Navigating the Mosaic of North American Carbon and Clean Fuels Markets

cCarbon
formerly CaliforniaCarbon

March 19, 2024

Outline

1. Who are we

2. Size of North American Carbon and Clean Fuels Markets

3. Interconnectedness of markets and key drivers: trading signals to compare them

4. Our outlook for 2024


CARBON
IS OUR
currency
Forecasting Environmental Markets

cCarbon

cCarbon (est. 2013)

is a specialized analysis platform for

environmental

commodity

markets and climate finance

Our data, insights and forecasts

enhance

decision-making

for environmental market

participants and investment firms

OUR WORKS IMPACT

US$200

Billions of assets under management in global that are guided by cCarbon forecasts

95%

of market-regulated global emissions covered by cCarbon products

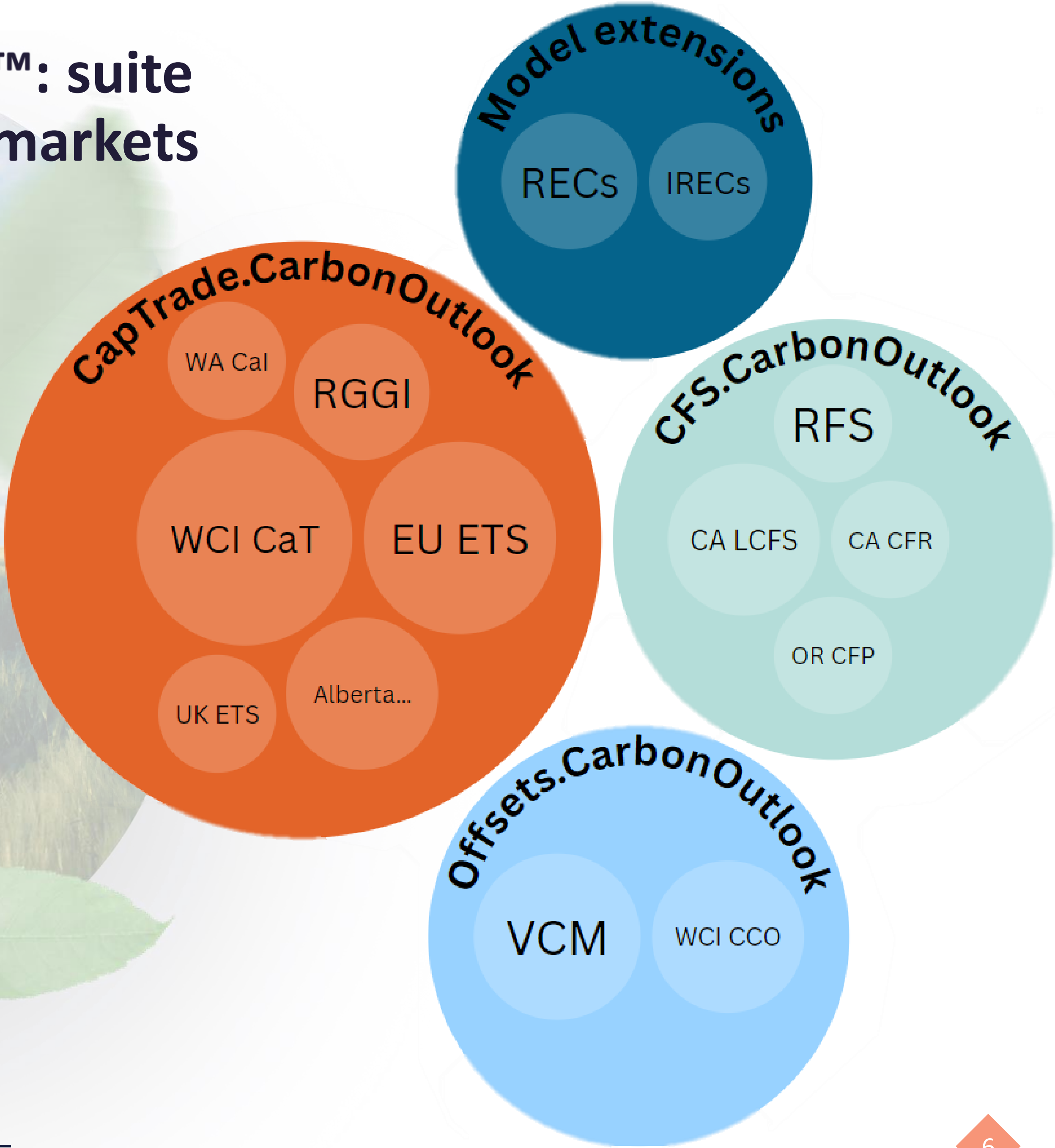
1600 +

corporate entities guided daitly by our analysis

Covering a wide range of carbon markets

Compliance Carbon Markets	WCI CaT	Washington Cal	RGGI	Alberta TIER	EU ETS	UK ETS
Clean Fuels Markets	California LCFS	British Columbia LCFS	US RFS	Oregon CFP	Canada CFR	SAF RD
Carbon Offsets	VCM	WCI COOs (NA Compliance Offsets)	Article 6			
Carbon Linked Mechanisms	NA VRECs	IRECs				

Analyses powered by CarbonOutlook™: suite of interconnected models for carbon markets

