

Advanced Financial Instruments for Sustainable Business and Decentralized Markets

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Lecture No. 18

In this lesson, first we will discuss international credits namely Clean Development Mechanism (CDM) and Joint Implementation (JI) and their own climate change mitigation objectives. Next, we will discuss the emission trading scheme of China including its pilot and national carbon markets. Further, we also discuss emission trading system from UK and compare it with European Union Emission Trading System. In this video, we will introduce international credits namely Clean Development Mechanism and Joint Implementation. We will also highlight their role in achieving climate change mitigation in the context of the European Union. International credits are financial instruments that represent 1 tonne of CO₂ or carbon removed or reduced from the atmosphere as a result of an emission reduction project.



International Credits

- International credits are financial instruments that represent one tonne of CO₂ removed or reduced from the atmosphere as a result of an emissions reduction project
- Clean Development Mechanism (CDM)
- Joint Implementation (JI)
- Joint Implementation provides for the creation of emission reduction units (ERUs), whereas the Clean Development Mechanism provides for the creation of certified emission reductions (CERs).

At present, international credits are generated through two key mechanisms set up under Kyoto Protocol. These are Clean Development Mechanism and Joint Implementation JI, CDM and JI. In this backdrop, this Clean Development Mechanism allows industrialized countries with a greenhouse gas reduction commitment. These are called annex one countries to invest in projects that reduce emissions in developing countries as an

alternative to more expensive emission reductions in their own countries.



International Credits

- Participants in the EU ETS can use international credits from CDM and JI towards fulfilling part of their obligations under the EU ETS
- The rationale behind the project-based mechanisms is that it is of secondary importance for the global environment where emission reductions occur
- CDM and JI are also important for the European emissions trading scheme (ETS) for CO₂ that is a major component of the European climate strategy

Next we have Joint Implementation Mechanism JI. JI allows industrialized countries to meet part of their required cuts in greenhouse gas emissions, greenhouse gas emissions by paying for projects that reduce emissions in other industrialized countries. Here, Joint Implementation provides for the creation of Emission Reduction Units or ERUs whereas Clean Development Mechanism provides the creation of certified emission reductions. These CERs can be traded and sold and used by industrialized countries to meet the part of their emission reduction targets under the Kyoto Protocol. These Emission Reduction Units or ERUs and CERs are basically account for the same amount of reduction but differ in their origin.

So CERs, CERs they originate from CDM projects while ERUs they originate from Joint Implementation or JI based projects. Sometimes the term Emission Reductions ERUs is used when talking about the project-based mechanisms in general. Each unit represents a reduction in 1 ton of CO₂ equivalent emissions. Here participants in UTS can use international credit from CDM and JI towards fulfilling part of their obligations under the UTS, subject to qualitative and quantitative restrictions till 2020. The EU has a domestic emission reduction target and does not currently envisage continuing of these international credits for UTS compliance after 2020.

So a mechanism is stipulated. To meet their Kyoto targets under the Burden Sharing Agreement most of the European countries plan to make use of their flexible project mechanisms namely CDM and JI. In the Kyoto Protocol from 1997, the EU members agreed to cut down their overall greenhouse gas emissions related to their 1990 levels by 8% in the period 2008 to 2012. Over time this pressure to reach the targets has become

even stronger and many countries realize that they have to start acting in order to achieve their targets. As most countries are aware they will not be able to reduce their emissions sufficiently with domestic action alone.

They want to make use of flexible mechanisms of Kyoto Protocol focusing on these project-based mechanisms namely CDM and JI. These project-based mechanisms have been designed to help countries to accomplish their Kyoto Protocol targets in an economically efficient and environmentally effective manner. It must be noted that this rationale behind project-based mechanism is that it is of secondary importance for the global environment where the emission reductions occur. Having said that real emission reductions are indeed achieved, many of the European governments have already advanced plans to make use of CDM and JI. In some cases, considerable parts of necessary emission reductions are hoped to be achieved abroad via these mechanisms.

Also these CDM and JI are important for European countries, for European emission trading scheme, for CO₂ that is a major component of European climate strategy. In addition, CDM and JI will also play an important role within the emission trading system as a linking between the ETS and the two project-based mechanisms has been established that allows to recognize JI and CDM creates as equivalent to EU's emission allowances. Now to make sure that a real emission reduction takes place, credits from CDM and JI projects can only be generated if they are additional to what would have occurred in the absence of the project. Therefore, a baseline scenario has to be developed and justified by the project participants before the project is implemented. It has to show what would have happened in terms of emission in the absence of the project.

