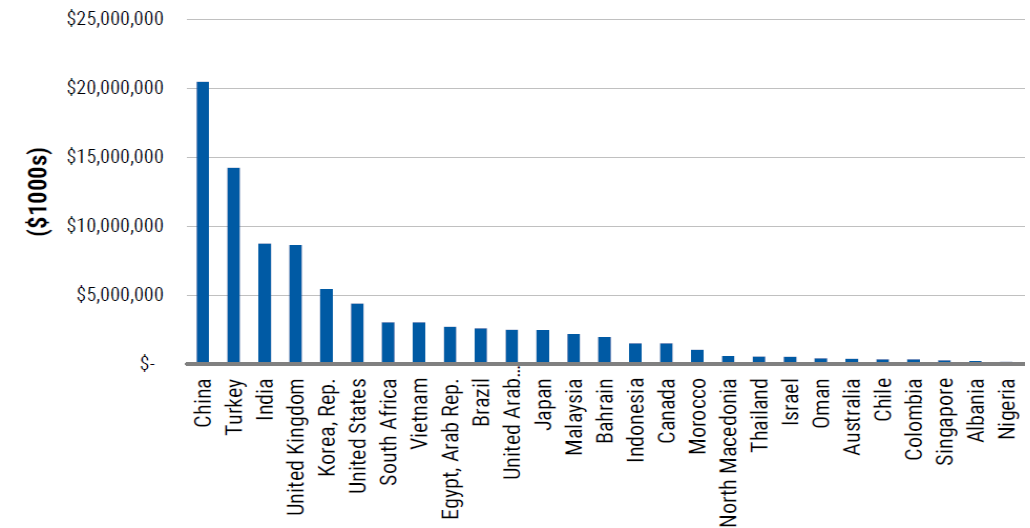
Timeline for Stage 1 Phase-out of Free EUA Allocations:								
2026	2027	2028	2029	2030	2031	2032	2033	2034
2.5%	5%	10%	22.5%	48.5%	61%	73.5%	86%	100%

CBAM Impact: Most exposed sectors and trading partners

- Over 119Mt of CBAM-covered products were exported to the EU in 2022, with the iron & steel industry representing nearly two-thirds of the total
- Most exposed: Albania, Armenia, North Macedonia, the UK, Egypt, and Turkey exported more than 50% of their covered goods to the EU
- China is most exposed to CBAM on a nominal basis, with \$21 billion of CBAM-covered goods sent to the EU in 2022
- The top five CBAM trade partners have or plan to have domestic carbon pricing programs by 2026

% of its WTO Trade of the Product to the EU27												
	China	Turkey	India	UK	Korea	USA	S. Africa	Vietnam	Egypt, Arab Rep.	Brazil	UAE	Japan
Aluminum	15%	75%	27%	72%	10%	8%	36%	11%	78%	6%	24%	8%
Cement	3%	19%	7%	47%	0%	19%	0%	1%	3%	40%	0%	1%
Fertilizer	3%	63%	1%	67%	1%	10%	1%	3%	63%	12%	1%	3%
Hydrogen	0%	86%	0%	87%	3%	1%	0%			0%	0%	0%
Iron & Steel	10%	49%	29%	64%	13%	8%	20%	24%	56%	13%	10%	6%
Average	6%	59%	13%	67%	5%	9%	11%	10%	50%	14%	7%	4%

Total value of all CBAM covered goods to the EU27 totaled \$90 billion in 2022



Source: EU Commission; Morgan Stanley, "CBAM and the Path to a Global Carbon Price," 8/May/2024.

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REPowerEU allowance auctioning creates short term added supply but is offset after 2026

Policy response to the Russian invasion of Ukraine



REPowerEU

Phase out Russian fossil fuel dependency

+

Increase Europe's renewable capacity



Accelerate Clean
Energy Transition



Save Energy



Diversify Energy
Sources

€20B initiative funded from frontloading EUAs & Innovation Fund

- 40% will be from frontloaded allowances from auctions in 2023-26, meaning allowances set aside for future auctions will be sold earlier
- 60% will come from the Innovation Fund, which finances projects developing innovative, emissions reduction technologies.

