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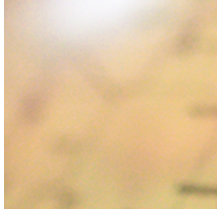
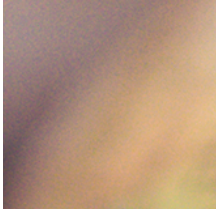
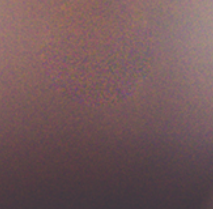
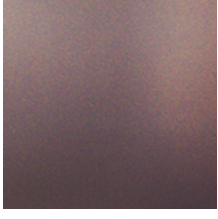
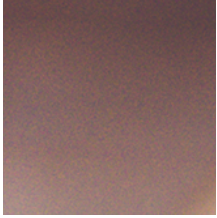


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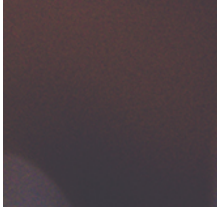
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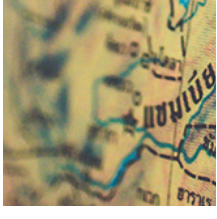
ROBERT SCHUMAN CENTRE FOR ADVANCED STUDIES



INFORMING THE CARBON MARKET POLICY DIALOGUE: THE EMISSIONS TRADING SYSTEMS AT A GLANCE



TECHNICAL REPORT
APRIL 2020



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Informing the Carbon Market Policy Dialogue: The Emissions Trading Systems at a Glance

Report prepared, as part of the LIFE DICET project, by FSR Climate and its external collaborators

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Foreword

The present report is chronologically the first output of the project *LIFE DICET – Deepening International Cooperation on Emissions Trading* (lifedicetproject.eui.eu). LIFE DICET supports EU and Member State policymakers in deepening international cooperation for the development and possible integration of carbon markets. This report is a collection of five short documents describing the Emissions Trading Systems (ETSs) currently in force in the following jurisdictions: EU, California-Québec, China, New Zealand and Switzerland. A central component of the DICET project is the Carbon Market Policy Dialogue (CMPD) between the European Commission, as the regulator of the EU ETS, and the regulatory authorities for the other ETSs in the above said jurisdictions.

The purpose of this report, and of others that will follow, is to inform the CMPD. Specifically, the report collects basic information about the main features of the ETSs represented in the CMPD (e.g., sectors covered, number of installations, total allowance volume, allocation method, etc.) and, for each of them, provides brief explanations and relevant references concerning both the main current regulatory issues and the recent and prospective reforms.

The report was written in December 2019, so it provides the reader with a snapshot of the ETSs at that specific point in time. This caveat is in order as each and every of the six ETSs has been going through a phase of relevant policy and regulatory changes.

The five descriptive documents were written by researchers at FSR Climate and its external collaborators in the DICET project, specifically: Giulio Galdi, Stefano F. Verde, Isabella Alloisio and Simone Borghesi (EU ETS), Emily Wimberger (California-Québec), Li Zhou (China), Ted Jamieson (New Zealand), and Bettina Schäppi and Jürg Füssler (Switzerland).

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1. Introduction

California and Québec established independent Cap-and-Trade Programs in 2012, and formally linked Cap-and-Trade systems on January 1, 2013. The jurisdictions began compliance obligations in 2013 with fully fungible compliance instruments. The province of Ontario was also briefly linked with the California-Québec Cap-and-Trade Program in 2018. The jurisdictions of California and Québec maintain legislative and regulatory authority over their respective programs and work collaboratively on system operability, market monitoring, and enforcement. Currently the California and Québec Cap-and-Trade systems have emissions caps set through 2030 and are in their third regulatory compliance period which ends in November 2021.

The California and Québec Cap-and-Trade Programs were developed following recommendations of the Western Climate Initiative (WCI), a collaboration of independent jurisdictions working together to identify, evaluate, and implement trading policies to tackle climate change at a regional level. A non-profit corporation, Western Climate Initiative, Inc. (WCI, Inc.), now provides administrative and technical services to support the implementation of state and provincial greenhouse gas (GHG) emissions trading programs.

2. Current technical features

The California and Québec Cap-and-Trade systems are harmonized across many technical features. California and Québec signed a formal linking agreement in 2013 in which they agree to integrate Cap-and-Trade systems and enable information sharing to support the analysis, operation, enforcement, and

supervision of the joint Cap-and-Trade system.¹ The formal linking agreement defines the gases that are included in the linked California-Québec Cap-and-Trade Program, the handling of compliance instruments and offsets, auctioning, market supervision, and enforcement. In addition, California Senate Bill 1018 (SB 1018) requires four additional findings prior to any jurisdiction linking with California² including equivalent stringency, enforceability, and limitations on liability.

Coverage

The California-Québec Cap-and-Trade Program covers carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulfur hexafluoride (SF₆), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), nitrogen trifluoride (NF₃), and other fluorinated greenhouse gases. These covered gases are converted to carbon dioxide equivalent or CO₂e, which is the number of metric tons of CO₂ emissions with the same global warming potential as one metric ton of another GHG. GHG reporting and compliance is conducted in units of CO₂e.

The California-Québec Cap-and-Trade Program covers approximately 85% of California and Québec GHG emissions. Beginning in the first compliance period electricity generation, including imported electricity, and large industrial sources with GHG emissions at or above 25,000 metric tons of carbon dioxide equivalent (MTCO₂e) are covered in the California and Québec systems. As of 2015 (the second compliance period) covered sectors also include combustion of gasoline, diesel, natural gas, and propane from all sources with emission below 25,000 MTCO₂e, including all commercial, residential, and small industrial sources and fuels used for transportation.

Within the covered sectors there are approximately 500 covered entities in the California Cap-and-Trade Program and 150 covered entities in the Québec Cap-and-Trade Program. These entities have compliance obligations and have emitted, produced, imported, manufactured, or delivered in 2009, or any subsequent year, more than the threshold level specified in the regulations.

Emissions Cap

California and Québec set their annual emissions caps based on the emissions of the jurisdictions and GHG reduction targets. The California cap was set at 162.8 million allowances in 2013 at approximately

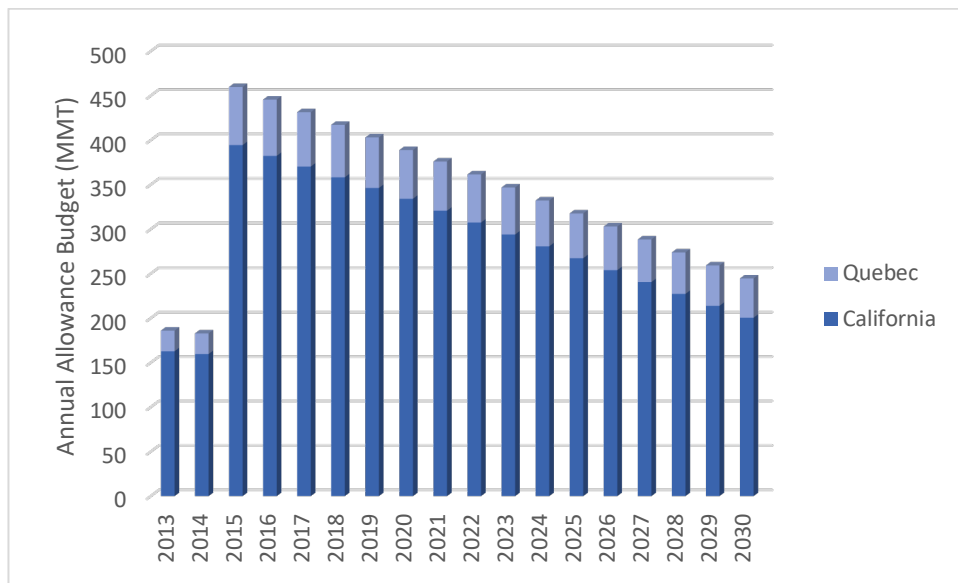
¹ https://ww3.arb.ca.gov/cc/capandtrade/linkage/ca_quebec_linking_agreement_english.pdf

² https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120SB1018

2% below the emissions level forecast for 2012. The cap declined in 2014 and then expanded to 394.5 million allowances in 2015 with the inclusion of transportation emissions. The California cap declines each year, approximately 2% from 2013 to 2015, 3% from 2015 to 2020, and an average of 4% each year from 2021 through 2031. The emissions cap is set at 200.5 million allowances in 2030.

The Québec emissions cap was set at 23.2 million allowances in 2013 and 2014 and expanded to 65.3 million allowances with the transition to the full program scope in 2015. The Québec cap declines approximately 3% each year through 2020. In 2021, the Québec cap increases slightly to 55.26 million allowances due to an adjustment in the global warming potential of different GHGs. Post-2021, the Québec cap declines approximately 3% each year to 44.14 million allowances in 2030. Figure 1 presents the annual emission cap for the California-Québec Cap-and-Trade Program.

Figure 1: California-Québec Program Annual Allowance Budgets



Allowance Distribution

Allowances in the California-Québec Cap-and-Trade Program are distributed through free allocation and can be purchased at auction or through trading. In California, industrial facilities receive free allowances for transition assistance and to prevent leakage through output-based allocation. Through 2018, the amount of free allocation is determined by benchmarks, production volumes, an annual cap adjustment factor, and an assistance factor based on assessment of leakage risk determined by assessment of emissions intensity and trade exposure by industry. From 2018 through 2020, assistant factors in California were set

at 100% for all sectors receiving free allocation. From 2021 through 2030, California Assembly Bill 398 (AB 398) specifies an assistance factor of 100% for all sectors receiving free allocation.

In California, electrical distribution utilities and natural gas suppliers receive allowances on behalf of their ratepayers. Natural gas and electrical utilities consign the allowances to auction and are required to use the allowance value for the benefit of ratepayers. In 2018, about 75% of California allowances were available through auction, including state owned allowances and utility consigned allowances. All entities can purchase allowances at auction and through trading as long as purchases conform to annual holding limits and auction purchase limits.

Allowances in the Québec Cap-and-Trade System are available for purchase at auction and through trading and are made available through free allocation. Emissions-intensive sectors vulnerable to international competition receive free allowances based on benchmarks for inputs of raw materials or product-based benchmarks through output-based allocation.

As of 2019, opt-in covered entities in Québec are also eligible for allocation of free allowances as well as regulated entities. There is no consignment of utility allowances in Québec and electricity and fuel distributors must purchase 100% of their allowances. All entities in Québec can purchase allowances in quarterly auctions provided purchases conform to auction and holding limits. In 2017, approximately 70% of allowances in Québec were auctioned or placed into the price containment reserve while 30% of allowances were freely allocated.

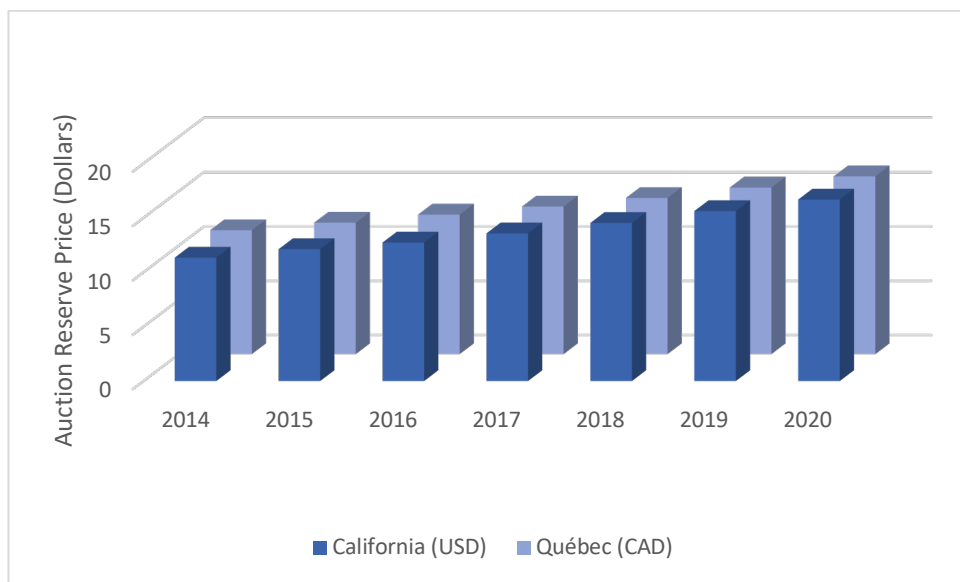
Auctioning

Compliance instruments in the California-Québec Cap-and-Trade Program are completely fungible and instruments issued by each jurisdiction can be used for compliance with each program. The California Air Resources Board (CARB) and the Québec Ministry of the Environment and the Fight Against Climate Change (MELCC) hold joint quarterly allowance auctions. Prior to linkage, each jurisdiction held separate auctions - California held 8 auctions while Québec held 4.