Lastly, the situation in the European Union gives the possibility to make use of JI and CDM on both private and government level. For example, governments can use JI and CDM credits to comply with their national Kyoto protocol reduction targets. Private entities that are covered by the EUTS can convert these CERs and ERUs into allowances that can be used in the EUTS. This became possible with the so called linking directive, linking directive, which wants to ensure that private actors can obtain their responsibilities within the European climate policy in the cheapest possible manner. To summarize, in this video, we discussed how parties to Kyoto Protocol and EU member nations can benefit from international credits like CDM and JI in achieving their climate change objectives and reducing the emissions in a real and substantial manner.



Clean Development Mechanism (CDM)

- The CDM allows emission-reduction projects in developing countries to earn certified emission reduction (CER) credits
- Article 12 of the Kyoto Protocol also gives the possibility for emission reductions in non-Annex I countries
- Annex I countries can then use the certified emission reductions (CERs), which they obtained from the CDM, project to contribute to their reduction compliance

In this video, we will further deepen our understanding about international credits namely Clean Development Mechanism CDM and Joint Implementation JI. First, the Clean Development Mechanism CDM allows for emission reduction projects in developing countries to earn Certified Emission Reduction or CER credits, each equivalent to 1 tonne of CO₂. The CERs can be then traded, sold and used by industrialized countries to meet a part of their emission reduction targets under Kyoto Protocol. The mechanism is to place sustainable development and emission reductions while giving industrialized countries some flexibility in how they meet their emission reduction limitation targets. Moreover, Article 12 of the Kyoto Protocol gives the possibility for emission reductions in non-Annex 1 countries, which have no emission reduction targets.

The purpose of Clean Development Mechanism shall be to assist parties not included in non-Annex 1 countries in achieving sustainable development and contributing to the fulfillment of the ultimate objective of the Convention that is to assist parties included in non-Annex 1 in achieving compliance with their Quantified Emission Limitations and reduction commitments under Article 3. Furthermore, non-Annex 1 countries here can then use the Certified Emission Reductions which they have obtained from CDM projects to contribute to their reduction compliance. Thus, the Clean Development or CDM mechanism also gives the possibility for emission reductions in developing countries that is non-Annexure 1 countries, non-Annexure 1 countries which themselves have no reduction targets under the Kyoto Protocol, though the investment in environmental projects in the frame of CDM non-Annexure 1 countries are supposed to transfer new and efficient technologies, new and efficient technologies to developing countries and help them in achieving sustainable development. Next we have Joint Implementation or JI. The mechanism known as Joint Implementation or JI defined in Article 6 of Kyoto

Protocol, Kyoto Protocol allows a country with an emission reduction or limitation commitment under the Kyoto Protocol with annex B, annex B commitment party to earn emission reduction units or ERUs, ERUs from an emission reduction or emission removal project in another annex B committed party, each equivalent to 1 tonne of CO₂ equivalent emission which can be counted towards meeting its Kyoto Protocol target, Kyoto target.



Joint Implementation (JI)

- JI is the project-based mechanism referred to in Article 6 of the Kyoto Protocol.
- It differs from the clean development mechanism (CDM)
- JI projects earn emission reduction units ERUs
- As JI projects take place between Annex I parties, the total emissions permitted in the countries remain the same so that JI basically is a “zero sum operation”

Joint implementation of first party is a flexible and cost efficient means of fulfilling a part of their Kyoto commitments while the host party benefits from foreign investment and technology transfer. Please note here that JI is the project based mechanism referred to in Article 6 of the Kyoto Protocol. JI stipulates and stimulates investment in emission reduction projects while giving industrialized countries and economies in transition some flexibility in how they meet their emission reduction or limitation targets. Joint implementation here JI allows industrialized countries to meet part of their required cuts in greenhouse gas emissions by paying for projects that reduce emission in other industrialized countries. Precisely, JI differs from CDM or Clean Development Mechanisms in a way that it represents a way for industrialized countries and basically annex one parties with a commitment inscribed in annex B of the Kyoto Protocol to take part in emission reduction projects or a project that enhances removals by sinks in the territory of another industrialized countries, for example annex one party with an annex B commitment.