Case Study: Auction Revenue Use in California

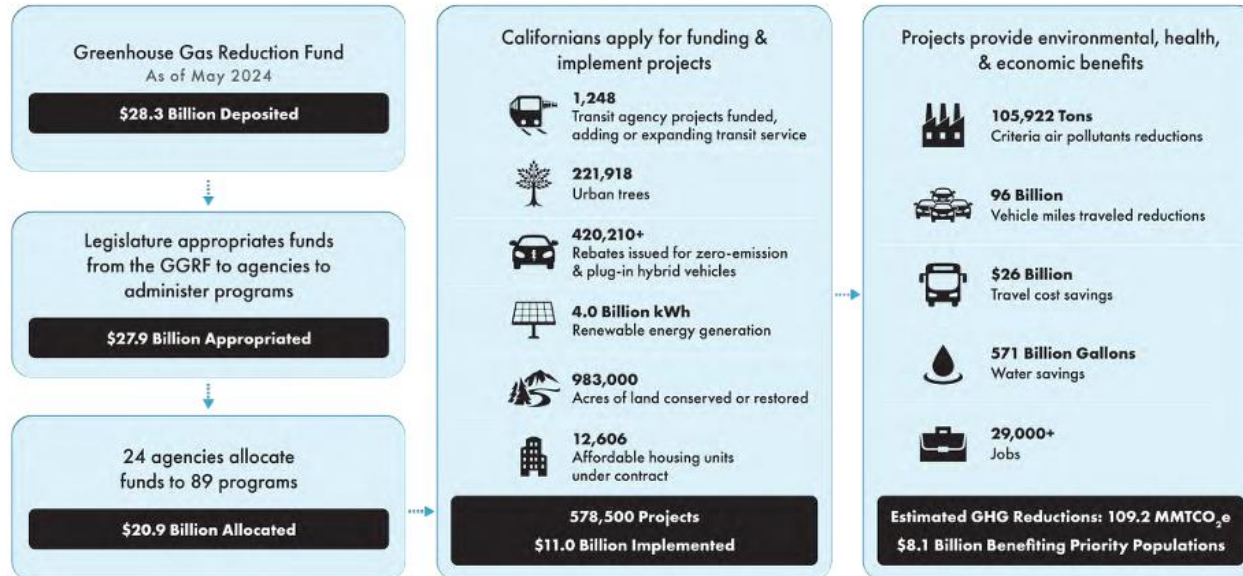
- California has implemented nearly 600,000 climate/development projects worth \$9.3 billion since the start of the program. Roughly 76% of funding is directed toward low-income communities.
- Revenue generated at auctions is returned to utility ratepayers through the California Climate Credit and funds the Greenhouse Gas Reduction Fund and the California Climate Investments program, which support investments in energy efficiency, clean transportation, solar energy, and other GHG-reducing projects.
- For an interactive map of climate investments statewide, visit <https://webmaps.arb.ca.gov/ccimap/>.

"This is the backbone of our climate funding in this state...It's a point of deep pride that we continue to be a model for the rest of the nation, and for that matter, around the world."