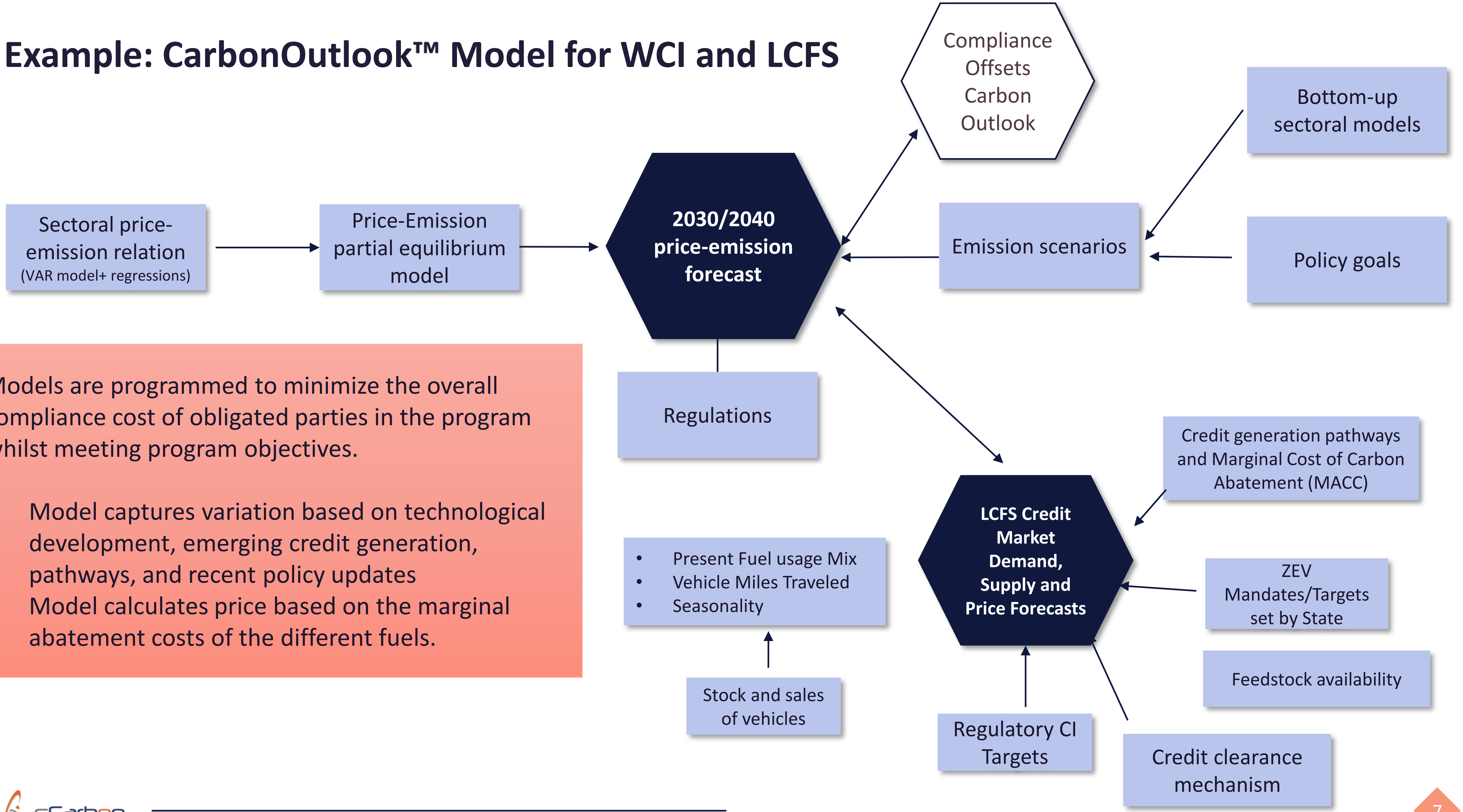


Two families of models:

1. Near term trend analysis models based on Econometrics and AI/ML models (**Trending.CarbonOutlook**)

2. Long term fundamental models based on linear programming **(Fundamental.CarbonOutlook)**

Example: CarbonOutlook™ Model for WCI and LCFS

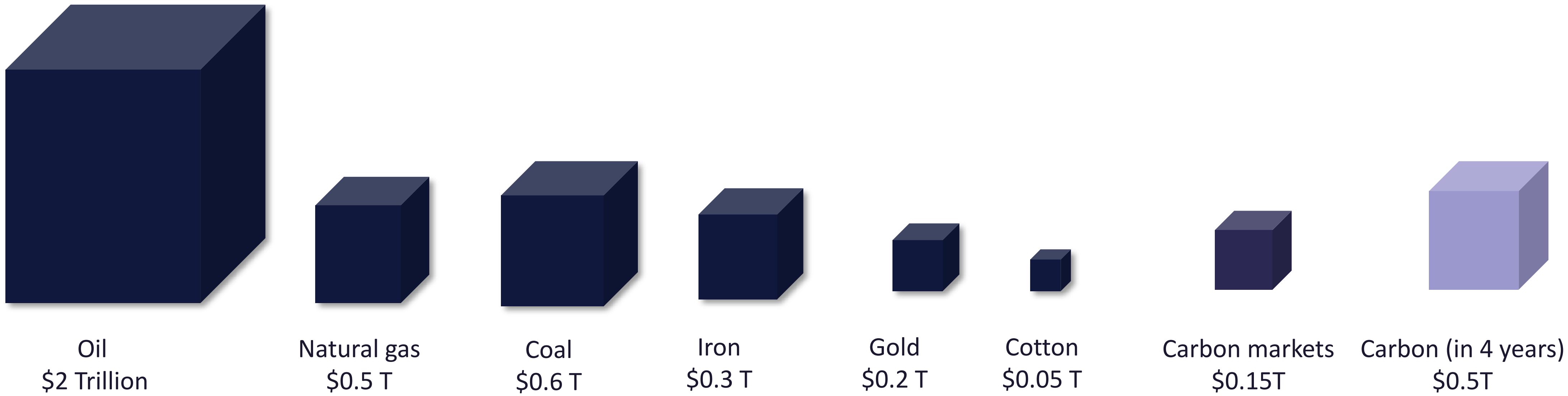


Models are programmed to minimize the overall compliance cost of obligated parties in the program whilst meeting program objectives.

- Model captures variation based on technological development, emerging credit generation, pathways, and recent policy updates
- Model calculates price based on the marginal abatement costs of the different fuels.