Moreover, as JI emission reduction units or ERUs each equivalent to 1 tonne of CO₂, the resulting ERUs from these projects can be counted towards meeting their own Kyoto Protocol targets, KP targets. So following Article 6 of the Kyoto Protocol, JI allows annex

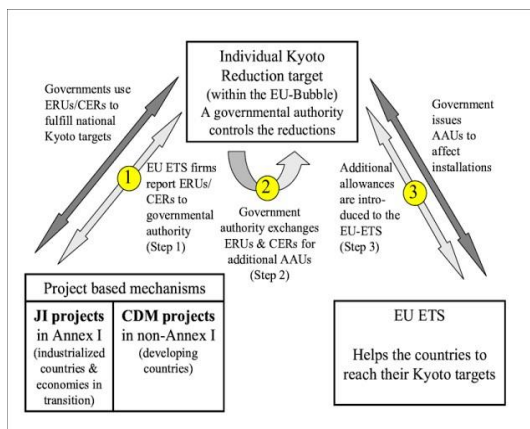
one parties to implement projects that reduce emissions or increase removal by sinks in the territories of other annex one parties. Emission reduction units generated by such projects can then be used by investing annex parties to meet their emission targets. As JI projects take place between annex one parties, the total emission permitted in the countries remain the same so that JI basically has zero-sum gain. So it's a zero-sum operation as both investor and host countries benefit from a JI project, it is expected that both countries will strike a fair balance.

So joint implementation or JI allows annex one parties of the Kyoto Protocol to implement projects that reduce emissions or increase removals by sinks in the territories of annex one parties and ERUs generated by such projects can then be used by investing annex one parties to fulfill their Kyoto commitments. To summarize this video, we further understood in greater detail about CDM and JI and how EU member nations, particularly those that are party to Kyoto Protocol and have some commitment, therein they can make use of or benefit from these CDM and JI project based mechanisms and also facilitate reduction in emission carbon emissions and greenhouse gas emissions and benefit the environment. In this video, we'll conclude with our understanding and discussion about CDM and JI, that is international credits. As the world's largest carbon market, the EUTS is currently the biggest source of demand for these international credits and making it the main driver of international carbon market and the main provider of clean energy investment in developing countries and economies in transition. Since phase three, CERs and ERUs are no longer compliance units within the EUETS and must be exchanged for EUETS emission allowances.



International credits: CDM & JI

- As the world's largest carbon market, the EU ETS is currently the biggest source of demand for international credits
- Participants in the EU-ETS can use international credits from CDM and JI
- Since phase 3, CERs and ERUs are no longer compliance units within the EU ETS



Source: <https://www.researchgate.net/publication/5159665>

Operators must request the exchange of CERs and ERUs for general allowances up to their individual entitlement limit set within the European Union Registry. To be precise,

there are three possibilities to acquire CDM and JI credits. In the first one is to undertake CDM and JI projects. CDM projects are in non-annexed countries, developing countries, while JI projects are in annexed countries and economies in transition. The first one is to undertake CDM and JI projects.

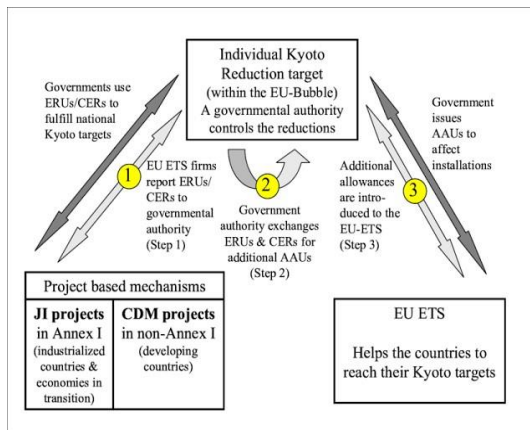
This option is particularly attractive for international funds and establishments in non-annex countries or transformation countries in which CDM and JI projects can be taken. Now here, once the EUTS firm reports ERUs and CRs to government authority in step one, in the second step, the government authority exchanges EUs and CRs for additional allowance allocation units, which are traded in UTS. So, these additional allowances are introduced to the EUETS as the last step. Thus, EUETS here facilitates and helps the countries to reach their Kyoto targets.



International credits: CDM & JI

There are generally three possibilities to acquire CDM and JI credits

1. To undertake CDM and JI projects
2. To buy the ERUs/CERs from somebody who directly undertakes CDM
3. To invest in a fund that finances CDM and JI projects and acquires the ERUs/CERs



Source: <https://www.researchgate.net/publication/5159665>

The second step or second way is to buy the ERUs and CRs from somebody who directly undertakes CDM. Now, the second step or second option is very attractive or mostly chosen by governments, which issue tenders for CDM and JI projects by private investors from which they want to buy the CRs and ERUs. So, the government use these ERUs and CRs to fulfill their national Kyoto targets and that is why this is useful for them. The third possible option is to invest in a fund that finances CDM and JI projects and acquire the ERUs and CRs. So this option employs to invest in a carbon fund that collects money to finance CDM and JI projects.