Each quarterly auction consists of a Current Auction and an Advance Auction. In the Current Auction, allowances from the current and previous budget years are offered for sale, while future vintage allowances are offered for sale in the Advance Auction. The Advance Auction consists of 10% of the allowance budget three years from the current budget year. The specific number of allowances offered in the Current Auction is detailed in the Auction Notice, which is released by the jurisdictions at least 60 days

prior to the quarterly auction. The Auction Notice also includes the Auction Reserve Price for the Current and Advance Auctions and detailed instructions and timeline for auction participation.³ Due to fluctuating exchange rates, the final Auction Reserve Price for joint quarterly auctions is made public one day prior to the auction and is the higher of the California or Québec Auction Reserve Price after applying an established exchange rate.⁴ Figure 2 presents the Auction Reserve Price for jointly held quarterly auctions, which began at \$10 USD in 2013 and increases 5% each year plus inflation.

Figure 2: Annual Auction Reserve Prices



A joint auction summary results report is posted within a week of the auction and jurisdiction specific Post Joint Auction Public Proceeds Report is subsequently released, outlining the auction proceeds received by each jurisdiction. A currency exchange is required to distribute auction proceeds as auction bids are submitted in both US and Canadian dollars. The total amount of auction proceeds received by California and Québec reflects state- and province-owned allowances brought to auction by each jurisdiction and an established exchange rate. To date, the sale of California-owned allowances has generated over \$12.5 billion USD for in auction proceeds⁵ while the sale of Québec has generated nearly \$4 billion CAD.⁶

³ <https://ww3.arb.ca.gov/cc/capandtrade/auction/nov-2019/notice.pdf>

⁴ https://ww3.arb.ca.gov/cc/capandtrade/auction/2020_annual_reserve_price_notice_joint_auction.pdf

⁵ https://ww3.arb.ca.gov/cc/capandtrade/auction/proceeds_summary.pdf

⁶ <http://www.environnement.gouv.qc.ca/changements/carbone/revenus-en.htm>

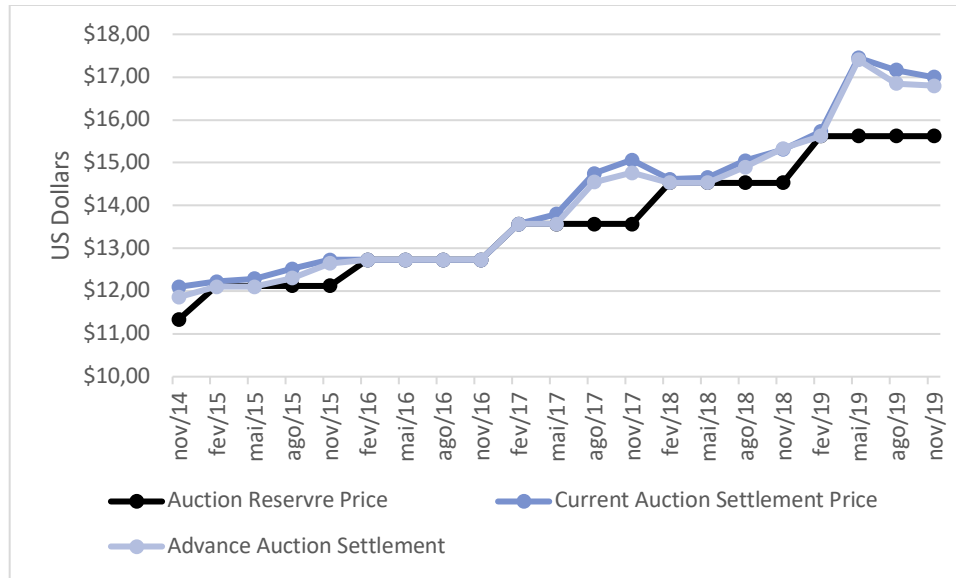
In addition, each jurisdiction separately may offer quarterly sales of allowances from the Allowance Price Containment Reserve, a pool of allowances taken from the annual allowance budget of each jurisdiction at the start of their respective program. Reserve Sales in California and Sales of Mutual Agreement in Québec can be held quarterly and offer allowances for sale to covered entities at fixed price tiers. These sales provide covered entities to purchase allowances needed to compliance. Only California covered entities can participate in Reserve Sales and only Québec covered entities can participate in Sales by Mutual Agreement. In 2019, the California price tiers are \$58.34, \$65.65, and \$72.93 and the price tiers in Québec are \$43.96, \$49.45, and \$54.94 (all in USD). At this time, no sales have been held in Québec or California.

Post-2020 California will no longer hold Reserve Sales due to requirements in AB 398 and will instead offer Reserve Allowances for sale at two pre-established price containment points. An additional pool of GHG reductions can be purchased at the price ceiling. Money generated from the issuance of price ceiling units will be used to achieve GHG reductions on at least a ton for ton basis. In 2021, the California price ceiling is \$65 and increases at 5% plus inflation each year.⁷ There is no price ceiling in the Québec Cap-and-Trade System.

Figure 3 outlines the auction settlement price for California-Québec joint auctions 2014 through 2019 for Current and Advance auctions along with the Auction Reserve Price in US dollars. The February and May 2018 auctions also included the participation of the province of Ontario, who was jointly linked to the California-Québec Cap-and-Trade Program briefly in 2018.

Figure 3: Auction Settlement Prices for California-Québec Joint Quarterly Auctions

⁷ https://ww3.arb.ca.gov/cc/capandtrade/capandtrade/ct_reg_unofficial.pdf



Unsold allowances are held in jurisdictional accounts and can be offered for sale at future quarterly auctions. Allowances can also be traded on the secondary market. The prices and terms of those transactions are not set by the jurisdictions of California and Québec. However, all transfers of compliance instruments must be registered in the Compliance Instrument Tracking System Service (CITSS), a management and tracking system for accounts and compliance instruments issued through California and Québec. CITSS is for use by authorized users who participate in the California-Québec Cap-and-Trade Program. Jurisdictional staff monitor all CITSS transactions and improper use of the system can result in civil and criminal penalties.

Offsets

In addition to allowances, offsets can be used for compliance in the California and Québec Cap-and-Trade systems. Offsets are GHG emission reductions or sequestered carbon that occur outside of sectors covered by a Cap-and-Trade system. Each offset credit is equal to one metric ton CO_{2e}. As required by California Assembly Bill 32 (AB 32), any reduction of GHG emissions used for compliance must be real, verifiable, enforceable, and additional. Any offset issued by California or Québec must be quantified according to approved Compliance Offset Protocols. California and Québec work together under WCI to identify offset project types, and there may be instances where a protocol is not applicable in every jurisdiction, however all offsets are fungible across the California-Québec Cap-and-Trade Program.

Entities may use offset credits to satisfy a specified portion of their covered emissions. Through 2020, offset credits can be used to cover up to 8% of an entities' compliance obligation in California and

Québec. AB 398 in California reduced the offset usage limit for California covered entities to 4% of compliance obligation from 2021 through 2025 with no more than half sourced from projects that do not provide direct environmental benefit to the State. From 2026 through 2030, AB 398 specifies an offset usage limit of 6% for California entities, with no more than half sourced from projects that do not provide direct environmental benefit to the State.⁸ For Québec covered entities, the offset usage limit will remain at 8% of entities' compliance obligations through 2030.

There are currently six Compliance Offset Protocols adopted by California that have resulted in the issuance of over 153 million offset credits. The six Compliance Offset Protocols are:⁹

- U.S. Forest
- Urban Forest
- Livestock
- Ozone Depleting Substances
- Mine Methane Capture
- Rice Cultivation

Québec has approved five Compliance Offset Protocols that require offsets to comply with requirements for transparency, coherence, comparability, accuracy, verifiability, effectiveness, and validity. Québec has issued 763,000 offset credits under the following five protocols:¹⁰

- Covered manure storage facilities
- Landfill sites
- Destruction of Ozone Depleting Substances
- Active Coal Mines
- Active Underground Coal Mines

3. Price Control

The California-Québec Cap-and-Trade Program establishes a firm aggregate limit of emissions with a fixed supply of allowances through 2030 and quantitative limits on the use of offsets for compliance. The price of allowances and offsets reflects supply and demand for these compliance instruments, which is

⁸ https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB398

⁹ <https://ww3.arb.ca.gov/cc/capandtrade/offsets/offsets.htm>

¹⁰ <http://www.environnement.gouv.qc.ca/changements/carbone/credits-compensatoires/index-en.htm>

uncertain. The California-Québec Cap-and-Trade Program includes cost containment provisions to ensure that cost-effective emission reductions are achieved while keeping the overall cost of the Program affordable. These features include:¹¹

- Allowance banking
- Multi-year compliance periods
- Broad program scope
- Auction Reserve Price
- Compliance offsets
- Allowance allocation
- Emission reductions by complementary direct regulations
- Allowance Price Containment Reserve
- And in California, from 2021 through 2030:
 - Price containment points
 - Price ceiling

Taken together, these provisions ensure that cost-effective emission reductions can be achieved across jurisdictions under a wide range of economic conditions.

4. Current Policy Discussions

The California-Québec Cap-and-Trade Program has undergone nearly annual modifications since the beginning of the jurisdictions' systems. Each jurisdiction maintains authority over their respective program and can make modifications to align with legislative and policy priorities. Any modifications made at the state or provincial level are discussed between the two jurisdictions to ensure the California-Québec Cap-and-Trade Program is well-functioning and to prevent disruptions to the market for compliance instruments. At this time there are no open regulatory proceedings that will require major modifications of the California-Québec Cap-and-Trade Program.

Useful links

California Cap-and-Trade Program: <https://ww3.arb.ca.gov/cc/capandtrade/capandtrade.htm>

¹¹ <https://ww3.arb.ca.gov/cc/capandtrade/meetings/062513/arb-cost-containment-paper.pdf>

Québec Cap-and-Trade System: http://www.environnement.gouv.qc.ca/changementsclimatiques/marche-carbone_en.asp

Western Climate Initiative, Inc.: <http://www.wci-inc.org/>

China

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1. Introduction

In 2013, seven provinces and cities including Beijing, Tianjin, Shanghai, Chongqing, Hubei, Guangdong and Shenzhen launched emission trading pilots. In December 2017, the Department of Climate Change of the NDRC issued the Construction Plan for National Carbon Emissions Trading Market (Power Industry), officially announcing the start of China's emission trading market at the national level. Currently, the Interim Measures for the Administration of Carbon Emission Permit Trading issued in 2014 serves as the guiding rule for the establishment of the national market. On April 3 2019, the Interim Regulations on the Administration of Carbon Emissions Trading (Exposure Draft) was released by the Ministry of Ecology and Environment (MEE) to collect public opinions from various agencies, enterprises, institutions and individuals. In October 2019, the MEE launched a nationwide training course on the allocation and management of carbon market allowances, which includes 17 times for estimated 6,000 participants in total. China's carbon market construction has entered a period of rapid development.