Size of North American Carbon and Clean Fuels Markets

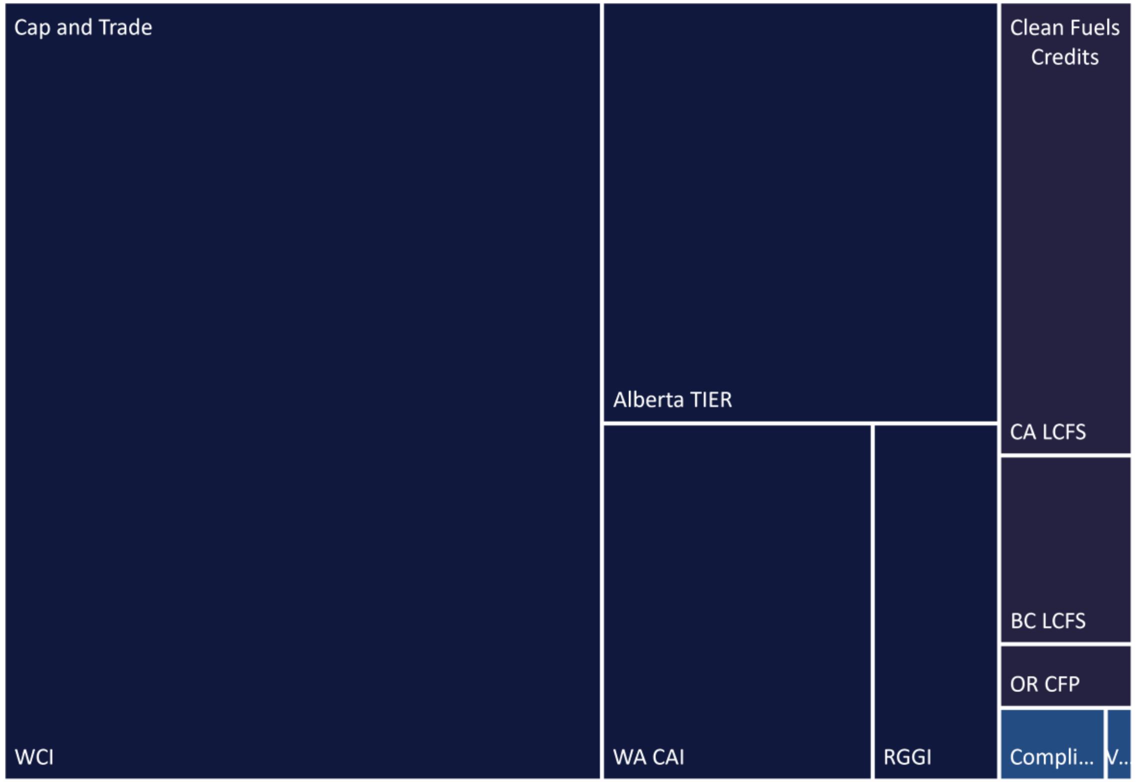
Carbon markets: when put in context of other commodities is nearly as big as gold, and in 4-5 years could become bigger than natural gas / coal



All figures – Annual sale of primary commodity. **Excludes derivative and secondary products sale and trades**
Carbon market figure is for 2023. Approx. 2 billion allowances annual issuances (EU ETS, UK ETS, WCI, RGGI, ALBERTA TIER, WA and CI linked clean fuels markets)

North American carbon markets are presently 20% of global market, by value. Expected to double in 3 years by value and volume.

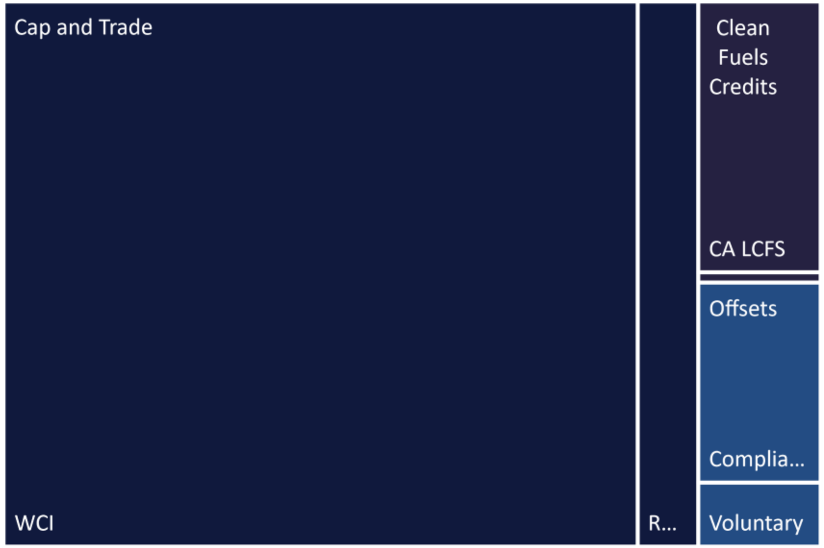
$30 billion in annual issuances



Annual issuance (2023)
Cap and Invest: $22b **(WCI is $15b)**
Clean Fuels credits: $3.6b
Offsets (Compliance and voluntary): $0.3b **(WCI CCOs are $0.2b)**

Source: cCarbon Analytics

$17 billion in 'bank' with various players



Surplus Bank (end of 2023)
Cap and Invest: $15b **(WCI is $13.2b)**
Clean Fuels credits: $1.3b
Offsets (Compliance and voluntary): $1.3b **(WCI CCOs are ~$1b)**

Upcoming markets

<u>New markets under development</u>
- New York Cap and Trade
- New Mexico CFS

<u>Markets that have come online and yet to trade in volumes</u>
- Canada CFR
- WA CFS

Offsets
- WA compliance offsets

Interconnectedness of markets and key drivers: trading signals to compare them

Three measures to track the different markets

Bank Coverage Index

- For Cap and Trade as well as Clean Fuels markets
- Direction indicates level of surplus/deficit