—Governor Gavin Newsom

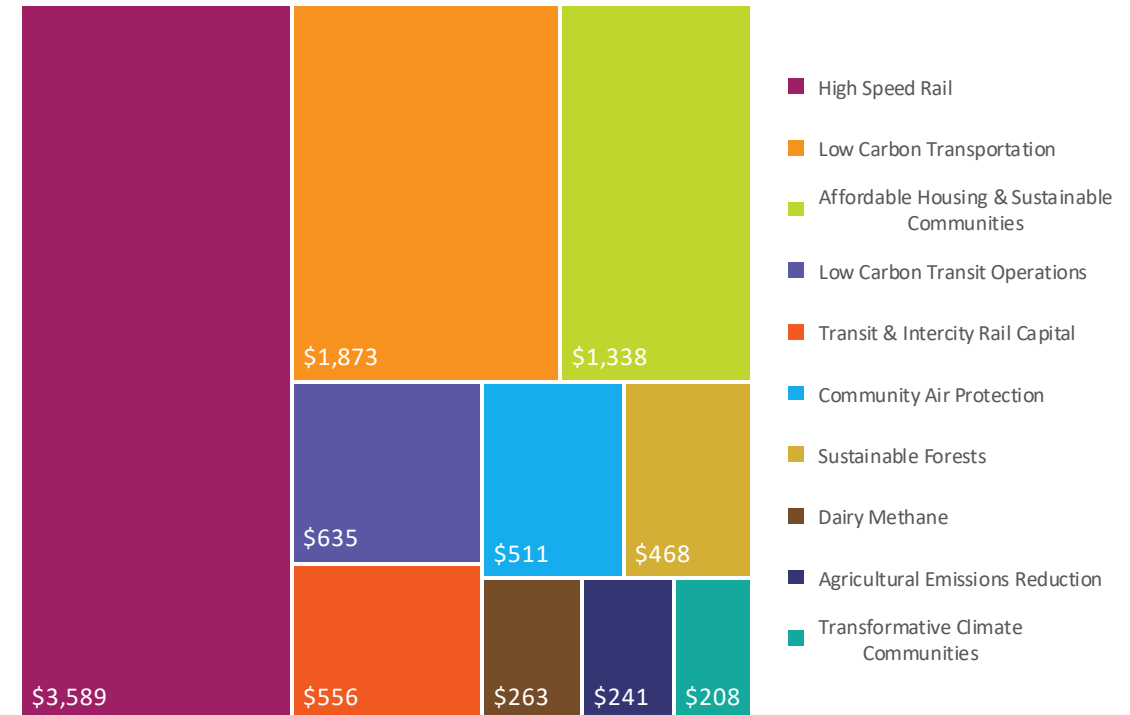
CALIFORNIA'S CAP-AND-TRADE DOLLARS AT WORK

As of November 2023



Source: CA Climate Investments, ["2024 Annual Report, Cap and Trade Proceeds."](#)

Total Implemented Investments from the Greenhouse Gas Reduction Fund (Top 10 Funded Project Categories, in millions USD)



Source: CA Climate Investments and Berkley Law as of November 2022.

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Case Study: Beyond 2030, CCA plays a crucial role in achieving new tightened emissions targets

- Though the cap-and-trade program does not technically expire until 2050, CARB's authority to actively operate and revise the program beyond 2030 will likely require a new legislative initiative.
- While there has been some uncertainty surrounding the extension of the CCA program, below are key reasons supporting the carbon market beyond 2030.

Market caps set to 2050

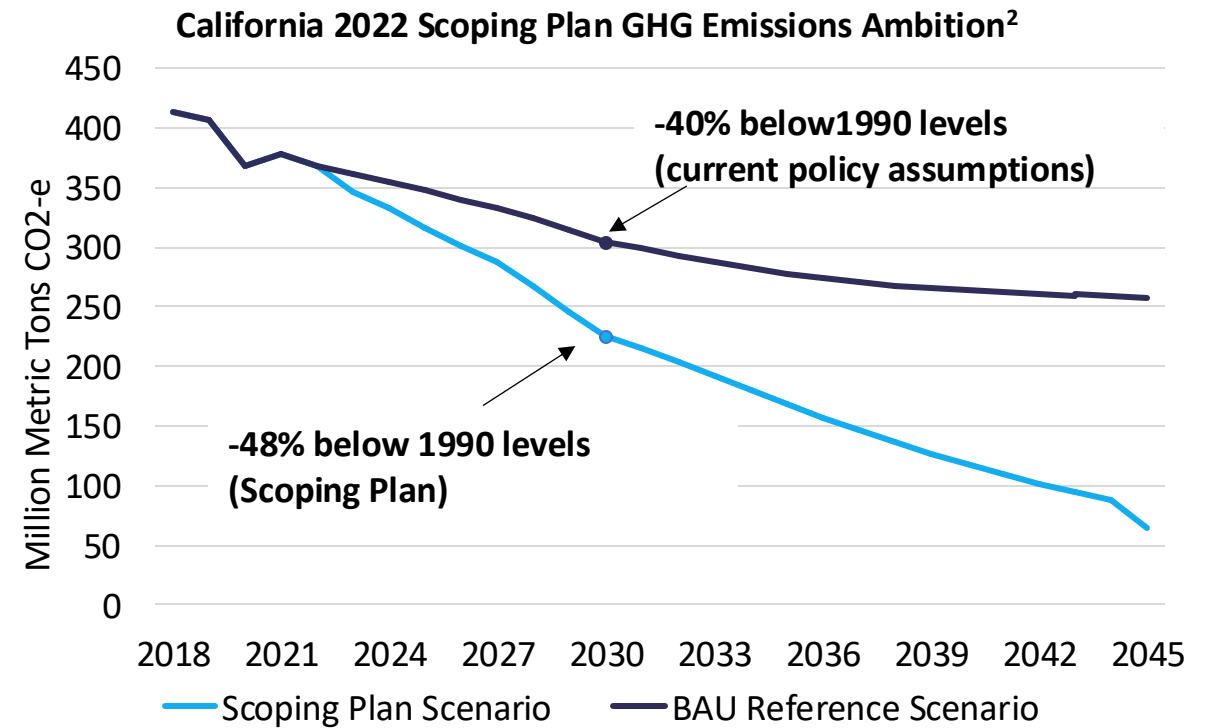
CCA program regulation includes specific annual market caps through 2031, with a predetermined formula to set annual caps from 2032-2050.¹