2. Current technical features

Coverage

Currently, only CO₂ was covered by the national carbon market. And other types of greenhouse gases have not considered yet.

The categories of emissions covered in the scope of compliance include both direct CO₂ emissions from fossil fuel combustion and indirect emissions related with imported electricity and heat before the electricity regulation is finished, as the electricity regulation might take a long time. Once the electricity regulation is completed, the design of ETS could be adjusted then.

China's national ETS will be carried out in stages, gradually expanding the coverage of industries and raising the threshold. According to the Cap Setting and Allocation Plan of National Carbon Emissions Allowances, the national emission trading market covers firms or economic entities whose annual comprehensive energy consumption reaches 10,000 tons of standard coal (about 26,000 tons of CO₂e) and above (referred to as "Key Emission Entities") in eight industries, including Production & Supply of Electric Power and Heat Power, Petrochemical, Raw Chemical Materials & Chemical Products, Non-metallic Mineral Products, Smelting & Pressing of Ferrous Metals, Smelting & Pressing of Non-ferrous Metals, Paper & Paper Products, Civil Aviation. Meanwhile, with the approval of MEE, provincial ecology and environment authorities may appropriately expand the local industry coverage of carbon emission trading and add new key emission entities into the national ETS. It is estimated that about 7,500 firms might be covered in these eight industries and national cap will be about 4.5 billion ton of CO₂. When the national ETS becomes stable enough, the threshold could be raised to firms or economic entities whose annual comprehensive energy consumption reaches 5,000 tons of standard coal.

For those industries in which the industry benchmark method is adopted to calculate allowance allocation (see below), only the integrated facilities for producing main products in covered key emission entities are covered in national ETS. For other industries in which the historical emission intensity reduction method is adopted, corporate legal persons or independent accounting entities are considered as a whole to compliance and covered in national ETS.

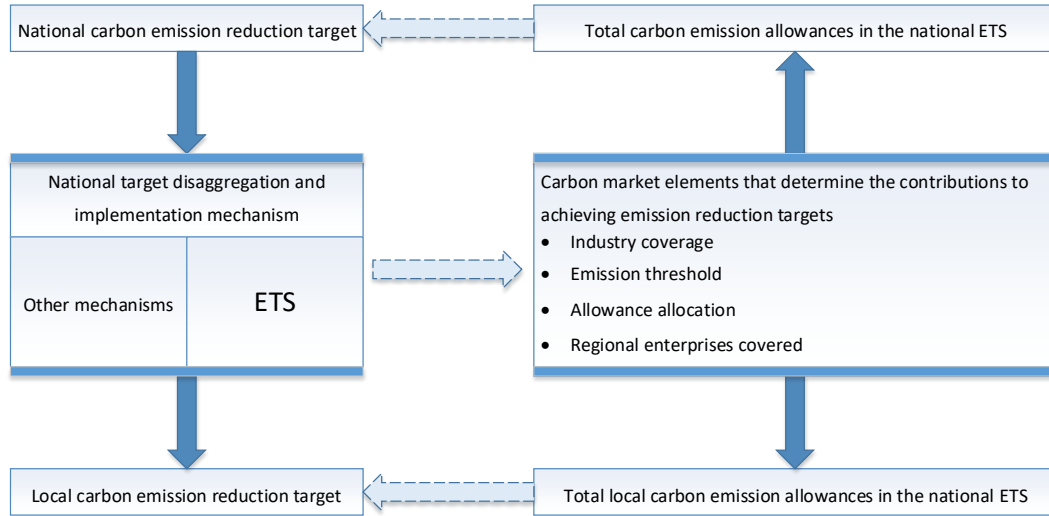
Cap setting

China's national ETS, in the initial implementation stage, is a rate-based carbon market, which has a flexible cap related to actual activity level. It is actually a multi-industry tradable performance standard (TPS). The cap of carbon emissions of China's carbon market is jointly determined by the performance standards for carbon emissions that reflect the carbon emission reduction target and by the actual economic output. It is a predictable cap with certain flexibility related with market regulation, rather than an absolute cap. In the future, the absolute cap could also be considered.

The following chart (Fig. 1) shows the logical framework for the overall scheme design of the national carbon market, pointing out the logical relationship among national carbon emission reduction targets, local carbon emission reduction targets, and core elements of the carbon market (industry coverage, threshold for enterprise inclusion, allowance allocation and cap setting). National carbon emission intensity reduction targets have been disaggregated to local level since 2010. The realization of such targets could

rely on ETS and other mechanisms after ETS starts. The cap of national ETS will be related with national carbon emission intensity reduction target, while the ETS could also contribute to local targets.

Figure 1: Logical framework of national carbon market design



Next, the quantitative relationships between the carbon emission reduction target and the core elements of the carbon market will be established below. The equation establishes a theoretical analysis framework for the overall design of the carbon market. This is a “top-down” and “bottom-up” combined approach. It describes the quantitative relationship between key policy objectives (carbon intensity reduction target and contribution of the carbon market), key carbon market elements (coverage and benchmarks) and other key economic indicators (overall economic growth rate and sub-industry activity level), and reveals the basic principles that should be followed in the overall design of the carbon market.

$$Q_{ets} = Q_{ets}^0 \times (1 + \alpha_{ets}) \times (1 - \delta \times \beta_Y / \varepsilon) = \sum_i^N B_i \times L_i$$

Where:

- Q_{ets} – Total carbon emission of carbon market at the end of the planning period;
- Q_{ets}^0 —Initial total carbon emissions from industries covered by the carbon market at the beginning of the planning period;
- α_{ets} —Comprehensive average economic growth rate of industries covered by the carbon market during the planning period;

δ —Contribution rate of carbon market to achieve carbon emission reduction targets;
 β_Y —National carbon intensity reduction target;
 ε —Proportion of initial carbon emission of carbon market in the national emissions at the beginning of the planning period;
 N —The number of industries covered;
 B_i —Industry emission benchmark value of the i industry;
 L_i —Actual level of activity of the i industry.

Allowance allocation

Currently, only free allocation is considered, while auction could be involved in the future. The allocation of free allowances includes the industry benchmark method and the historical emission intensity reduction method. The industry benchmark method is applicable to industries with complete statistical data and limited product variety, while the historical intensity reduction method is for those with complex production processes or flawed data collection. Most of the industries that were considered to be covered in the national market in the first stage, including power industry, meet the requirements of using the industry benchmark method. However, there is currently no allowance allocation method officially announced for all industries. Only for the power industry, there is the Implementation Plan for the Allocation of CO₂ Emission Allowances for Key Emission Entities in the Power Industry (Including Captive Power Plants and Cogeneration Plants) (Draft) in 2019, which is still collecting comments and suggestions.

MRV

The Measuring, Reporting and Verification (MRV) are performed jointly by the national and provincial ecological environment authorities, key emission entities and verification agencies. Each key emission entity should formulate its own monitoring plan, implement such plan and submit annual emission report. The national authorities published the GHG emission accounting methods and reporting guidelines for 24 industries from 2013 to 2015. Authorities were also responsible for conducting the carbon emission data reports, verification of these reports and emission monitoring plan formulation from 2013 to 2018. Such work covered firms or other economic organizations whose annual comprehensive energy consumption reaches 10,000 tons of coal equivalents (about 26,000 tons CO₂_eq) in any of the years between 2013 and 2018 in the eight industries mentioned in coverage section above. In addition, detailed regulations have been made for the measuring, reporting and monitoring of GHG emissions, third-party verification, re-check procedure and reports submission.

3. China's ETS pilots

Coverage

Also considering the combination of “top-down” and “bottom-up” approaches like that of national ETS, the coverage, the thresholds of key emission entities, and the cap of allowances have been determined in the pilots. The industries covered in the pilots mainly include electricity, heat, steel, nonferrous metals, chemicals, petrochemicals and construction materials (see Table 1), with different firm thresholds (see Table 2).

Table 1: Sectors covered in China's ETS pilots

Pilot	Sectors covered
Beijing	Power, Heat, Cement, Petrochemical, Other Industries, Manufacturing and Service, Urban Rail Transit Operating Companies and Electric Vehicle Public Passenger Transport Companies.
Tianjin	Power, Heat, Steel, Chemical, Petrochemical and Oil and Gas Exploitation
Shanghai	Industrial Sector: Power, Steel, Petrochemical, Chemical, Nonferrous Metals, Construction Materials, Textile, Paper, Rubber and Chemical Fiber Non-industrial Sectors: Aviation, Airports, Ports, Shopping Malls, Hotels, Office Buildings and Railway
Hubei	Industrial enterprises whose comprehensive energy consumption reaches 10,000 tons of standard coal and above in any year from 2015 to 2017, involving 16 industries including power, heat, cogeneration, steel, cement, chemical etc..
Guangdong	Power, Cement, Iron, Steel, Petrochemical, Paper and Civil Aviation
Chongqing	Chemical (Calcium Carbide, Synthetic Ammonia, Methanol), Construction Materials (Cement, Flat Glass), Steel (Crude Steel), Nonferrous Metals (Electrolytic Aluminum, Copper Smelting), Papermaking (Pulp Production, Machine-made Paper and Cardboard), Power (Power Generation, Cogeneration)
Shenzhen	Power, Water, Manufacturing and Construction

Table 2: Thresholds and number of firms in China's ETS Pilots

Pilot	Threshold	Number of entities (Year)
Beijing	Annual emissions \geq 5,000 tons of CO ₂	903 (2018)
Tianjin	Annual emissions \geq 20,000 tons of CO ₂	107 (2018)
Shanghai	Industry: Annual emissions \geq 10,000 tons of CO ₂ Non-industrial: Annual emissions \geq 10,000 tons of CO ₂	381 (2018)
Hubei	Comprehensive energy consumption \geq 10,000 tons of standard coal in any year from 2015 to 2017	338 (2018)
Guangdong	Annual emissions \geq 20,000 tons of CO ₂ or annual Comprehensive energy consumption \geq 10,000 tons of standard coal	249 (2018)
Chongqing	Annual emissions \geq 20,000 tons of CO ₂	195 (2017)
Shenzhen	Annual emissions \geq 3000 tons of CO ₂ Large public buildings and buildings with an area \geq 10,000 square meters	811 (2018)

Cap setting

Economic growth and uncertainties have been fully taken into consideration in the pilots, and the cap setting is combined with the national carbon intensity reduction target. The total allowance amount is composed of three parts: initial allocated allowance, reserved allowance for new entities and allowance reserved by the government. In addition to most of the allowances that are allocated for free, there is a small portion (generally within 3%) of paid allocation by auction or fixed price in order to facilitate market price discovery and regulation in each pilot. In four pilots, clearly defined annual caps have been set: 158 million tons for Shanghai in 2018, 256 million tons for Hubei in 2018, 422 million tons for Guangdong in 2018, and 100,448,153 tons for Chongqing in 2017. For those pilots without an absolute cap, their caps can be considered as the sum of all the free allowances allocated to the covered entities and the paid allowances. By the end of December 2018, about 3,000 key emission entities have been covered in the seven pilots

involving more than 20 industries, and the total cap was close to 1.3 billion tCO₂e. The caps of different pilots vary widely, from about 40 million tCO₂e/year of Shenzhen to about 420 million tCO₂e/year of Guangdong, accounting for 40-60% of the total emissions in relative pilot areas.

Allowance allocation

There are three main methods for initial allowance allocation: auctions, free allocation, and combined allocation. The free approach is adopted by all pilots with the exception of Guangdong. Guangdong paid more attention to primary market and uses a combination of free and paid allocation. Moreover, there are mainly three methods for free allocation in the pilots (see Table 3): (i) historical emissions reduction; (ii) historical emission intensity reduction; (iii) industry benchmark.