The general procedure is that the fund selects the JI and CDM projects from which emission credits are to be acquired following a transparent procurement procedures. To summarize this video and conclude the discussion, emission reductions abroad via CDM and JI projects are likely to play a very important role for meeting the European Kyoto

commitments. On the one hand, governments can use these flexible Kyoto mechanisms to require less severe emission reductions, restrictions by domestic households and domestic industry. On the other hand, firms covered by the upcoming European Emissions Trading Scheme will be able to exchange these CDM and JI credits to emission allowances for their use within the scheme. In this video, we will introduce emission trading systems in China, in particular its pilot and national carbon markets.



China's Pilot and National carbon market

- In 2011, the Chinese government selected seven provinces and cities, including Beijing, Tianjin, Shanghai, Guangdong, Shenzhen, Hubei and Chongqing, to launch pilot carbon emission trading schemes.
- The pilots made great efforts in system design, technical development and capacity building.
- 7 pilot carbon market with different characteristics were launched between 2013 and 2014.
- Further, Chinese province, Fujian launched its ETS in September 2016

In 2011, the Chinese government selected seven provinces namely Beijing, Tianjin, Shanghai, Guangdong, Shenzhen, Hubei, Chongqing to launch pilot carbon emission trading schemes. These pilot markets made great efforts in system design, technical development and capacity building. The seven pilot carbon markets with different characteristics were launched between 2013 and 2014. In addition, the Chinese province, Chongqing launched its ETS in September 2016.



China's Pilot carbon markets

Features	Beijing	Guangdong
Launch Date	November 2013	December 2013
Phases	2013~ present	Phase one: 3 years (2013-2015) Phase two: 5 years (2016-2020) Phase three: Ongoing (2021-present)
Average 2022 allowance Price	Average secondary market price: CNY 93.32 (USD 13.85)	Average secondary market price: CNY 76.53 (USD 11.35)
Banking and Borrowing	Banking is allowed, Borrowing is not allowed	Banking is allowed, Borrowing is not allowed
Secondary Trading	Beijing Carbon Emission Allowances (BEA), China Certified Emission Reduction (CCERs)	Guangdong Emission Allowance (GDEA) and CCERs
Allowance allocation	Free allocation through Grandfathering and Benchmarking. In November 2022, the first auction was held since 2013, generating total revenue of CNY 113 million (USD 16.4 million).	Free allocation through Grandfathering and Benchmarking. Guangdong auctions a small share of allowances

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Let us start with two of the pilot carbon markets including Beijing and Guangdong. Both these markets started in 2013. Guangdong was implemented in a phase-wise manner with phase 1 first three years from 13 to 15, then phase 2 16 to 20 and currently we are in phase 3. The average allowance price in 2022 was around 13.85 dollars for Beijing, 11.35 dollar for Guangdong. For both the pilot carbon markets, banking is allowed but borrowing is not allowed. The trading takes place in both these markets with BEA in Beijing, that is Beijing carbon emission allowances and Guangdong emission allowance GDE in Guangdong. CCER or China Certified Emission Reduction carbon credits are also traded in both the markets. The method of allowance allocation has been free allocation in Beijing through grandfathering and benchmarking.

In No. 2022, the first auction was held since 2013 generating a total revenue of US dollar 16.4 million. In Guangdong also, free allocation through grandfathering and benchmarking remains a major mode. It also auctions a small share of allowances. Next, we have markets from Hubei and Shanghai.



China's Pilot carbon markets

Features	Hubei	Shanghai
Launch Date	April 2014	November 2013
Phases	2014 and ongoing	PHASE ONE: 2013-2015, also known as the "trial phase" PHASE TWO: 2016-present
Average 2022 allowance Price	Average secondary market price: CNY 46.86 (USD 6.95)	Average secondary market price: CNY 40.16 (USD 5.96)
Banking and Borrowing	Banking is allowed, Borrowing is not allowed	Banking is allowed, Borrowing is not allowed
Secondary Trading	Spot products include Hubei Emission Allowances (HBEAs) and CCERs. The HBEA spot forward product was introduced in 2016 but has not been traded since May 2017	Products include Shanghai Emission Allowances (SHEA), Shanghai Emission Allowance Forwards, and CCERs
Allowance allocation	Allowances have primarily been freely allocated, through both grandfathering and benchmarking, although several ad hoc auctions have been held since 2014.	Allowances have primarily been freely allocated, through both grandfathering and benchmarking. A small share of the annual cap may be auctioned. One auction was held in each of the following years: 2014, 2016, 2018, and 2019. Since then, two auctions have been held each year.