Room to contribute to 2045 carbon neutrality goals

The emissions in 2030 are expected to be ~200Mt with the Scoping Plan's new emissions reduction target, while the Reference scenario (no policy change) projects them to be ~300Mt.²

CCAs can be auctioned years in advance

According to law firm, Sheppard Mullin, the program would have to end several years before 2030 to prevent the loss of value from CCAs auctioned in advance. The lawyers argue this risk highlights how the current provision's 2030 date is 'meaningless'.³



1. CARB, "Unofficial electronic version of the Regulation for the California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms," p. 110, April 2019, retrieved 31/Dec/2024.

2. CARB, CLIFI as of 28/Feb/2023.

3. Carbon Pulse, "California's ARB has authority to operate cap-and-trade program beyond 2030 -law firm," 26/Oct/2022

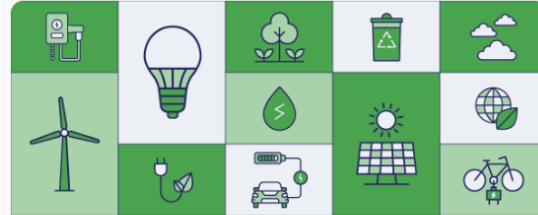
Research & Insights



June 26, 2024

Remember Acid Rain?

How Cap-and-Trade Solved an Environmental Catastrophe & Insights on Today's Carbon Markets from the "Father of Carbon Trading"



January 22, 2024

Carbon Pricing: Investing in Climate Action

By Oktay Kurbanov, Partner at Climate Finance Partners (CLIFI)



April 25, 2024

Supply and Demand Dynamics in Carbon Allowance Markets: The Inflection Point and Beyond

By Oktay Kurbanov, Partner at CLIFI



August 21, 2023

Futures: The Most Effective Way to Get Exposure to Carbon Markets

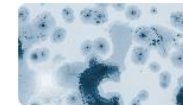
By Luke Oliver, Head of Strategy, Head of Climate



First CCA Auction of the Year Clears at Record Price

February 23, 2024

1 Min. Read Time



February 15, 2024
Carbon Briefing: Update on Recent Price Moves

3 Min. Read Time



February 9, 2024
What the European Commission's Proposed 2040 Target Means for the EU ETS

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February 5, 2024
Macquarie Releases First Carbon Compendium

3 Min. Read Time



January 26, 2024
RGGI Sets New Records as the Market Approaches the End of its Compliance Period

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Potential Risk	Description
Loss of principal	There are risks involved with investing, including possible loss of principal. There is no guarantee the ETC will achieve its investment objectives.
Futures Market / Cap and Trade	The ETC invests in futures tied to cap and trade markets. There is no assurance that cap and trade regimes will continue to exist. Regulatory changes may affect cap and trade with adverse impacts on the ETC. It may underperform other similar funds that do not consider conscious company / ESG guidelines when making investment decisions.
International	The ETC invests internationally. In addition to the normal risks associated with investing, international investments may involve risk of capital loss from unfavorable fluctuations in currency values from differences in generally accepted accounting principles or from social, economic or political instability in other nations.
Derivatives / Fixed Income	The ETC invests in derivatives and fixed income instruments. The primary risk of derivative instruments is that changes in the market value of underlying carbon allowances and of the derivative instruments (futures contracts) relating to those carbon allowances may not be proportionate. Derivatives are also subject to illiquidity and counterparty risk. Fixed Income securities are subject to interest rate risk and will decline in value as interest rates rise.
Clearing broker	The ETC's investment in exchange-traded futures contracts may expose it to risks of a clearing broker. This broker maintains assets in a bulk segregated account. ETC assets deposited with this broker to serve as margin may be used to satisfy the broker's own obligations. In event of default, the ETC could experience lengthy delays in recovering some or all its assets or may not see any recovery.
Not Diversified	The ETC is not diversified.