Table 3: Free allocation methods adopted in China's ETS pilots

Pilot	Historical emissions reduction	Historical emission intensity reduction	Industry benchmark
Beijing	Cement, petrochemical, other industries, key emission entities of service, and fixed facilities for transportation	Mobile facilities of transportation enterprises, existing facilities of heating enterprises, gas and water production and supply enterprises	Power generation enterprises (cogeneration), all new facilities in covered industries
Tianjin	Existing facilities in the steel, chemical, petrochemical, and oil and gas exploitation industries	Existing facilities in the power and heat industries	All new facilities in covered industries
Shanghai	For buildings such as shopping malls, hotels, offices, and airports, as well as those with complex product	Industrial enterprises, aviation, port, water transport, and tap water production enterprises with high correlation	Power and heat industries such as power generation, power grid and heating

	spectrums, highly changing boundaries in recent years and therefore difficulties for adoption of other methods	between product output and carbon emissions, and sufficient measuring	
Hubei	Other industries	Heat, power cogeneration, paper, glass and other building materials industries	Cement, power
Guangdong	Mining of the cement industry, production of fine powder, short-flow enterprises and others in the steel industry and petrochemical enterprises	Enterprises that use generators on special fuels (such as coal gangue, oil shale, coal water slurry, petroleum coke and other fuels) in the power industry, heating boilers, special paper-making and paper products, those that are involved in pulp manufacturing, and aviation companies	Coal-fired gas generator sets in the power industry (including heat supply and cogeneration entities), clinker production and grinding in the cement industry, long-flow enterprises in the steel industry, ordinary paper and paper products manufacturers, and comprehensive service aviation enterprises
Chongqing	Electrolytic aluminum, alloy, calcium carbide, cement, steel, caustic soda	-	-
Shenzhen	-	Some enterprises in the power industry	Power, water, gas, construction, and other manufacturing companies

Offsets

The impact of the CCER (Chinese Certified Emission Reduction) offset mechanism on the caps has been taken into consideration in the seven pilots and the CCER offset proportion is limited to less than 10%. Restrictions on the source of the CCER have been set only by Chongqing and Shanghai. However, local CCERs are not only permitted for compliance in the origins of the projects in all seven pilots, and CCERs whose origins have cooperation with relative pilots have been given preference to improve the liquidity of the carbon market in those pilots.

Table 4: Offset proportion and type of projects of CCER in China's ETS pilots

Pilot	Limit of offset proportion	Type of Projects
Beijing	5% of the annual allowance; 2.5% for projects outside Beijing	Projects that are not HFCs, PFCs, N ₂ O, SF ₆ reduction and hydropower projects
Tianjin	10% of annual actual emissions	(1) Projects only from CO ₂ gas (2) Excluding emission reductions from hydropower projects
Shanghai	5% of the annual allowance	-
Hubei	10% of the initial annual carbon emission allowance	Not generated from large and medium-sized hydropower projects
Guangdong	10% of actual annual carbon emissions	(1) Carbon dioxide and methane emission reduction accounts for more than 50% of all project emission reductions (2) Non-hydropower projects, projects that do not use power generation, heating and residual energy (including waste heat, residual pressure, residual gas) utilization on coal, oil and natural gas and other fossil fuels (excluding coalbed methane) (3) No projects that have generated emission reductions before registration with the UN CDM Executive Board
Chongqing	8% of approved emissions	Energy conservation and energy efficiency improvement; clean energy and non-water renewable energy; carbon sinks; energy-related activities, industrial production activities,

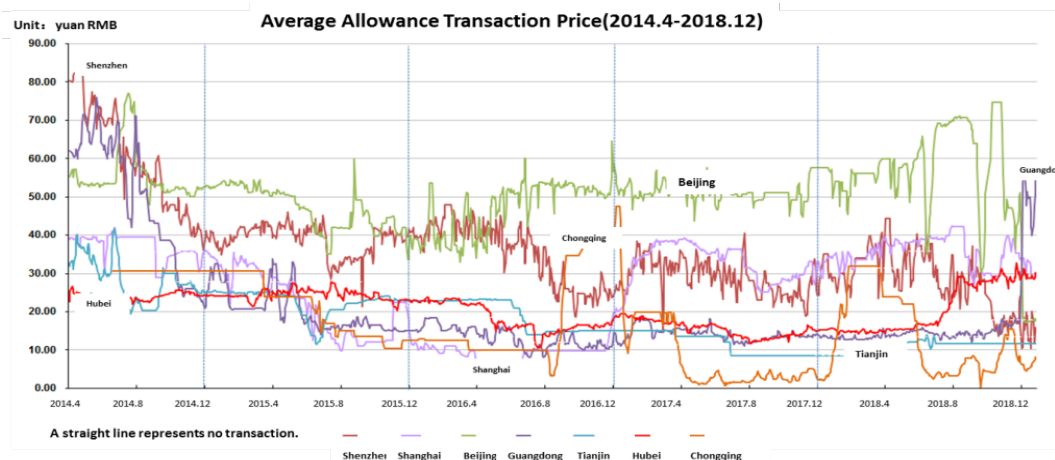
		agriculture, waste treatment, etc.; no hydropower reduction projects
Shenzhen	10% of annual carbon emissions	Wind power, solar power and waste incineration power generation projects within a specific area from provinces or regions that have signed regional strategic cooperation agreements with the city for carbon trading
		Forestry carbon sequestration projects and agricultural emission reduction projects within a specific region nationwide
		All project types of the projects invested and developed nationwide by enterprises of the city

Allowance prices

In most of the pilots, carbon prices had a temporary increase at the beginning, but then fell and remained at a stable level. In May and June 2015, a dramatic decline of carbon prices was occurred in most of the pilots. The price trends started to diverge since August 2016. In 2017, Chongqing’s carbon price fluctuated significantly, while it stayed stable in other pilots. In 2018, the carbon prices in Beijing, Guangdong and Chongqing all experienced significant fluctuations and the rest were stable. There are many influence factors including the carbon assets management ability related with compliance time the willingness of trading related with penalty cost and confidence of ETS, major events such as policy adjustment, and overall market supply & demand.

There are only spot markets in pilots and future market is under discussion. In general, the prices in the pilots are highly volatile, especially before and after the compliance period. And major events such as policy adjustments related to the carbon market have had a significant impact on carbon prices in most of the pilots. After a certain time since the launch of pilots, the long-term trend of carbon price was determined by the overall market supply and demand. And the impact of the overall market supply and demand has become increasingly significant and has played a decisive role on carbon price volatility in most of the pilots.

Figure 2: Average allowance price of each pilot (April 2014 - December 2018)



Source: data from Hubei Carbon Exchange

Useful links

1. Notice of the Guangdong Provincial Development and Reform Commission on Issuing the 2018 Guangdong Implementation Plan for Carbon Emissions Allowance Allocation
2. Notice of the Shanghai Municipal Development and Reform Commission on Issuing the 2018 Shanghai Carbon Emissions Allowance Allocation Plan
3. Notice on Issuing the List of Entities of Shanghai Carbon Emissions Trading Allowance Administration (2018 Edition)
4. Notice of the Beijing Municipal Ecological Environment Bureau on the Management of Key Emission Entities and Tasks of Carbon Emission Trading Pilot in 2019
5. Notice on the Beijing Carbon Emissions Trading Pilot Related Work in 2018
6. Notice of the Hubei Provincial Department of Ecology and Environment on Issuing the 2018 Hubei Carbon Emissions Allowance Allocation Plan
7. Notice of the General Office of the Tianjin Municipal People's Government on Issuing the Interim Measures for the Administration of Carbon Emissions Trading of Tianjin

8. Announcement on the Compliance of Covered Enterprises of Tianjin Carbon Emissions Trading Pilot

9. Interim Measures for the Administration of Carbon Emissions Trading of Shenzhen. 2014

10. Shanghai Carbon Market Report. 2015

11. National Center for Climate Change Strategy and International Cooperation. China Carbon Market Report. 2016.

12. Institute of Energy, Environment and Economy, Tsinghua University. World Bank PMR Project - China Carbon Market “Research on Coverage, Cap Setting, Allowance Allocation Methods and Supplementary Mechanism”. Beijing. 2018.

13. Institute of Energy, Environment and Economy, Tsinghua University. National Carbon Emissions Trading System Manual (Version 1.0). Beijing. 2019.

The European Union

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1. Introduction

Since it started operating, in January 2005, the EU ETS has been the world's largest ETS, covering about 5% of global GHG emissions and 45% of EU's emissions. Adopted by the EU to be the main instrument for meeting its first Kyoto Protocol target (8% reduction of GHG emissions below 1990 levels, over 2008-2012), the EU ETS has been the cornerstone of EU climate policy.

Over the past fifteen years, the EU ETS has undergone some major reforms, notably the 2009 one which shaped the current trading period, Phase III (2013-2020), and the 2018 reform for forthcoming Phase IV (2021-2030). As of Phase III, the total volume of emission allowances is determined at the EU level (as opposed to being the sum of caps determined at the national level) and a single set of rules governs their allocation. Free allowances are distributed by applying emission efficiency benchmarks and in principle auctioning has replaced free allocation as the default allocation method, first and foremost in the electricity sector. Almost ten years after the 2008 reform, the reform for Phase IV pursued three main objectives: a) strengthening the price signal by further tightening the cap, b) better targeting free allocation and c) supporting low-carbon innovation and modernisation of the energy sector (in lower-income Member States) through funding mechanisms based on auction revenues. Last but not least, as part of a strategy to address a persistent excess supply of allowances – primarily the consequence of the Great Recession –, the Market Stability Reserve was originally adopted in 2015 and reinforced under the Phase IV reform.

The European Union Allowances (EUAs) issued under the EU ETS cover one tonne of CO₂-eq emissions each and their current price is about €25.

2. Current technical features

Coverage

The EU ETS covers carbon dioxide (CO₂), nitrous oxide (N₂O) and perfluorocarbon (PFC) emissions from about 11,000 heavy energy-using installations, including power stations and industrial plants (oil refineries, steel works and production of iron, aluminium, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids and bulk organic chemicals), as well as from air flights. Both to limit administrative costs and to avoid disproportionately burdening small firms, in most sectors only installations above certain production capacity thresholds are subject to the EU ETS. As regards aviation, only flights within the European Economic Area (EEA)¹² are currently subject to the EU ETS. The future regulation of this sector will depend on the specific design of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSA) by the International Civil Aviation Organization (ICAO) (ICAP, 2019)¹³.

Cap setting

In Phase III, every year the number of emission allowances issued decreases by the same amount, which is equal to 1.74% of the 2010 baseline. Starting from Phase IV, the same linear factor will increase to 2.2%. The steeper trajectory of the EU ETS cap will enforce a 40% reduction of regulated emissions by 2030, relative to 2005 levels. This is in line with the EU's Paris Agreement commitment.

Allowance allocation

As of Phase III, power generators must buy all their allowances, with derogations for eight lower-income Members States. By contrast, installations in sectors deemed at significant risk of carbon leakage are given free allowances covering 100% of their benchmarked emissions. Here, the level of benchmarked emissions is determined by multiplying the relevant benchmark by the installation's recent output level. As a rule, the benchmark corresponds to the average performance of the 10% most efficient installations. The European Commission developed 52 product-specific benchmarks and two fallback approaches based on heat and fuel consumption. As to the installations that are not in sectors at risk of carbon leakage, free allocation is less generous. For them, free allowances cover progressively smaller shares of benchmarked emissions: from 80% in 2013 to 30% in 2020.

¹² The EEA is composed of the EU Member States plus Iceland, Norway, and Lichtenstein.

¹³ ICAP (2019), *Emissions Trading Worldwide: Status Report 2019*, Berlin: ICAP.