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Hubei market started in 2014 and Shanghai started in 2013. Shanghai was implemented in phases with phase 1 in 2013 to 2015 was trial phase and then 2016 onwards we are in phase 2. The average allowance price was 6.95 dollars in 2022 in Hubei and 5.96 dollars in Shanghai. Now here banking is allowed, and borrowing is not allowed. In Hubei, the spots product included Hubei emission allowances and CCERs. The HBEAs or Hubei emission allowances spot-thaw product was introduced in 2016 but has not been traded since No. 2017. In Shanghai market, products include Shanghai emission allowances SHEA and Shanghai emission allowance SEA and CCERs.

The allowance allocation mechanism in Hubei has been primarily free allocation through grandfathering and benchmarking although several ad-hoc auctions have been held since 2015. In Shanghai, the allowances have been primarily freely allocated through grandfathering and benchmarking. A small share of the annual cap is auctioned. One auction was held in each of the following years including 2014-2018 and 2019. Since then, two auctions have been held each year.



China's Pilot carbon markets

Features	Shenzhen	Tianjin
Launch Date	November 2013	December 2013
Phases	2013~ present	2014-present
Average 2022 allowance Price	Average secondary market price: CNY 42.52 (USD 6.31)	Average secondary market price: CNY 34.36 (USD 5.10)
Banking and Borrowing	Banking is allowed, Borrowing is not allowed	Banking is allowed, Borrowing is not allowed
Secondary Trading	CCERs, Shenzhen Allowances (SZAs) are main traded products.	Products include spot Tianjin carbon emission allowances and spot CCERs
Allowance allocation	Allowances have primarily been freely allocated, through both grandfathering and benchmarking. So far, two auctions have been held, in June 2014 and August 2022 (generating a total revenue of CNY 25.26 million (USD 3.67 million)).	Allowances have primarily been freely allocated, through both grandfathering and benchmarking.

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Next we have Shenzhen and Tianjin. The launch date is 2013 for both the markets and currently they are implemented in phases. The average allowance allocation price was 6.31 dollars. This is the average price of allowance being traded in Shenzhen market and 5.1 dollar is the average allowance secondary trading price in Tianjin.

For both the markets, banking is allowed, and borrowing is not allowed. The Shenzhen CCRs, Shenzhen allowances, SZEAs are main trader products. In Tianjin market, products include spot Tianjin carbon emission allowances and spot CCERs. In Shenzhen, allowance has been primarily freely allocated through grandfathering and benchmarking. So far two auctions have held in 2014 June and August 2022 generating a total revenue of approximately 3.6 million dollars. In Tianjin, allowances have been primarily freely allocated again through both grandfathering and benchmarking methods. Lastly, we have the pilot market of Chongqing and the National Carbon Market. The Chongqing market started in 2014 while the National Carbon Market started in 2021 and ongoing. The average allowance traded price in Chongqing has been in the range of 5.86 dollars while the National Carbon Market it has been in the range of 8.2 dollars. For both the markets, banking is allowed and borrowing is not allowed. In Chongqing, there is a spot market for carbon emission trading center for trading of allowances and CCERs. No derivative trading is allowed.



China's Pilot and National carbon market

Features	Chongqing	National Carbon Market
Launch Date	June 2014	2021
Phases	2014 and ongoing	2021 and ongoing
Average 2022 allowance Price	Average secondary market price: CNY 39.51/tCO ₂ (USD 5.86/tCO ₂)	Average secondary market price: CNY 55.30 (USD 8.20)
Banking and Borrowing	Banking is allowed, Borrowing is not allowed	Banking is allowed, Borrowing is not allowed
Secondary Trading	There is a spot market at Chongqing Carbon Emissions Trading Center for trading of allowances, CCERs. No derivatives trading is allowed.	Emissions allowances can be traded on a dedicated trading platform managed by the Shanghai Environment and Energy Exchange. Derivatives are currently not allowed
Allowance allocation	Allowances have primarily been freely allocated, through both grandfathering and benchmarking. Auctioning was introduced in 2021.	Free allocation of allowances through benchmarking till 2021. Gradually auctioning has been introduced.

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In National Carbon Market, emission allowances can be traded on a dedicated traded platform managed by Shanghai Environment and Energy Exchange, SAE. And derivative trading is currently not allowed. For Chongqing, the allowance have been primarily freely allocated through both grandfathering and benchmarking and auctioning was introduced in 2021. For the National Carbon Market, free allocation of allowances through benchmarking was done as of 2021. Gradually, the auctioning method has been introduced. To summarize, in this video, we discussed the particulars of 7 pilot carbon markets and the National Carbon Market.

We discussed about their implementation in phases. We also discussed the average allowance traded price and the policies related to banking borrowing. We also discussed what kind of products are traded in secondary market trading. And we also discussed briefly about their allowance allocation methods. In the next set of videos, we will discuss about their market size, volume and market microstructure. In this video, we will continue with our discussion of China's pilot and National Carbon Market trading schemes.