Liquidity Index

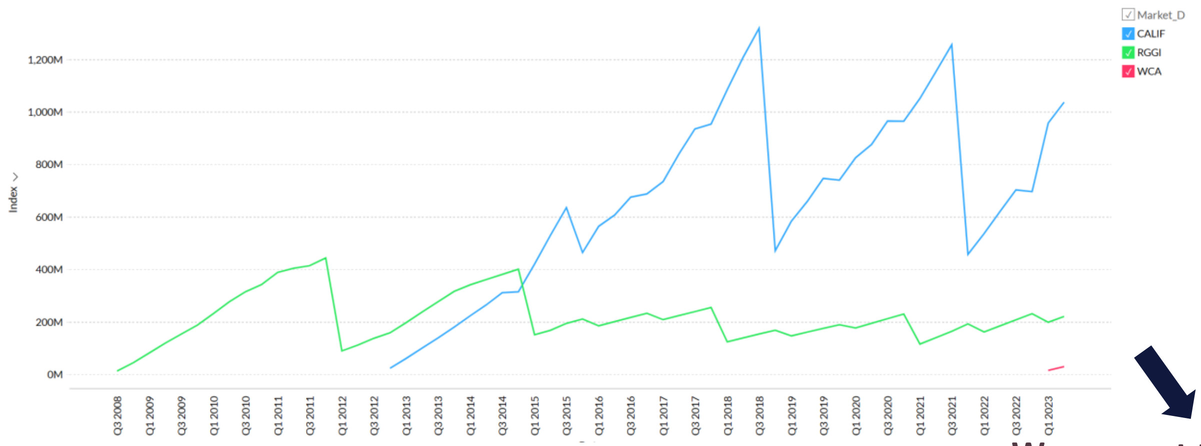
- For Cap and Trade as well as Clean Fuels markets
- Level of trading in the secondary market

Value Giveback Index

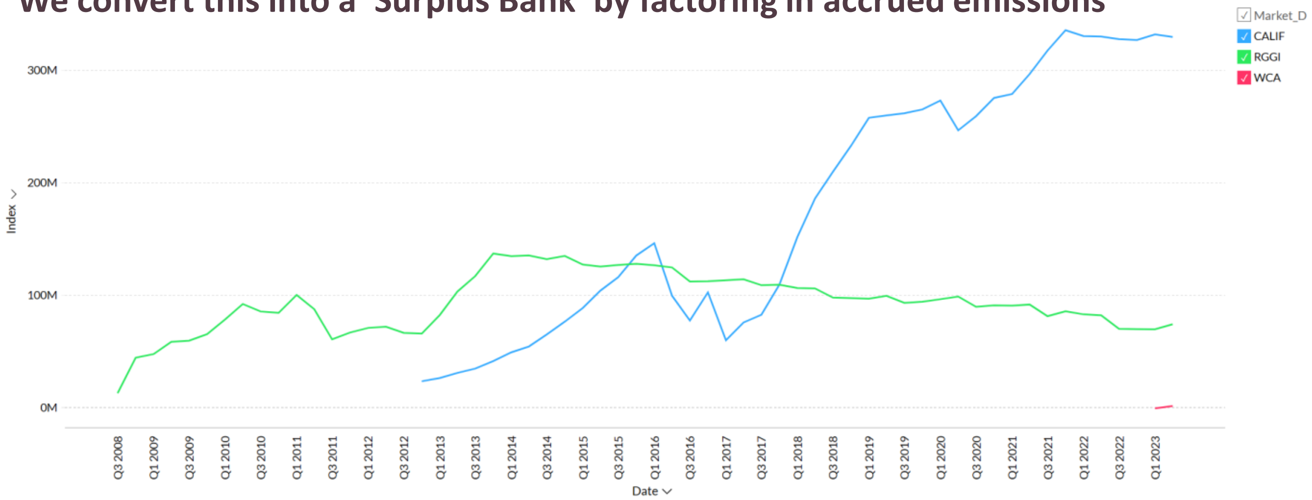
- For Clean Fuels markets
- Helps determine where to ship fuels

Bank Coverage Index - we study and forecast credit/allowance bank size to provide an early indicator on market evolution

cCarbon's Bank Coverage Index –Total Bank. This is what the market sees



We convert this into a 'Surplus Bank' by factoring in accrued emissions

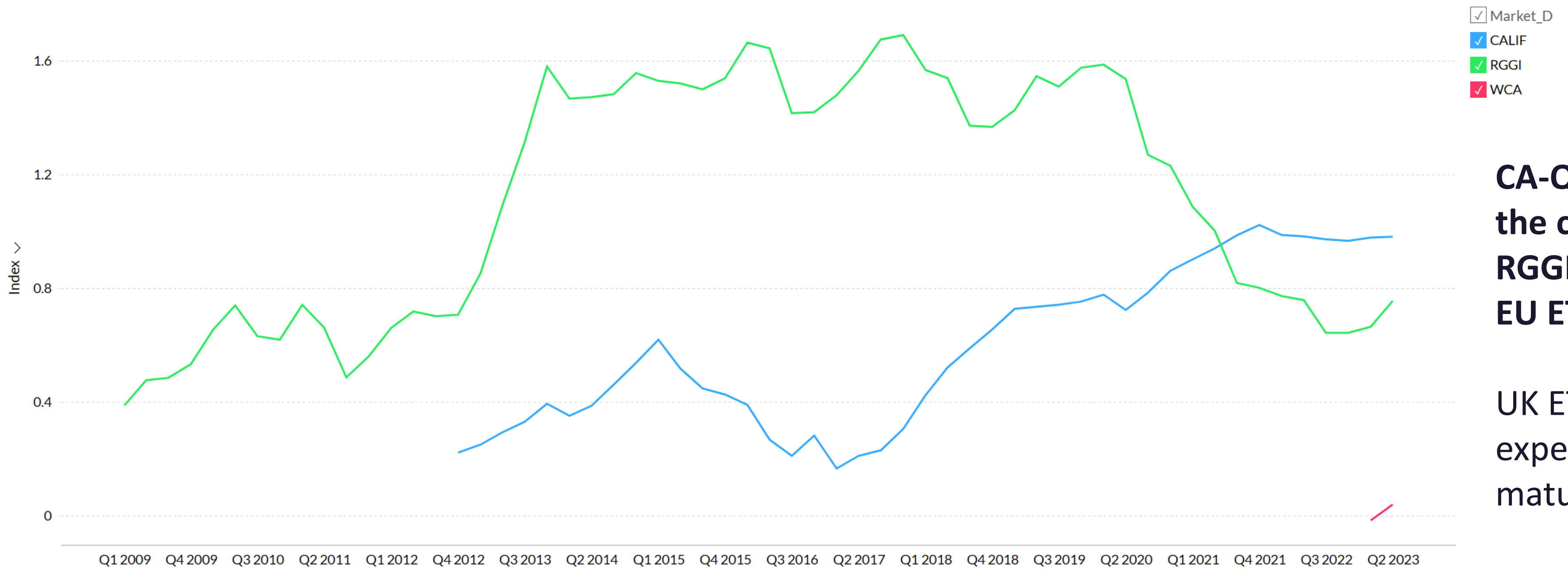


CA-QC CaT market's surplus bank has gone up according to the latest data, while RGGI's has decreased.