The identification of the sectors at risk of carbon leakage is based on two sectoral indicators (4-digit NACE¹⁴) computed at the EU level: Carbon Cost Intensity (CCI) and Trade Intensity (TI). CCI measures the potential significance of carbon costs as in the maximum impact that carbon prices could have on the sector. CCI is given by the ratio of a) the sum of direct and indirect emissions, valued at €30/tCO₂, to b) the gross value added. TI, which measures the openness of the sector to international competition, is a proxy for the inability to pass through additional costs without loss in international market share. It is defined as the ratio between a) the total value of exports and imports (to- and from non-EU countries) and b) the total EU market size, which is equal to the sum of turnover and imports. A sector is then classified as being at risk if one or more of the three following thresholds is exceeded: CCI >30%; TI >30%; and a double threshold CCI >5% & TI >10%. The first list of sectors at risk of carbon leakage – the ‘carbon leakage list’ – was defined in 2009, for the years 2013 and 2014. Out of 258 sectors, 165 were classified as being at risk. The second list was defined in 2014 for the years 2015–2019.

Because the aggregate amount of preliminary free allocation calculated by Member States exceeded the maximum amount of allocation available, a uniform cross-sectoral correction factor has been applied to all installations¹⁵. Moreover, special allocation rules were set for the aviation sector, with 82% of allowances freely allocated, 15% auctioned, and 3% withheld for new entrants and fast-growing companies. It is estimated that, in Phase III, 43% of total allowances will be freely allocated, the rest (57%) being auctioned by Member States.

As of Phase IV, a less lenient rule is applied to identify the sectors at risk of carbon leakage. Specifically, a sector is classified as being at risk of carbon leakage if the product of the Carbon Emissions Intensity indicator (CEI) (expressed in terms of KgCO₂ per Euro of gross value added) and the TI indicator, $CEI \times TI$, exceeds 0.2. This time, the resulting carbon leakage list includes 63 sectors. A second important new rule for free allocation introduces adjustments to initial allocations in cases of annual output variations exceeding +/-15%.

Offsets

Since its inception, the EU ETS was designed so as to be part of the nascent international carbon market and thereby to contribute to its development. The EU ETS was directly connected to the Kyoto system, as the owners of regulated installations were allowed to use Certified Emissions Reductions (CERs)

¹⁴ NACE is the statistical classification of economic activities in the EU.

¹⁵ This mechanism has proved contentious because it implies that even the most efficient installations do not receive enough free allowances to cover 100% of their initial emissions.

and Emission Reduction Units (ERUs), respectively generated by the Clean Development Mechanism (CDM) and the Joint Implementation (JI), to meet their compliance obligations. However, quite soon quantitative restrictions to the use of international credits were introduced. In Phase II, installation owners were allowed to use international credits up to a certain percentage of the total allowances distributed in the given country. These percentages ranged from 0% (Estonia) to 20.6% (Spain), summing to 13.4% for all Member States taken together (Ellerman *et al.*, 2010)¹⁶. The use of international credits was further tightened in Phase III through both quantitative and qualitative restrictions. Accordingly, for each firm, they can only cover up to 11% of the allowances needed for compliance¹⁷. Most important, as it stands, no use of offsets is allowed in Phase IV.

Price containment

By the start of Phase III, the EU ETS had accumulated a surplus of about two billion allowances (more than the total volume of annual emissions under the EU ETS). The Great Recession was the main cause of the initial fall in allowance demand. The persisting surplus originated from this exceptional event, combined with the perfect rigidity of allowance supply. As expected, the allowance surplus severely depressed EUA prices.

In 2012, the European Commission started tackling the problem by postponing the auctioning of 900 million allowances from 2014-2015 to 2019-2020, a measure known as ‘backloading’¹⁸. However, as further action proved necessary, the Market Stability Reserve (MSR) was established. The MSR consists in a rule-based mechanism to cope with possible shocks to allowance demand. By introducing some flexibility in allowance supply, the MSR is intended to mitigate the impacts on EUA prices of any shock affecting allowance demand. With the MSR, the number of allowances to be auctioned partly depends on the market surplus (i.e., the difference between the cumulative amount of allowances available for compliance at the end of a given year, and the cumulative amount of allowances effectively used for compliance with the emissions up to that given year):

- if surplus exceeds 833 million allowances, allowances equal to 12% (24% in the period 2019-2023) of the surplus are withheld from auctions and added to the reserve;

¹⁶ Ellerman, D., Convery, F. and C. de Perthuis (2010), *Pricing carbon – The European Union Emissions Trading Scheme*, Cambridge University Press.

¹⁷ The limit is 4.5% for firms subject to the EU ETS starting from Phase III.

¹⁸ However, it was eventually decided that the 900 million allowances already withdrawn through backloading would not be re-injected into the market at the end of Phase III. Instead, they were moved to the reserve.

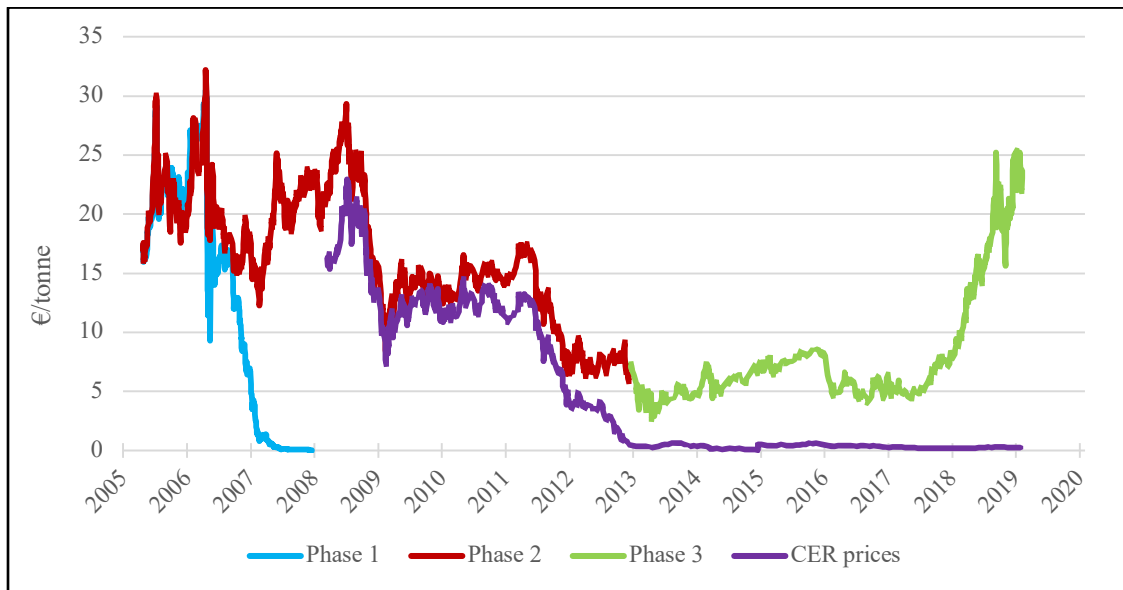
- if surplus is lower than 400 million, 100 million allowances are taken from the reserve and injected into the market through auction;
- if surplus is anywhere between 400 and 833 million allowances, no intervention is triggered.

The thresholds triggering the adjustments to allowance supply delimit an interval of surplus values within which “experience shows that the market was able to operate in an orderly manner”¹⁹. Furthermore, from 2023 onwards, the number of allowances held in the reserve will be limited to the auction volume of the previous year via invalidation of those in excess. The European Commission monitors the operation of the MSR, which is formally reviewed every five years.

3. Allowance prices

At the time of writing (mid November 2019), the price of EUAs is around €25. The surge of EUA prices that started at the end of 2017, when political agreement on the reform for Phase IV was finally reached, has been followed by a relatively stable period.

Figure 1: EUA and CER prices, 2005-2019 (February)²⁰



Source: ICE (EUA prices) and Refinitiv Financial Solution (CER prices).

¹⁹ To determine the trigger values, operators’ hedging needs is the key variable that is considered.

²⁰ The collapse of intra-phase future prices at the end of Phase I is due to the initial prohibition (no longer existing) of banking allowances across trading periods.

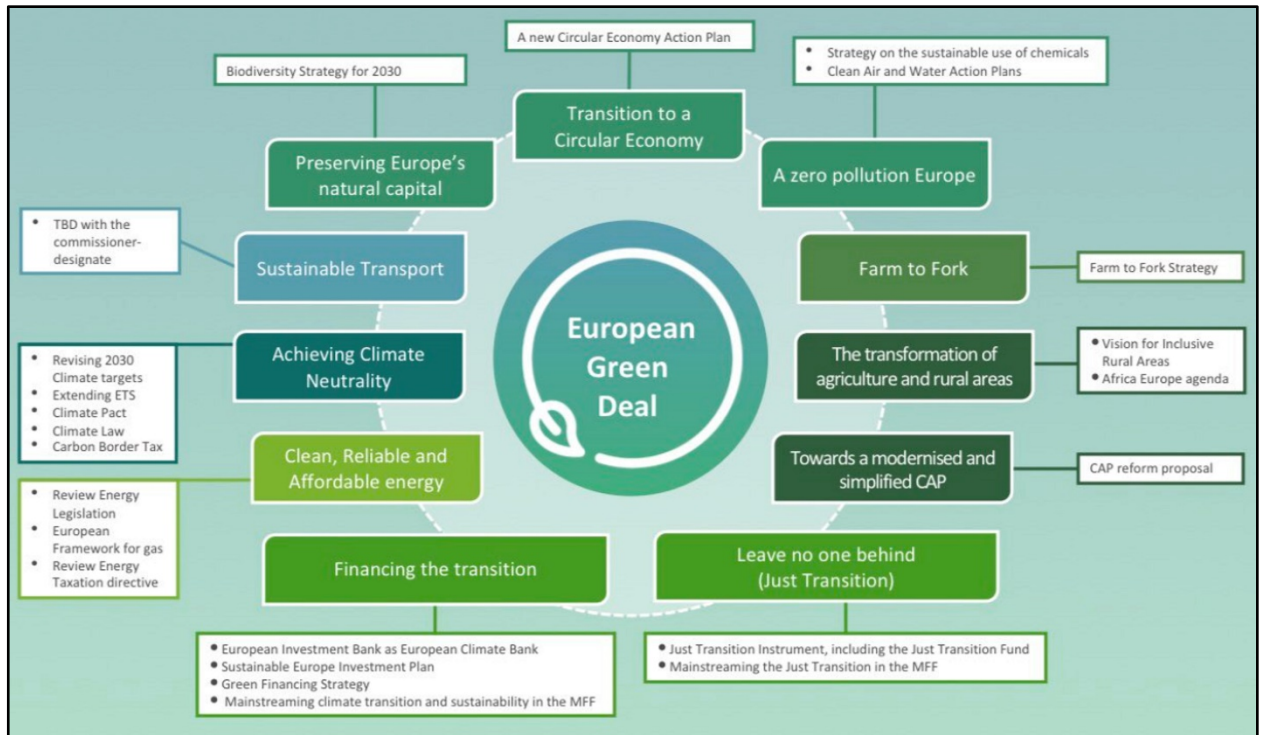
Looking at the past evolution of EUA prices before 2017, major variations include: a) the abrupt fall of April 2006, when the first publication of verified emissions revealed that regulated installations had been overallocated, and b) the collapse between the second half of 2008 and early 2009, resulting from the impact of the Great Recession on allowance demand. Subsequently, EUA prices further declined and then stagnated for a few years, which was also a result of effective national policies for renewables and energy efficiency as well as of the inflow of international carbon credits into the EU ETS.

4. Recent developments

Today, while the reform for Phase IV has yet to take effect, the EU ETS finds itself at the centre of what promises to be an unprecedented relaunch of the EU's climate policy. The new European Commission, which has taken office in November 2019, has made the European Green Deal a top priority of its mandate. In the words of President Ursula von der Leyen: "The European Green Deal should become Europe's hallmark. At the heart of it is our commitment to becoming the world's first climate-neutral continent" (von der Leyen, 2019)²¹. In early 2020, Frans Timmermans, the Executive Vice-President for the European Green Deal, will present the European Commission's proposal for a European Climate Law. This will enshrine the 2050 climate-neutrality target into legislation, including the intermediate steps for reaching the target.