In particular, we will discuss the size and brief snapshot of market size and turnover of Chinese markets and start the discussion with the carbon market at Beijing. Let us have a quick snapshot of China's carbon markets. As we can see, in all the 7 and the new market fusion, the total volume of carbon allowances is 51.52 million tonnes and in terms of value, it amounted to 370.32 million euros. The average traded price in euros per tonne was 7.19. As we can see, the Guangdong has the highest traded volume here 14.45 while in terms of value it was 145.78 million euros. Across all the markets, they are all heavily traded with volume ranging from 3 to 7 million tonnes while in terms of value it is around 20 to 50

million euros. The average price varies from 3 to 10 and averages around 7.19 euro per tonne. So the markets have been fairly liquid and heavily traded.

Let us start our discussion with the Beijing's carbon market. It launched in November 2013 and since then it is continuing with the first phase itself. In terms of average allowance prices, the average auction price was around 17.44 US dollars while the secondary market price in 2022 was around 13.85 dollars.

The total revenue generated from this program amounted to 16.8 million US dollars since 2022 since the beginning of the program. The Beijing pilot market has seen a relatively high carbon price compared to other emission trading systems in China. In this market, banking is allowed, pouring is not allowed. Next, in the Beijing market, the primary allocation of allowances or primary market consists of allowance distribution through free allocation. Also, there is a provision of 5% of allowances through regular and irregular auctions.

The secondary trading consists of 5 spot products namely Beijing carbon emission allowances PA, CCRs, forest certified emission reductions FCR, green transport certified emission reductions GTCR and energy saving projects certified emissions PCR. The Beijing green exchange manages the trading of all 5 products. Due to financial market regulations in China, no forward markets or derivative products are allowed. The compliance period is one calendar year from January to December and the covered entities have until mid-June of the next year to surrender and furnish the required allowances. Next we have market stability provisions which include first flooring and ceiling.

So the competent authority can auction extra allowances if the weighted average price exceeds 22.26 dollars for 10 consecutive days. It can also buy back allowances from the market using a special funding resource from the municipal budget if prices are below 2.97 dollars. In terms of exchange, the Beijing green exchange implements a system of limits on price increases and decreases for trading over the exchange which is around plus minus 20% of the reference price.

The reference price here is the weighted average price of all transactions on the previous trading day. This is to prevent large volatility and price fluctuations. The exchange also sets the maximum position limit for different market participants which is the sum of their annual allocated allowances plus 1 million tons of compliance entities, 1 million tons for compliance entities and 1 million tons for institutional investors and 50000 tons for natural persons, individuals. The reserve, in terms of reserve the competent authority may set up 5% of allowances as reserved for regular and irregular auctions. To summarize, in this video we saw a brief snapshot of revenue and volumes of allowances across the pilot

markets of China.



Beijing

- Launch: November 2013.
- Phases – 2013~ present
- **AVERAGE 2022 ALLOWANCE PRICE**

Average auction price: CNY 117.54 (USD 17.44)

Average secondary market price: CNY 93.32 (USD 13.85)

- **TOTAL REVENUE**
- CNY 113 million (USD 16.8 million) in 2022 since beginning of program
- The Beijing pilot has seen a relatively high carbon price level compared to the other ETS pilots in China.
- **BANKING AND BORROWING**

Banking is allowed. Borrowing is not allowed.

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We also discussed the market microstructure of the Beijing market in detail. In next videos we will see the market microstructure in details of other pilot markets. In this video we will discuss the market microstructure of Guangdong, Hubei and Shanghai pilot carbon markets. The Guangdong market started in December 2013. It was first Chinese carbon pilot to start the operation and covered around 40% of the city's emissions in 2021.



Beijing

- **MARKET STABILITY PROVISIONS**

PRICE FLOOR AND CEILING

The competent authority can auction extra allowances if the weighted average price exceeds CNY 150 (USD 22.26) for ten consecutive days. It can also buy back allowances from the market using a special funding source from the municipal budget if the price is below CNY 20 (USD 2.97).

EXCHANGE

The Beijing Green Exchange implements a system of limits on price increases and decreases for trading over the exchange which is $\pm 20\%$ of the reference price (the weighted average price of all transactions on the previous trading day) to prevent large price fluctuations.

It also sets the maximum position limit for the different market participants: the sum of their annual allocated allowances plus one million tonnes for compliance entities, one million tonnes for institutional investors, and 50,000 tonnes for natural persons.