Bank Coverage Index - our propriety indices enable cross comparison of carbon markets

The aim of the bank indices is to facilitate comparison of the markets on an equal footing. The issue arises when attempting to compare the surplus or circulating bank, which makes little sense due to the markets having different sizes. Therefore, the indices strive to normalize the market across various market sizes.

cCarbon's Bank Coverage Index –Surplus Bank/ trailing emissions. This influences behaviour of traders



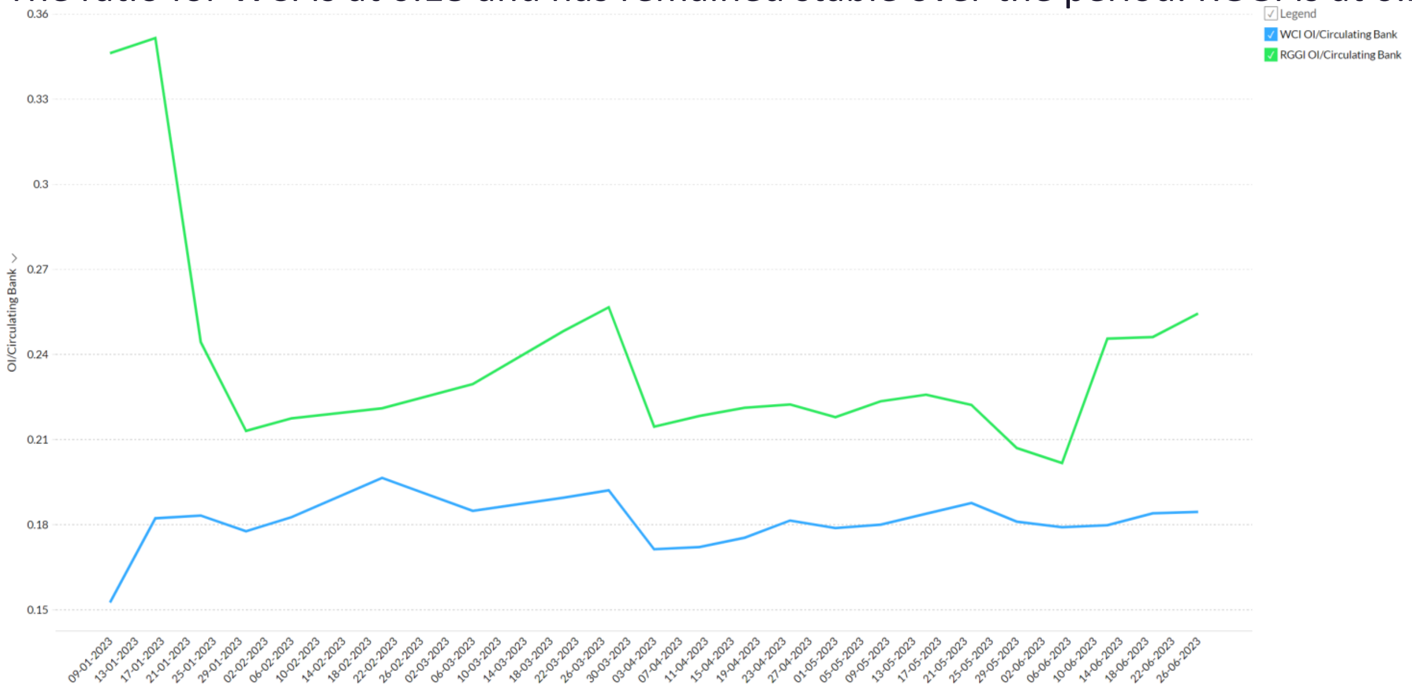
CA-QC CaT stabilizes at roughly 1 times the current emissions.
RGGI rises to 0.75
EU ETS bank coverage ratio also is ~0.8

UK ETS and WA CAI ratios are low but expected to increase as the scheme matures

Liquidity Index - Tracking liquidity and that provides a different view

Bank Open Interest (OI) tells us about how much of the bank is covered on the exchange-futures market on a weekly basis. This is a one of the measure of liquidity formulated by cCarbon.

The ratio for WCI is at 0.18 and has remained stable over the period. RGGI is at 0.25.



cC.Info Bank adjusted OI (open interest):