²¹ Von der Leyen, U. (2019), *Mission letter to Frans Timmermans – Executive Vice-President-designate for the European Green Deal*, European Commission, Brussels.

Figure 2: The European Green Deal



Source: European Commission.

Figure 2 shows the many elements that make up the European Green Deal in its preliminary version announced to the public. Those most closely relevant to the EU ETS are listed under the heading 'Achieving climate neutrality', notably:

- **Revising the 2030 climate targets.** The European Commission will put forward a plan to increase the EU's GHG emissions reduction target for 2030 to at least 50%, up from the 40% currently agreed. For the EU ETS, this would imply a further tightening of the cap over Phase IV. To increase the level of ambition of other major emitters, in the context of international negotiations, the target could be pushed towards 55%.
- **Extending the EU ETS.** Under consideration is the extension of the EU ETS to the shipping sector as well as progressive reduction of free allowance allocation to the aviation sector (already regulated). Moreover, it will be proposed both introducing carbon pricing for the transport and buildings sectors and having them converge with the EU ETS by 2030.

- **Carbon Border Tax.** Depending on other countries' level of ambition in climate mitigation, the European Commission considers proposing the introduction of a Carbon Border Tax (compatible with WTO rules) levelling the playing field for European products.

Other measures under the European Green Deal with significant implications for the EU ETS include a) the phase-out of coal, b) the abolition of any remaining fossil fuel subsidies, and c) the review of the EU Energy Taxation Directive setting minimum tax rates on energy goods.

Useful links

EU's greenhouse gas emissions:

<https://www.eea.europa.eu/data-and-maps/indicators/greenhouse-gas-emission-trends-6>

EU Climate policy: https://ec.europa.eu/clima/index_en

History and features of the EU ETS (legislative texts included): https://ec.europa.eu/clima/policies/ets_en

EU ETS handbook: https://ec.europa.eu/clima/sites/clima/files/docs/ets_handbook_en.pdf

EU ETS data viewer: <https://www.eea.europa.eu/data-and-maps/dashboards/emissions-trading-viewer-1>

EU ETS registry (EU Transaction Log): <https://ec.europa.eu/clima/ets/>

European Commission's 2019 Carbon market report:

https://ec.europa.eu/clima/sites/clima/files/strategies/progress/docs/com_2019_557_en.pdf

New Zealand

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1. Introduction

New Zealand's ETS was introduced by legislation in 2008. The Government's plan at that time was to extend coverage of the ETS so that by 2013 it would include all sectors and all greenhouse gases. This would provide a consistent price signal for the whole economy and contribute to meeting New Zealand's commitments under the Kyoto Protocol.

There have been significant amendments to the legislation since that time. In particular, two Bills passed in 2009 and in 2012 changed the planned entry dates of some sectors. A further amendment Bill, proposing major reforms to the ETS, was introduced to the Parliament on 24 October 2019.

Entry into force by sector

At the time that the ETS legislation was introduced, plantation forestry was an important issue for New Zealand's emission trends and for meeting the country's Kyoto Protocol commitments. The forestry provisions were brought into force immediately, and then other sectors entered the ETS over time as shown in Table 1 below.

Table 1: Start dates for ETS participation by sector

Start date	Emission reporting	Surrender of units	Allocation of units	Sector(s) affected
January 2008	✓	✓		Deforestation of established, (pre-1990) forest land
January 2008	✓	✓	✓	New (post-1989) forest if voluntarily registered in the ETS
January 2009	✓			Liquid fossil fuels (mainly for transport)
January 2010	✓			Stationary energy, industrial process
January 2010		✓		Liquid fossil fuels
July 2010		✓		Stationary energy, industrial process
July 2010			✓	Emission-intensive and trade-exposed industrial activities
January 2011	✓			Waste disposal, HFCs, SF ₆ and agricultural N ₂ O and CH ₄
January 2013		✓		Waste disposal, HFCs, and SF ₆

2. Current technical features

Coverage

The ETS covers the six Kyoto gases²², and nearly all of New Zealand's fossil fuel, industrial process, and other non-agricultural emissions. Agriculture makes up 48% of New Zealand's emissions, mainly CH₄ and N₂O. Table 2 gives approximate coverage information, excluding removals and forestry.

²² New Zealand has no emissions of nitrogen trifluoride (NF₃).

Table 2: Coverage

Sector	Emissions included	Emissions (Mt) for 2017 (approx.)	Percent of New Zealand emissions (approx.)
Liquid fuels	<ul style="list-style-type: none"> • Transport petrol and diesel • Fuel oil (industry and coastal shipping) 	20.6	25.4
Stationary energy	<ul style="list-style-type: none"> • Coal • Natural gas • Geothermal energy²³ 	11.3	14.0
Industrial process	<ul style="list-style-type: none"> • Iron and steel making • Aluminium smelting • Cement and lime production • Glass production 	3.0	3.7
Synthetic gases	<ul style="list-style-type: none"> • HFCs imported in bulk • SF₆ used in electricity transmission 	1.9	2.3
Waste	<ul style="list-style-type: none"> • Landfill CH₄ 	1.3	1.6
Total		38.1	47.0

Caps on the supply of units

In the original concept of the NZ ETS, the scheme was considered largely as a means of meeting New Zealand's Kyoto Protocol commitments and was intended to function in the large-scale capped environment of Annex 1 Parties and their collective commitments.

New Zealand Units (NZUs) are issued by the Government and are allocated to participants through industrial allocation and by various forms of allocation to the forestry sector. This supply would not be enough to meet demand, even if emitters made all feasible reductions. Therefore, it was to be expected that participants would import significant numbers of Kyoto units to make up the difference, and that the market price of NZUs would follow Kyoto unit prices.

A domestic cap was not part of this original concept, and at that time the legislation did not provide for auctioning or for caps on the supply of units into the ETS. The Government has recently made decisions on auctioning and setting caps on the supply of units, and proposed new legislation to reform the ETS (see below) includes these changes.

²³ Emissions of fugitive CO₂ and CH₄ in geothermal steam.

Allowance allocation

Industrial allocation

Industrial allocation is intended to mitigate the risk of emission leakage. Units are allocated free to companies that carry out any of 26 specific processes, individually defined in regulations, which are emission-intensive and trade-exposed.

Allocation is indexed to the amount of product made. The amount allocated is determined by a benchmark equal to either 90% or 60% of average historical emission intensity for that process in New Zealand, and calculated from a baseline period between 2006 and 2009. The 90% level is for 'highly emission-intensive' activities which include steel, aluminium, methanol, and cement production.

Other free allocations

Owners of plantation forest land that was forest before 1 January 1990 (pre-1990 forests) received a one-off allocation, which was intended as partial compensation for any loss of long-term land value as a result of the ETS. A small one-off allocation was also given to holders of commercial fishing quotas.

Offsets

New Zealand Units (NZUs) are issued by the Government and allocated in the ETS. They can be surrendered against one tonne of CO₂-equivalent emissions each. The Government allocates NZUs to post-1989 forest owners.

Participants with registry accounts could buy Kyoto units from other jurisdictions and transfer them into New Zealand. They could use ERUs, CERs, and RMUs for surrender in the ETS, with no quantity limit, until 31 May 2015.²⁴ Participants were not allowed to bank any Kyoto units for use after that date.

During CP1, participants could also exchange their NZUs for Kyoto units (New Zealand-issued AAUs) which could be exported and sold in other jurisdictions. Forest owners used this option to sell New Zealand forestry offsets offshore.

Price containment

²⁴ Some unit types were banned, e.g. units from nuclear or large hydroelectric CDM projects.

From 2008 the ETS has had a price ceiling or fixed price option. All participants can buy units from the Government at a fixed price of NZ\$25²⁵ and must surrender them immediately.

From 2010, when they began, all non-forestry surrender obligations were at a rate of one for two, i.e. participants only needed to surrender one emission unit for each two tonnes of CO₂-equivalent emissions that they reported. This was phased out in three steps, i.e. the surrender obligation was increased to 2:3 in 2017 and 5:6 in 2018 before being removed for calendar 2019.

Consequently, from 2008 until 2016 the effective price in the ETS was capped at \$25.00 for forestry, and at \$12.50 for other sectors. It is now capped at \$25 for all sectors.

Other technical features – non-forestry sectors

Points of obligation for emissions

Consistent with the original intention of achieving the highest possible coverage and a consistent emission price for the whole economy, the points of obligation for fossil energy emissions are as far up the supply chain as possible – on suppliers rather than fuel-using facilities. This means that all fuel users, regardless of size, have an emission cost built into their fuel prices. The emissions associated with mining and processing fuel are also covered.

Table 3: Points of obligation for fossil fuels

Fuel	Point of obligation for reporting and surrender
Coal	Miner (coal mine methane and carbon in fuel sold) or importer (carbon in fuel only)
Natural gas	Miner (own use fuel, venting, and carbon in fuel sold)
Liquid fossil fuels	Refined fuels as they leave the refinery or are imported ²⁶

Voluntary opt-in for fuel buyers

²⁵ Currently €14.87.

²⁶ Refinery emissions will be added to the ETS from January 2023. Until then New Zealand's refinery is outside the ETS because it has a pre-existing negotiated agreement with the Government.

Large buyers²⁷ of coal, gas, and liquid fuels are allowed to ‘opt in’ and take on the ETS obligations for their fuel. The fuel supplier subtracts fuel sold to opt-in participants from its annual emission return, and the opt-in participant reports the emissions and surrenders units.

This option allows large emitters to participate in the ETS market and manage their own surrender strategy and price risks, rather than relying on the energy supplier to do so. There is a requirement to give one year’s notice before opting in and four years’ notice before opting out again, to avoid any opportunistic use of the option.

Unique emission factors

Participants usually report emissions using a default emission factor. In many sectors, they also have an option to apply for a unique emission factor which will be lower than the default. The default may be set at a level slightly higher than an expected average. This can give participants an incentive to invest in improved monitoring and analysis.

For example, coal miners may use a default emission factor based on the carbon content of the grade of coal they mine, and set very slightly above average for the coal type. If they have verified analysis showing lower carbon content, they can apply for a unique emission factor. Unique emission factors are important for geothermal steam and waste, because varying composition can significantly affect emissions.

Potential emissions for waste and HFCs

These two sectors have ETS obligations equal to potential emissions, i.e. expected lifetime emissions are covered up front. Landfill operators surrender units when waste goes into the landfill, for the total amount of methane that the waste will generate and emit as it decomposes. Importers of HFCs surrender units equal to the total that would occur if the HFCs were emitted.

Non-forestry removal activities

Exporters who remove HFCs from New Zealand for destruction can apply for and receive removal credits, which are emission units equal to the total greenhouse warming potential of the HFCs that are destroyed.²⁸

²⁷ Generally limited to users of at least 2000 TJ of gas, 250,000 tonnes of coal, or 35 million litres of liquid fuel annually.

²⁸ New Zealand has no domestic facilities to destroy recovered refrigerants, so the actual destruction is carried out in Australia.

Removal credits are also given to exporters who send carbon-containing products offshore, when the carbon in the product is covered by the ETS and units have already been surrendered for it. This provision is used for exported methanol and LPG – gas suppliers have already surrendered units for all carbon in the gas they sell, and the exporter gets credit for carbon that leaves New Zealand in its product.

This approach means that over time the net number of units surrendered will match the amount of carbon or HFC that is not accounted for and can be assumed to be emitted in New Zealand. It avoids any need to account in detail for refrigerants and fuels that may be sold several times before they are exported.

The Climate Change Levy

The ETS covers imported HFCs that are used in New Zealand for the manufacture and servicing of air conditioners and other equipment. HFCs are also imported already installed in air conditioners and other equipment. Instead of being ETS participants, which would not be practical given the small amounts involved, importers of these items pay a levy. The levy rate is adjusted annually in line with current ETS prices.