RESERVE

The competent authority may set aside up to 5% of allowances for regular and irregular auctions.

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It has a very broad sectoral coverage. The Guangdong emission trading system is the largest of Chinese emission trading system pilots in terms of market size and spot trading volume. It has been implemented in phases, the first phase running from 2013 to 2015, second phase running for 5 years from 2016 to 2020 and the third phase which is ongoing

from 2021 onwards. As the first Chinese region to reduce auctioning as a method of allowance allocation, Guangdong held quarterly auctions till 2016. Since 2017 auctions have been held on an ad hoc basis and CEXA organizes auctions for the primary market. We have Guangdong emission allowance GDA as the main spot trading product in the secondary market.

Bidding transfer has been introduced in 2020 to organize auctions for covered entities to enhance market efficiency for the secondary market. Other products include CCRs, EHCRs. They are also traded in the secondary market and all products are traded on CWAX exchange. For this market the compliance period is one calendar year from January to December and covered entities have until June to August for the following year to surrender allowances. So they surrender allowances in the following year for the previous year's emissions.



Hubei

- Launch: April 2014
- It covers around a quarter of the province's emissions.
- Hubei's system covers around 339 entities in a broad range of industrial sub-sectors (till year 2021). Unlike the other Chinese pilots, Hubei does not pre-define which sectors are covered under its ETS; rather, it sets a threshold which applies to all industrial sectors.
- Allowances have primarily been freely allocated, through both grandfathering and benchmarking, although several ad hoc auctions have been held since 2014.
- Hubei has been one of the most active regional markets in China in terms of trading and has the second largest market in terms of spot trading volume, after Guangdong. It is also one of the regional pioneers for allowance forward trading in China.

Next we have Hubei market. It was launched in April 2014. It covers around a quarter of the province's emissions. Hubei's carbon market system covers around 339 entities and a broad range of industrial sub-sectors. Unlike other Chinese pilots, Hubei does not predefine which sectors are covered under its CTS rather it sets a threshold level which applies to all the industrial sectors. Allowances have primarily been freely allocated through both grandfathering and benchmarking approaches although they have several ad hoc auctions which are held since 2014. And Hubei has been one of the most active regional markets in China in terms of trading and has the largest market in terms of spot trading volume after Guangdong.



Hubei

- **MarketStabilityProvisions**
- **RESERVE** 8% of the total cap is kept as a government reserve for market stabilization.
- **INTERVENTION** In case of market fluctuations, severe supply-demand imbalances, or liquidity issues, the Hubei EEB – in consultation with an advisory committee consisting of government institutions and other stakeholders – can buy or sell allowances in order to stabilize the market. Specifically, the Hubei EEB takes action if the allowance price reaches a low or high point six times during a 20-day period.
- **EXCHANGE** The exchange limits day-to-day price fluctuations to a 10% move in either direction.
- **Auctioning:** A small share of the annual cap can be auctioned. The main purpose of auctions is to promote price discovery and provide regulated entities with additional supply to meet their compliance demand. To date, auctions have been held on an ad hoc basis and took place in 2014, 2019, 2020, 2021 and 2022.
- Recent years have seen two auctions per year, with a first auction for regulated entities only and the second open to all participants.

It is also one of the regional pioneers for allowance forward trading in China. Next for Hubei the primary market for issuances include China Hubei exchange which organizes ad hoc auctions for the primary market. Since 2019 Hubei has held two separate rounds of auctions targeting different types of entities in each compliance year. The secondary market products include spot products with Hubei emission allowances or HBEAs and CCRs. The HBEA spot forward contract was introduced in 2016 but has not traded since May 2017 and China Hubei emission exchange manages trading of all the products. Coming to the compliance period, it is one calendared year from January to December.

The covered entities have until the last working day of May of the following year to surrender allowances. In most compliance years, the exact date for the covered entities to surrender allowances is set by the government on an annual basis and varies across the years. Coming to the market stability provisions, Hubei market has a provision for reserve which is 8% of the total cap kept as a government reserve for market stabilization. In terms of interventions, in case of market fluctuations or severe demand supply imbalances or liquidity issues, the Hubei exchange, Hubei EWB in consultation with an advisory committee consisting of government institutions and other stakeholders can buy or sell allowances in order to stabilize the market. Most specifically, the Hubei EWB takes action if the allowance price reaches a low or high point 6 times during a 20-day period.

Also the exchange sets day-to-day price fluctuation limit of 10% movement in either direction. The auctioning mechanism is also there where a small share of the annual cap can be auctioned. The main purpose of these auctions is to promote price discovery and provide regulated entities with additional supply to meet their compliance demand. Till date, auctions have been held on an ad hoc basis and they took place in 2014, 19, 20, 21

and 22. Moreover, recent years have seen two auctions per year with the first auction for regulated entities only and the second open to all the participants.