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Major asset classes material differences from carbon allowances

Investment	Material Differences
Carbon Allowance Futures Contracts	Carbon futures contracts are deliverable contracts where each Clearing Member with a position open at cessation of trading for a contract month is obliged to make or take delivery of Carbon Emission Allowances to or from the regional regulatory body in accordance with the ICE Futures Regulations. Specific risks are discussed on the disclosure slides at the end of the presentation.
Equities	The risks of investing in equity include share price falls, receiving no dividends or receiving dividends lower in value than expected. They also include the risk that a company restructure may make it less profitable. Alternatively a company may fail. If this happens, you may be at the end of a long list of creditors and therefore risk not get the value of your investment back.
Bonds	Bonds are subject to interest rate risk and will decline in value as interest rates rise. Other risks include, but are not limited to reinvestment, inflation, credit/default, ratings downgrades, and liquidity risks.
Commodities	Investments in commodities are subject to higher volatility than more traditional investments. Commodity price risk is the possibility that commodity price changes will cause financial losses for the buyers or producers of a commodity.
Real Estate (REITs)	In addition to the normal risks associated with investing, REIT investments are subject to changes in economic conditions, credit risk and interest rate fluctuations.

Index Definitions

S&P 500: Standard & Poor's Index is a capitalization-weighted index of 500 stocks.

Bloomberg Barclays US Aggregate Bond Index ("The Agg"): A broad base, market capitalization-weighted bond market index representing intermediate term investment grade bonds traded in the United States. Inception date: January 1, 1986

S&P GSCI: A composite index of commodities that measures the performance of the commodity market. Inception date: May 7, 2007

MSCI US REIT Index (daily price return USD): A free float-adjusted market capitalization weighted index that is comprised of equity Real Estate Investment Trusts (REITs). Inception date: June 20, 2005

MSCI All Country World Index (Gross USD): The MSCI All Country World Index is a market capitalization weighted index designed to provide a broad measure of equity-market performance throughout the world. Inception date: May 31, 1990

LBMA Gold Price PM: The global benchmark price for unallocated gold delivered, IBA operates electronic auctions for spot, unallocated loco London gold.

S&P GSCI Crude Oil Index: Provides a publicly available benchmark for investment performance in the crude oil market. Inception date: May 1, 1991

S&P Global Clean Energy Index: Designed to measure the performance of 30 companies from around the world that are involved in clean energy-related businesses. Inception Date: February 22, 2007

Other Definitions

Intercontinental Exchange (ICE): The Intercontinental Exchange is an American company that owns exchanges for financial and commodity markets and operates 12 regulated exchanges and marketplaces.

Sharpe ratio: Used to help investors understand the return of an investment compared to its risk. Generally, the greater the value of the Sharpe ratio, the more attractive the risk-adjusted return.

Standard deviation: the standard deviation is a measure of the amount of variation or dispersion of a set of values.

Carbon allowances: Top 4 carbon allowance markets by constituent trade volume. The Index is used since the index start date July 25, 2019. From 11/30/2016 to prior to the index start date, 60% and 5% were respectively assigned to EUA futures prices (current year and next year December vintages) using Intercontinental Exchange daily published settlement prices, 20% and 5% were respectively assigned to CCA futures (current year and next year December vintages) using IHS Markit OPIS's daily Carbon Market Report published prices, and 10% was assigned to RGGI (current year December vintage) using IHS Markit OPIS's daily Carbon Market Report published prices. Prior to 11/30/2016, 60% and 5% respectively were assigned to EUA futures prices (current year and next year December vintages) using Intercontinental Exchange daily published settlement prices and 35% was respectively assigned to CCA futures (current year December vintage) using IHS Markit OPIS's daily Carbon Market Report published prices. For the two ranges developed prior to the index start date, Intercontinental Exchange and IHS Markit OPIS's Daily Carbon Market Report publish daily pricing for each contract vintage for all relevant days when the futures trade.

Market Stability Reserve: The Market Stability Reserve (MSR) holds allowances out of the auction when excess volumes are available on the market and reinjects them when there is low circulation. There is no predetermined price floor or ceiling however this mechanism, creates stability in the market and improves resilience to future spikes in supply/demand.

Important Notes

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Investors will be advised that investing involves risk, including possible loss of principal. There can be no assurance that any series of ETCs will achieve its stated objectives. Under the ETC Programme, the Issuer may offer multiple different ETC Series. The performance of each ETC Series will be linked to specified reference indices comprised of futures contracts in the Global Carbon Credit Markets. The indices, and corresponding future contracts, are subject to political, social or economic changes which may cause decline in value. The Issuer may invest in derivatives, which are often more volatile than other investments and may magnify gains or losses for investors in the relevant ETC Series. Fluctuations in the currencies of foreign countries may have an adverse effect to domestic currency values. Narrowly focused investments typically exhibit higher volatility. Investors will be advised of these and other relevant risk factors before investing in any ETC Series.

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