Other technical features – forestry

Pre-1990 forest land

Owners of plantation forests that have been forest since before 1 January 1990 (pre-1990 forests) do not normally participate in the ETS. They can harvest trees for timber, and clear-fell land as part of managing the forest for production, but must always replant. If the land is deforested, and used for a purpose other than forestry, they must surrender units equivalent to the loss of carbon stock.

Post-1989 forestry

Owners of plantation forests that were established after 31 December 1989 (post-1989 forests) can become voluntary ETS participants. They can account for increases in the carbon stock in the forest over time, and be allocated units equivalent to these removals. They must also surrender units if the carbon stock is reduced by harvesting, deforestation, or sudden events like forest fires²⁹.

²⁹ Forest owners would normally be expected to have insurance in case of such sudden events.

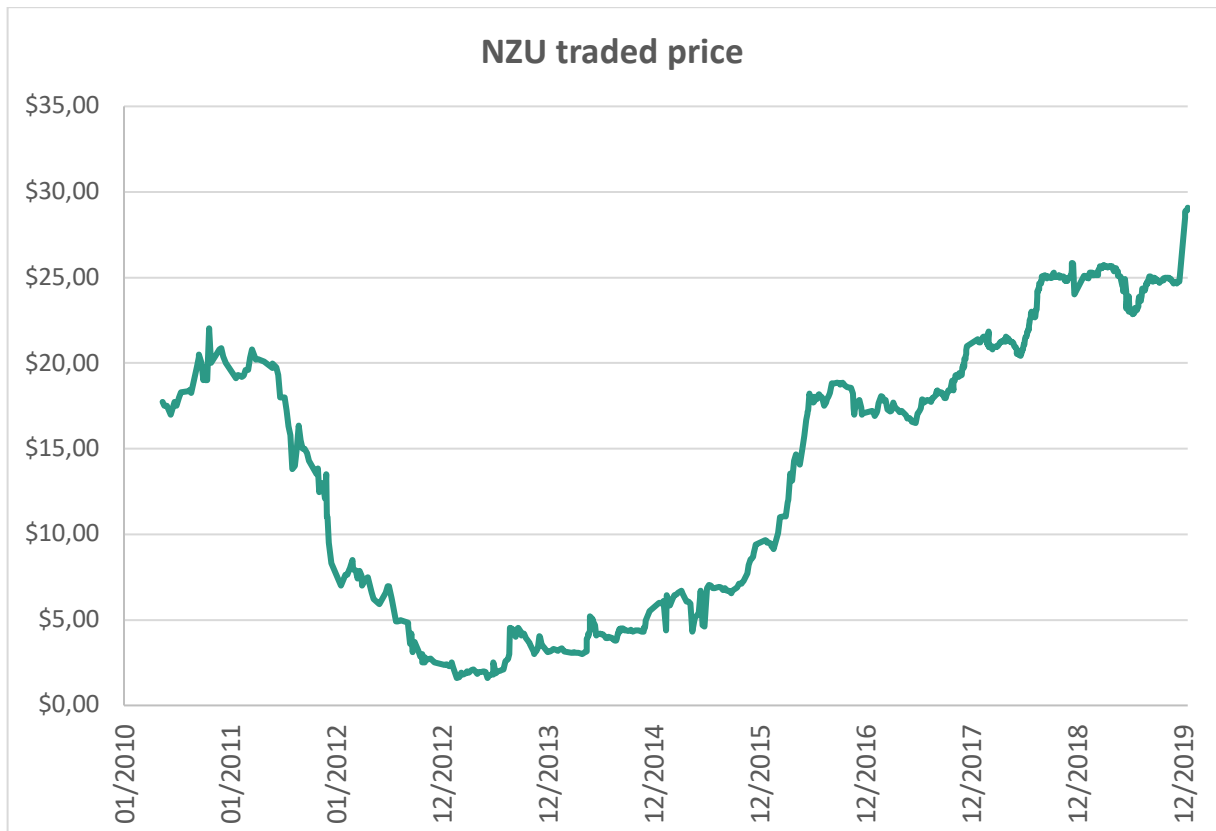
3. Allowance prices

The price history of the ETS has been dominated by the import and use of Kyoto units, the fall in Kyoto unit prices from 2011, the transition to the domestic-only scheme that is now in place, and more lately by the \$25 fixed price option. Table 4 indicates how the traded price of New Zealand Units (NZUs) has been affected by these changes. Figure 1 shows the price history from early 2010 to the present.

Table 4: Price evolution – policy and market changes affecting NZU prices

Period (approximate)	Price driver(s)
To Jun 2011	Allocated and forestry offset NZUs available NZUs typically cheaper than Kyoto units and were surrendered
July 2011 to Nov 2012	Mix of NZUs and Kyoto units surrendered NZUs followed Kyoto unit prices almost exactly
Dec 2012 to May 2015	Nearly all surrenders were Kyoto units NZU prices higher than Kyoto prices (NZUs are not vintaged) but still low
Jun 2015 to Sep 2016	Kyoto units no longer accepted Allocated and previously stockpiled NZUs surrendered Announcement that the 1:2 would be phased out
Oct 2016 to Jul 2018	Allocated and previously stockpiled NZUs surrendered
Aug 2018 to Nov 2019	Significant use of the \$25 fixed price option
Dec 2019 to Jan 2020	NZUs trading at up to \$29 in anticipation of removal of the fixed price option

Figure 1: Price evolution – NZU prices over time



In 2019 the fixed price option was used for about half of all surrender obligations. As expected, NZUs have generally traded at prices close to \$25. They have occasionally traded above \$25, because of market expectations that the fixed price option will be removed and prices will rise in future.

The Government released a consultation document on future ETS settings in December 2019 (below) and since that time NZUs have started trading at \$28–29.

4. Current policy and regulatory debates

Proposed reform of the ETS

The Government recently passed ‘Zero Carbon’ legislation that sets out long term targets and a system of national emission budgets. It is working to pass further legislation that will reform the ETS and position it to play a much bigger role in delivering on New Zealand’s targets. The Emissions Trading Reform Bill was presented to the Parliament on 24 October 2019, debated for the first time on 5 November, and is now being considered by a Parliamentary committee. If passed, it will become law in mid-2020.

Proposals in the Emissions Trading Reform Bill

The Bill is a detailed legislative proposal to update and reform the ETS, including provisions to cap and manage the supply of units. The main proposed changes are listed in Table 5 below:

Table 5: Changes proposed for the ETS in reform bill

Change	Proposed policy
Unit supply management	A process for setting supply caps for each year, out to five years ahead, and ensuring that the caps are consistent with national emission budgets.
Industrial allocation	Phasing down industrial allocation rates with the first reductions in 2021, and a process to re-assess the risk of emission leakage and other factors and further reduce allocations over time.
Price containment measures	Remove the fixed price option and establish a cost containment reserve, with units to be released for sale if trigger prices are reached. Units sold from the reserve will have to be backed by additional reductions. There will also be provision for a price floor, i.e. a reserve price for auctioning.
Auctioning	Provision for auctioning, and the appointment of an independent auction monitor.
Forestry averaging	Post-1989 forests currently surrender or receive units for all changes in carbon stock. They will now only receive credit for increases up to an average level, but will have no harvesting obligations if they replant.
Agriculture	The Government has reached an agreement with the agriculture sector to work on the systems and capacity for farm reporting and emission pricing. The Bill provides for agricultural CH ₄ and N ₂ O to be covered by the ETS from 2025.

Proposals for settings

The Government released a consultation document on 19 December 2019 that proposes provisional settings for the ETS in the five years 2021–25. These are summarised in Table 6:

Table 6: Currently proposed settings

Parameter	Proposed settings
Total cap for the five years	151 million
Total units to be auctioned over five years	82 million
Cost containment reserve trigger price	\$50 (in all years)
Units available to cost containment reserve	37.4 million
Reserve price for auctions	\$20 (in all years)

Useful links

New Zealand's greenhouse gas emissions: <https://www.mfe.govt.nz/climate-change/state-of-our-atmosphere-and-climate/new-zealands-greenhouse-gas-inventory>

History and features of the ETS: <https://www.mfe.govt.nz/publications/climate-change/guide-new-zealand-emissions-trading-scheme>

Consultation document that set out policy thinking when the ETS was first considered (2007): <https://www.mfe.govt.nz/publications/climate-change/framework-new-zealand-emissions-trading-scheme>

NZU price history: <https://github.com/theecanmole/nzu>

Zero Carbon Act: <https://www.mfe.govt.nz/climate-change/zero-carbon-amendment-act>

Emissions Trading Reform Bill: https://www.parliament.nz/en/pb/bills-and-laws/bills-proposed-laws/document/BILL_92847/climate-change-response-emissions-trading-reform-amendment

Consultation document on proposed ETS settings: <https://www.mfe.govt.nz/publications/climate-change/reforming-new-zealand-emissions-trading-scheme-proposed-settings>

Switzerland

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1. Introduction

The Swiss ETS was introduced on 1 January 2008 as an alternative to comply with the national CO₂ levy on heating fuels. In the first commitment period (2008-2012), firms covered by the levy had two options: to pay the CO₂ levy, or to voluntarily participate in the Swiss ETS, which exempted them from the CO₂ levy. The CO₂ levy acted as a price ceiling for entities participating in the ETS, and the option for ETS participation allowed firms to pay a potentially lower rate for emissions reductions than this ceiling price. For 2008 and 2009 the CO₂ levy amounted to CHF 12/tCO₂ and since then the rate increased stepwise to 96 CHF/tCO₂. Since 2012, the participation in the Swiss ETS is mandatory for some entities. The Swiss ETS was revised in 2011 to bring it more in line with the EU ETS, thereby providing comparable market conditions for Swiss and EU industries and facilitating the prospect of a future linking with the EU ETS. At the beginning of 2013, the CO₂ Act and the revised CO₂ Ordinance entered into force. From 2013 to 2020, they form the framework for the current Swiss climate policy. As of January 1, 2020, the linkage with the EU ETS will enter into force allowing companies in the Swiss ETS to trade emission allowances in the larger EU emissions market.

2. Current technical features

Sectors covered and number of installations

The Swiss ETS currently includes GHG intensive companies from the cement, chemicals and pharmaceuticals, refineries, paper, district heating, steel and other sectors. Unlike the EU ETS, civil aviation and fossil fuel power stations are not included in the Swiss ETS. However, after January 1, 2020, they will be included as well.

Table 1: Number of ETS participants per sector

	ETS- participant	Allowance free of charge 2013-2018 [CHU2]	Emissions 2013 – 2018 [t CO _{2eq}]	Difference	Coverage
District heating	15	1,056,270	1,951,896	-895,626	54.1%
Paper	4	1,630,265	694,114	936,151	234.9%
Metal	6	1,370,723	1,309,456	61,267	104.7%
Cement, stone and earths	8	17,105,161	15,976,882	1,128,279	107.1%
Chemistry, pharma	11	4,098,139	5,047,153	-949,014	81.2%
Refinery	2	3,111,396	3,574,179	-462,783	87.1%
Other	7	1,085,217	1,118,856	-33,639	97.0%
Total	53	29,457,171	29,672,536	-215,365	99.3%

Source: https://www.bafu.admin.ch/dam/bafu/en/dokumente/klima/fachinfo-daten/Ueberblick-Emissionshandel-fuer-stationaere-Anlagen-2013%E2%80%932017.pdf.download.pdf/%C3%9Cberblick_Emissionshandel_f%C3%BCr_station%C3%A4re_Anlagen_2013-2018.pdf

Large, greenhouse gas-intensive companies (installed combustion capacity > 20 MW, refining of mineral oil, production of coke etc.) are required to participate in the Swiss emissions trading scheme, while medium-sized companies may participate voluntarily³⁰. Research, development and testing facilities as well as special waste management facilities can be excluded from the ETS upon the company's request. If an ETS company's total emissions in each of the previous three years are less than 25,000 tonnes CO₂ equivalent (CO_{2eq}), the company can apply for an exemption from the ETS obligation ('opt-out'). They must however continue to submit a monitoring plan and monitoring report or commit to reduce greenhouse gas emissions in accordance with Article 31 paragraph 1 letter b of the CO₂ Act. Certain categories of companies (such as e.g. companies cultivating plants in greenhouses, quarrying of rock, soil or other mining activities, manufacturing of beverages, etc.) can voluntarily participate in the

³⁰ CO₂-Ordinance: <https://www.admin.ch/opc/en/classified-compilation/20120090/201801010000/641.711.pdf>: Companies are obliged to participate in the ETS if they are engaged in an activity listed in Annex 6, opt-in: activities that qualify for participation in the ETS (Annex 7).