RGGI open interest by bank ratio is at 0.25

WCI which is at 0.18

EU ETS is at 0.84

UK ETS is at 0.56

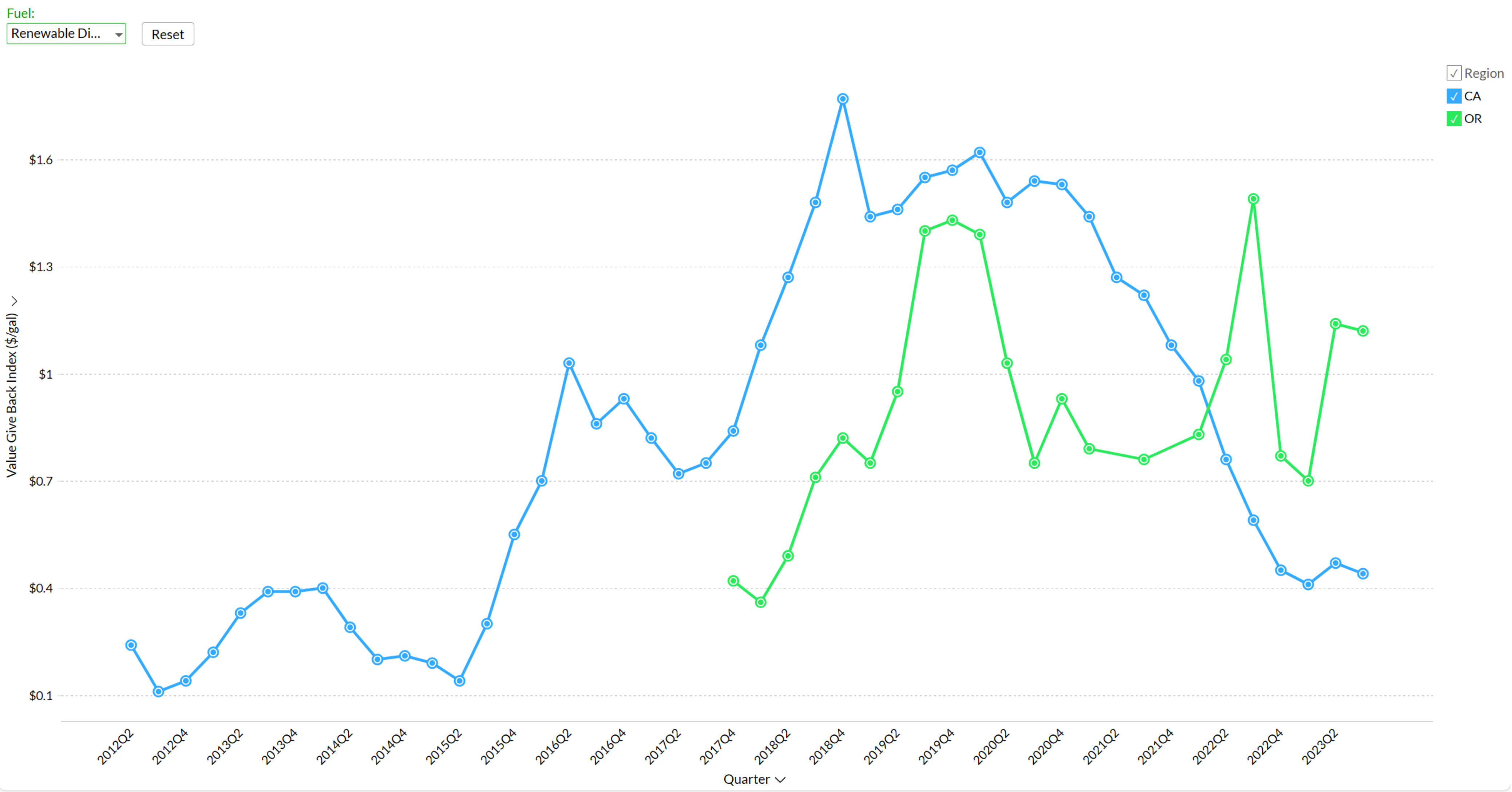
Bank adjusted OI tells us about how much of the bank is covered in the futures market on a weekly basis. This is a measure of liquidity formulated by cCarbon.

Value Giveback Index

- Value giveback index (VGI) is an indicative measure of incentive a fuel could generate in the given clean fuel market.
- Supports producers to decides which markets to plan and prioritize

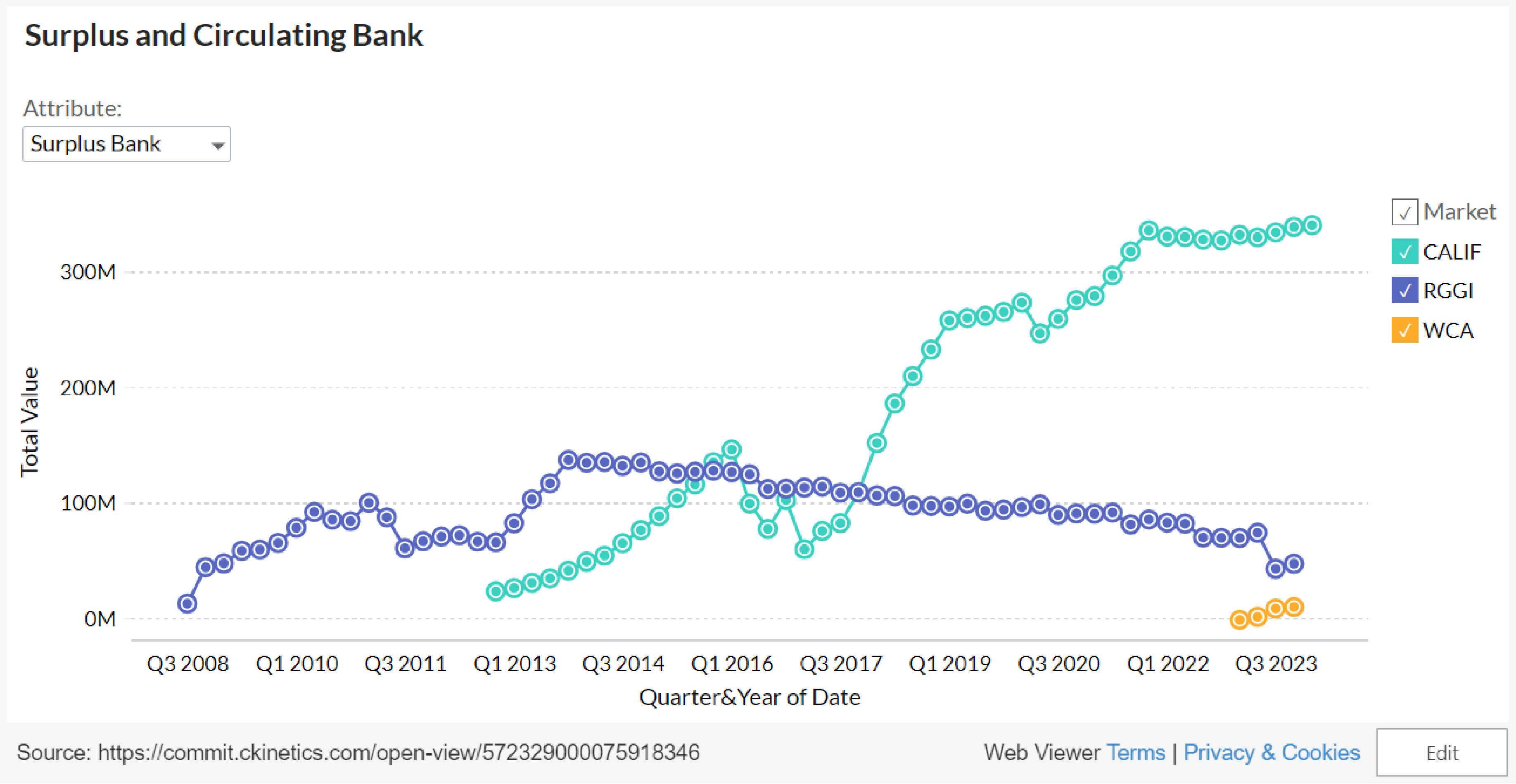
$$\text{VGI (\$/gal)} = \frac{\text{Number of Credits} * \text{Credit Price (USD)}}{\text{Fuel Volume (gallons)}}$$

Value Giveback Index: CA vs OR



What do our signals tell us?