ETS ('opt-in'), if they reach a total thermal input of at least 10MW. In return, all ETS participants are exempt from the CO₂ levy. As of 2018, 53 companies were included in the ETS whereof 49 companies were obliged to participate and 4 companies opted-in. 58 companies asked for an opting-out.

Cap setting

For 2013, the cap was 5.63 million tonnes CO₂eq and will decrease annually by the same absolute amount (1.74% of the 2010 baseline, as in the EU-ETS) to around 4.9 million tonnes CO₂eq in 2020.

Allowance allocation

The Swiss emission trading system (ETS) in its current form is a cap-and-trade system that is to a large extent a copy of the ETS of the European Union. Therefore, the Swiss companies are subject to the same rules as their competitors in the EU. Based on historical activity data from the years 2008-2012, an absolute quantity of emission allowances (CHU) is determined in the system ("cap"). For each ETS participant, emission allowances are allocated free of charge on the basis of product, heat, fuel or emission benchmarks, regardless of its greenhouse gas emissions³¹. The free allocation based on benchmarks is practically the same as in the European Emissions Trading Scheme, which is convenient in view of linking the two ETSs³².

Emission allowances are freely tradable ("trade") and can either be surrendered to the Confederation to cover the greenhouse gases emitted or sold to other ETS participants.

Companies participating in the ETS have to report their annual GHG emissions to the Confederation and surrender the necessary emissions allowances to cover them. 5% of total emission allowances are retained annually in order to make them accessible to new market entrants and ETS companies that significantly increase their capacity.

There are about CHF 2-3 million of revenues from ETS auctions every year. These revenues are added to the general government budget. The secondary market is currently not very liquid, which is one

³¹ In the first phase, the allocations were grandfathered based on entity emissions; in the second phase, the allocation to companies was based on Product, Heat, Fuel and Emissions Benchmarks in line with the EU-ETS regulation (Narassimhan et al. 2018).

³² Linking the Swiss and EU CO₂ emissions markets would be beneficial in particular in order to improve the liquidity in the (too small) Swiss ETS. An agreement has been signed on 23 November 2017 in Bern. It was approved by the Swiss Parliament on 22 March 2019 and was ratified by Switzerland and the EU in December 2019. The Agreement enters into force on 1 January 2020 (FOEN 2019b).

of the reasons why several stakeholders pushed for linking the Swiss and EU ETS and there have been negotiations between Switzerland and the EU since 2011.

Total allowance volume

In the period 2013-2018, enterprises participating in the Swiss ETS emitted 29,672,536 tonnes of CO₂eq and total free allowances amount to 29,457,171 tonnes of CO₂eq. The auctioned allowances amount to 2,879,485 tonnes of CO₂eq.

Table 2: Cap and calculated allocation

	Cap	5% Reserve	95% of the cap	Calculated allocation (without CSCF)	Cross-sectoral correction factor (CSCF)
2013	5,632,864	281,643	5,351,224	5,356,061	-0.09%
2014	5,529,455	276,473	5,252,981	5,330,420	-1.45%
2015	5,426,045	271,302	5,154,743	5,304,741	-2.83%
2016	5,322,635	266,132	5,056,502	5,279,100	-4.22%
2017	5,219,225	260,961	4,958,263	5,253,458	-5.62%
2018	5,115,815	255,791	4,860,022	5,227,813	-7.04%
2019	5,012,405	250,620	4,761,788	5,202,134	-8.46%
2020	4,908,996	245,450	4,663,548	5,176,493	-9.91%

Table INFRAS. Source: <https://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate-policy/emissions-trading/swiss-emissions-trading-scheme--ets-.html>

So far, changes in production capacity have led to an increase in allocation of free allowances by 304,508 emission allowances since 2013. Partial closures resulted in a decrease of 1,481,072 emission allowances. This results in a total reduction of 1,176,564 emission allowances, which are reallocated to the reserve.

Special adaptation factors

For production processes that can be operated with either thermal fuels or electricity, special adaptation factors are applied. For those benchmarks, 0.465 t CO₂ per MWh are deducted for the indirect emissions from electricity used.

Offsets

Emission Reduction Units (ERUs), Certified Emission Reductions (CERs), and Removal Units (RMUs) are accepted international offset credits within the Swiss ETS. The maximum quantity of emission-reduction certificates for fixed installations is defined in Art. 48 of the CO₂-Ordinance. Temporary certificates from carbon sink projects (RMUs, tCERs, and ICERs), such as afforestation and reforestation, are allowed, but they cannot be banked for use in future commitment periods. The FOEN may ask companies that use temporary credits to guarantee that additional offsets are purchased once temporary credits expire. Like the EU, as of 2021 Switzerland will not admit any more certificates to its ETS.

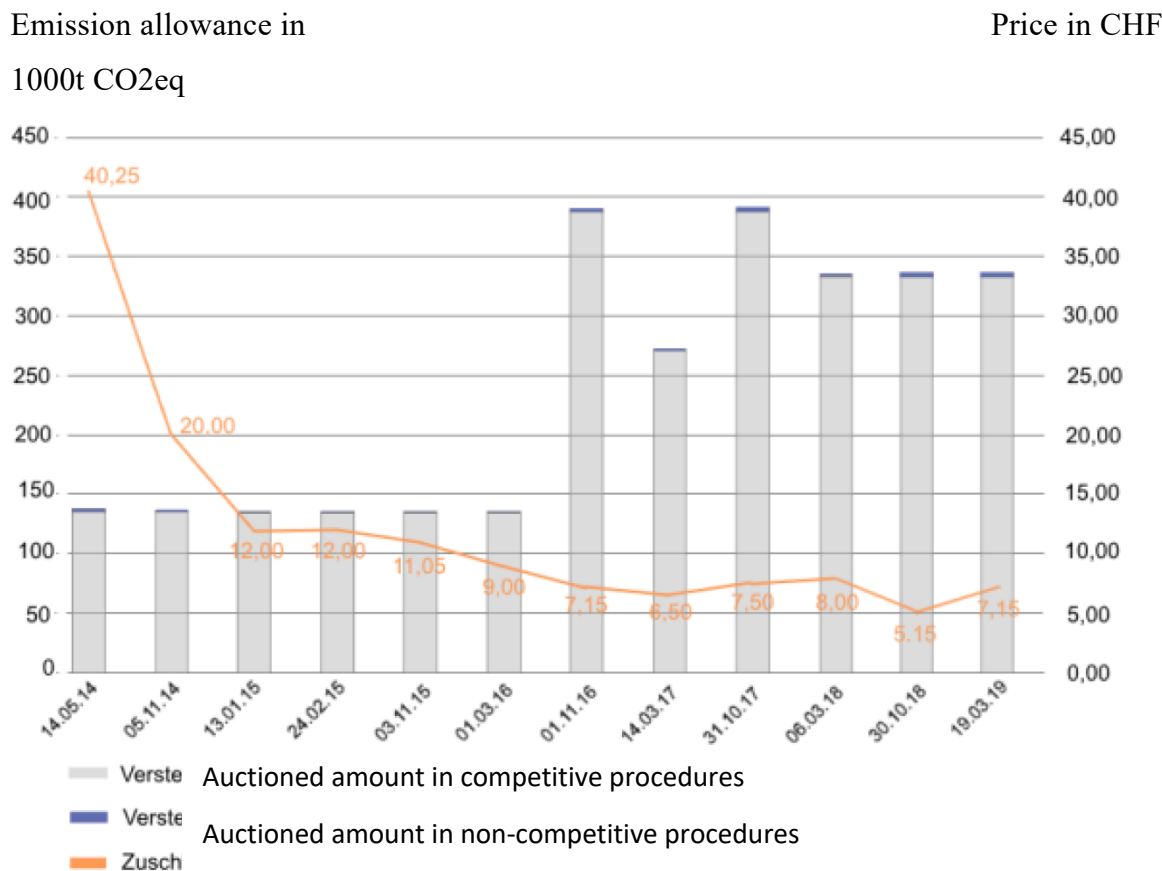
Price containment

In the Swiss ETS, there is no price ceiling or price floor foreseen and no mechanism similar to the EU-ETS MSR (Market Stability Reserve). However, there is a hardship provision in the law. In the transition period until the envisaged linking with the EU-ETS, a Swiss ETS company may submit a request for assessment as a hardship case if the purchase of emission allowances to meet its obligations in the Swiss market substantially impairs its ability to compete. The FOEN approves such a request if the company can prove that it has used all the available options to meet its obligations (FOEN, 2019c).

3. Allowance prices

The following figure shows the evolution of amount and prices of auctioned emission allowances since the first auction in 2014. The allowance price at the first auction in May 2014 was CHF 40.25. At the most recent auction in March 2019, the allowance price was CHF 7.15.

Figure 1: Amount of auctioned emission allowances and allowance prices



Source: FOEN 2019d

4. Recent developments

On 23 November 2017, an agreement was signed in Bern linking the Swiss and EU ETS. It was approved by the Swiss Parliament on 22 March 2019 and was ratified by Switzerland and the EU in December 2019. It will enter into force on 1 January 2020. When the agreement comes into force, civil aviation and

fossil fuel power stations will be integrated into the Swiss ETS (FOEN, 2019b) to be in line with the current regulation in the EU. Regarding civil aviation, domestic flights and flights from Switzerland to countries in the European Economic Area will be affected. For fossil-thermal power plants, the existing compensation obligation will be discontinued. In line with the EU, as of 2021 Switzerland will not admit any more certificates to its ETS (FOEN 2019e).

References

FOEN 2019a: Swiss climate policy

<https://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate-policy.html> [24 September 2019]

FOEN 2019b: Linking the Swiss and EU emissions trading schemes

<https://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate-policy/emissions-trading/linking-the-swiss-and-eu-emissions-trading-schemes.html> [24 September 2019]

FOEN 2019c: Information for ETS companies

<https://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate-policy/emissions-trading/swiss-emissions-trading-scheme--ets-/emission-trading-scheme--ets---information-for-ets-companies.html> [24 September 2019].

FOEN 2019d: Overview ETS for stationary installations 2013-2018

https://www.bafu.admin.ch/dam/bafu/en/dokumente/klima/fachinfo-daten/Ueberblick-Emissionshandel-fuer-stationaere-Anlagen-2013%E2%80%932017.pdf.download.pdf/%C3%9Cberblick_Emissionshandel_f%C3%BCr_station%C3%A4re_Anlagen_2013-2018.pdf

FOEN 2019e: Factsheet - Linking the Swiss and EU emissions trading schemes, 25.05.2019

<https://www.news.admin.ch/newsd/message/attachments/56213.pdf>

Narassimhan, E., K. S. Gallagher, S. Koester and J. Rivera Alejo 2018: Carbon pricing in practice: a review of existing emissions trading systems, *Climate Policy*, 18:8, p. 967-991

Useful links

Swiss climate policy

<https://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate-policy.html>

Linking the Swiss and EU emissions trading schemes

<https://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate-policy/emissions-trading/linking-the-swiss-and-eu-emissions-trading-schemes.html>

Information for ETS companies

<https://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate-policy/emissions-trading/swiss-emissions-trading-scheme--ets-/emission-trading-scheme--ets---information-for-ets-companies.html>

CO2 Ordinance

<https://www.admin.ch/opc/en/classified-compilation/20120090/201801010000/641.711.pdf>