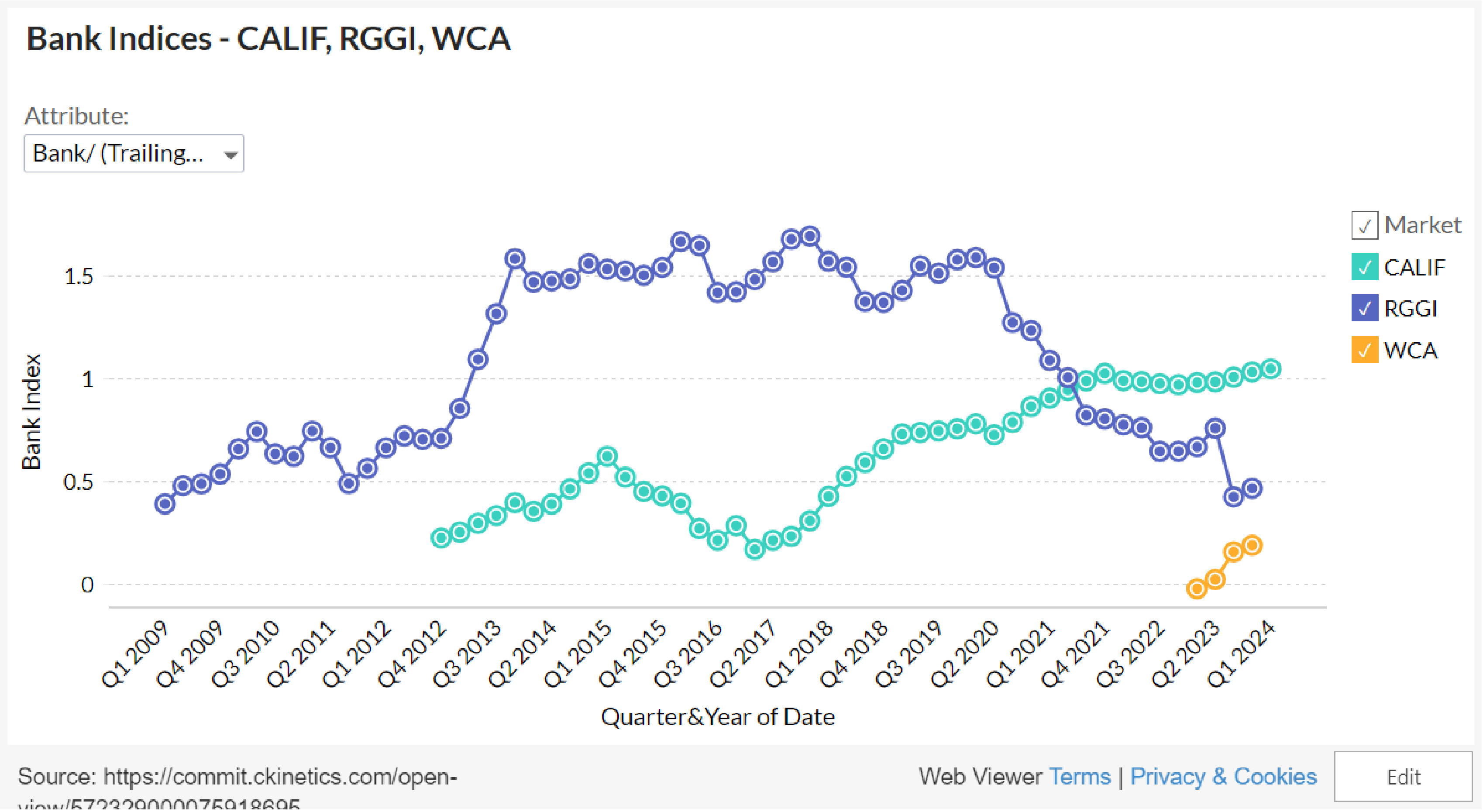
CC.info Bank estimate – CA-QC CaT market's surplus bank has been on an upward trajectory



"Surplus Bank" is defined as the number of allowances currently in entity accounts that are in excess of all entities' obligations at a given time. It is indicative of the state of the market – a expanding surplus bank means a weaking market and a constricting surplus bank indicates a tightening market.

The California-Quebec Cap-and-trade market's surplus bank has grown from 275 million in Q4 2020 to 330 million at the end of Q2 2023.

CC.Info Bank Coverage Index – CA-QC CaT remains higher than 1, program review hopes to change that

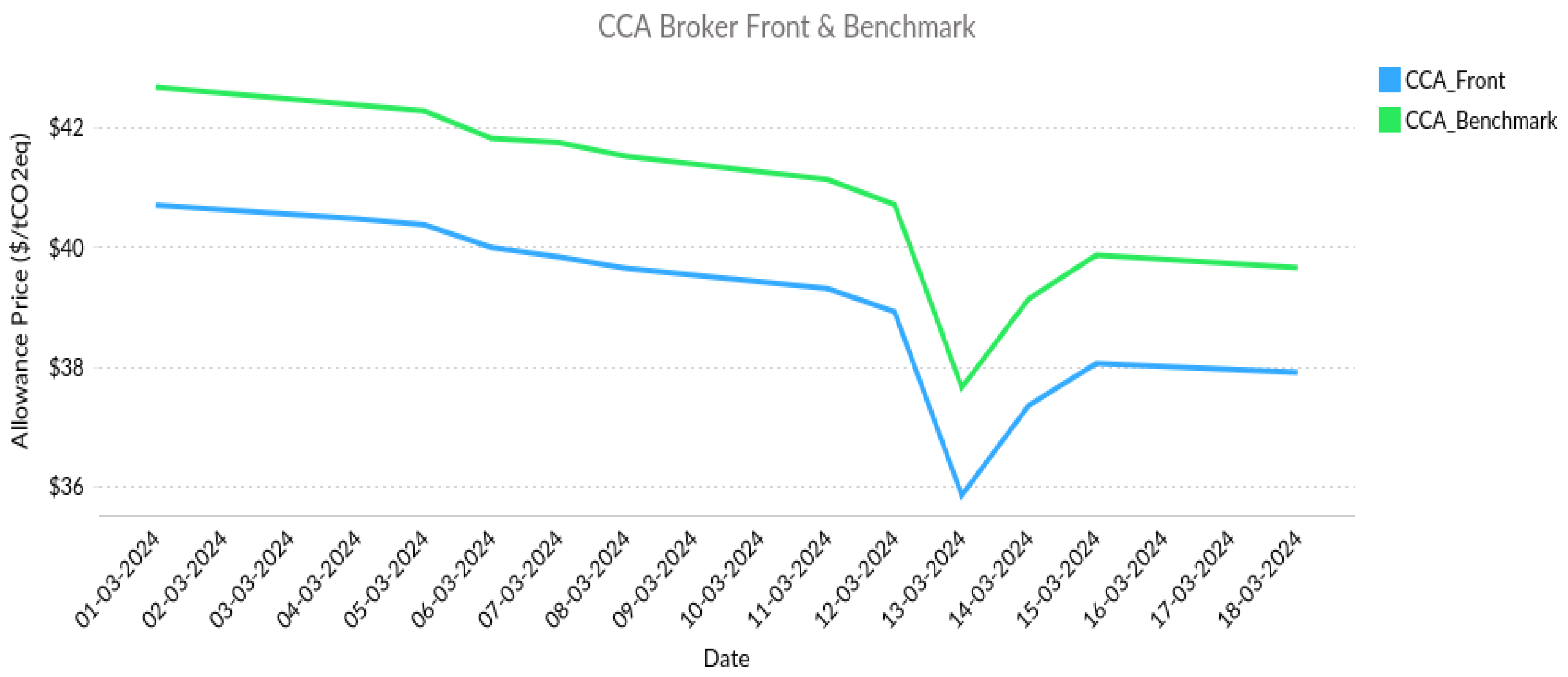


"Bank Coverage" is an index defined as the surplus bank of allowances in the market over the trailing 12 months' emissions. The index is used to determine the level of allowance surplus in the market in relation to its annual emissions. An index of 1 indicates a bank coverage of 1 time of emissions, meaning the market has 1 year of surplus allowances available.

California-Quebec Cap-and-trade market has a bank coverage of 1.04.

RGGIs been on a declining trend and is expected to decline further.

Are carbon markets liquid enough? – Recent 13% CCA fall indicates to sell-out



- RGGI open interest by bank ratio is at 0.25
- WCI which is at 0.18
- EU ETS is at 0.84
- UK ETS is at 0.56

- Liquidity impacts a market's ability to resist volatility during sell-offs.

Key drivers and what to expect in 2024 - North American Carbon markets

WCI Cap-and-Trade

Scoping plan's 48% below 1990 target will drive the outlook on prices and emissions. Timing of CARB's roll out is going to be crucial.

Market to turn to deficits, once new program is adopted in 2025. Surplus Bank expected to decline below 100 million allowances by 2030.

Besides the cap, the next biggest short-term driver for emission reductions is renewable diesel (for both California and Quebec) followed by growth share of renewable electricity in California grid.

We are projecting a slower uptake of EVs than previously.

Things we are tracking for the end of the decade: SB1440 impact, RNG in the pipeline (decarbonizing Natural gas), heat pumps in new building stock, SB596 requiring cement sector to reach net-zero by 2045.

Timeline of CDR projects and their inter-relation with the Cap-and-Trade program remain uncertain.

Key drivers and what to expect in 2024 - North American Carbon markets

Washington Cap-and-Invest

Market Risk of Ballot Initiative 2117 – A risk that the program ends in 2024 – (High Risk>25%)

Linkage with California & Quebec – integrating with larger WCI CaT could provide price stability

GHG inventory numbers and reported emissions will bring clarity in Q4 2024. Uncertainty on the actual emissions in the baseline year – mainly for transportation and imported electricity.

Transportation is a key sector to monitor closely. EVs and renewable diesel will play important role.

RGGI

Program likely to be updated with 'Cap to Zero by 2040' to tighten the market.

Coal abatement saturated – shift from natural gas to renewable sources driven by higher carbon price.

New York Cap-and-trade planned to start in 2025, will likely have a limited impact on RGGI.

Offshore wind and Interconnectors with Canada considered extremely influential on RGAs pricing.

Key drivers and what to expect in 2024 – NA Clean Fuels Market

California LCFS

Renewable Diesel continues to flood the credit markets with 3.18 million credits in Q3 2023.

With 1.4 billion gallons consumed in 2023 which is expected to reach around 3 billion gallon by 2030.

We forecast the average Value Giveback Index (VGI) for renewable diesel to almost triple to 1.63 $/gal by the end of 2030.

CARB's April workshop to solidify the timeline and proposed changes; We project credit prices to bounce back to $85-90/MT in 2024.

Oregon CFP

Share of renewable diesel credits in OR CFP will continue to increase in 2024

EV sales to reach up to 90K by the end of 2024

Credit prices likely to stay around $90/MT

Key drivers and what to expect in 2024 – NA Clean Fuels Market

Washington CFS

Started reporting the quarterly prices in 2023 which were at $78/MT. We expect it to come down with a growing credit bank in the coming years.

Ethanol is currently the major credit generator and soon RD will start to come in at scale.

Canada CFR

Early trades indicate a price range of CAD 250-350/MT. This is in-line with the initial model predictions.

We expect credit prices to slide after the initial bank build-up in 2024 and 2025 with the current program stringency.

RD volumes produced and shipped expected to grow in Canada with BC attracting the initial volumes given the stacking.

Two RD facilities already operating; six more expected to come online between 2024-2027.

Upcoming Canadian federal elections in Nov 2024 will be a key driver for the market to get political certainty.

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