Shanghai

- The Shanghai was launched in November 2013 and was the second region to start its pilot ETS.
- It covers around 36% of the city's emissions.
- Phase One : 2013-2015, also known as the "trial phase"
- Phase Two: 2016-present

MARKET STABILITY PROVISIONS

- Exchange-
- Depending on transaction type, if prices vary by either 10% or 30% in one day, the SSEE can institute price stabilization measures such as temporarily suspending trading or imposing holding limits.
- Reserve-
- A small share of the annual cap can be kept in a reserve for auctioning before the end of the annual compliance cycle as a market stability measure

Next we have Shanghai exchange. Shanghai exchange was launched in November 2013 and was the second region to start its pilot ETS. It covered around 36% of the city's emissions. Phase 1 of this exchange from 2013 to 2015 is also known as the trial phase and phase 2 was 2016 to present. So, it has been implemented in two phases.

It also employs market stability provisions first from exchange. Depending upon the transaction type, if prices vary by 10% or 30% in one day, the SSEE exchange can institute price stabilization measures such as temporarily suspending the trading or imposing holding limits. For reserve, a small share of the annual cap can be kept in reserve for auctioning before the end of the annual compliance article as market stability reserve. Next coming to the market types. So first we have primary issuances where no set percentage of allowance are allocated by auctioning.



Shanghai

Market Types

- Primary: No set percentage of allowances are allocated via auctioning, though the Shanghai ETS regulations state that auctioning is to be introduced gradually. Ad hoc auctions have been held since 2014 to provide compliance entities with additional supply. In addition, further auctions have also been held since 2020 where institutional investors have also been allowed to participate.
- Secondary: Products include Shanghai Emission Allowances (SHEA), Shanghai Emission Allowance Forwards, and CCERs. SHEAs and CCERs are spot products.

Banking and Borrowing Rules

- Banking is allowed both within and across trading periods, with some restrictions for the latter. For banked allowances from the first trading period (2013-2015), only one-third per year could be used by compliance entities between 2016 and 2018. Allowances are bankable for institutional investors without such an annual maximum limit. Borrowing is not allowed.

Compliance Period

- One calendar year. Covered entities must surrender allowances in June of the following year.

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Though the Shanghai ETS regulations said that auctioning is to be introduced gradually. Secondly, ad hoc auctions have been held since 2014 to provide compliance entities with additional supply. In addition, further auctions have also been held since 2020 where institutional investors have been allowed to participate. Secondary market products include Shanghai emission allowances, Shanghai emission allowance forwards and CCRs, SHEAs and CCERs. These are spot products. In terms of banking and borrowing rules, banking is allowed both within and across trading periods with some restrictions for the latter.

For bank allowances from the first trading period 13 to 15, only one third per year could be used by compliance entities between 16 and 18. Allowances are bankable for institutional investors without such an annual maximum limit. Borrowing is not allowed. The compliance period runs calendar year to calendar year and covered entities must surrender allowances in June of the following year, following the current emission. To summarize, in this video, we discussed the market microstructure of Guangdong, Hubei and Shanghai.

In particular, we discussed the market dates, the implementation in phases, the market stability provisions, market types and banking borrowing rules and compliance period for these three markets. In this video, we will discuss the market microstructure of three key important markets including Shenzhen, Chongqing and Tianjin. To begin with, Shenzhen pilot market began in June 2013 and was the first of the Chinese pilot to start the operation. It covers around 36% of the city's emissions and it began in phases from 2013 onwards.

The methods included allowance allocation, benchmarking, grand parking and

auctioning. As per the latest regulations for auctioning, as per the provincial regulation for Shenzhen emission trading pilot scheme published in 2022, it says that allowances can be sold at auction or at fixed price. At least 3% of allowances should be auctioned. So far two auctions have been conducted in June 2014 and 2022 August. The compliance period runs from calendar-to-calendar year and covered entities have until the end of August of the following year to surrender allowances.

Next we have Tianjin pilot market. It was launched in December 2013. It covers around 50% of the city's emissions as per the 2020 data and emissions are covered for around 140 entities. It is currently running its first phase from 2014 onwards till present. And first the market types, primary allocations of allowances are freely allocated. So free allocation.

Tianjin climate exchange PCA organizes ad hoc auctions as well for primary market. Between 2019 and 2021, it held five auctions. In terms of secondary market trading, the products include spot Tianjin carbon emission allowances, PCAs and spot CCERs. Also Tianjin climate exchange manages trading of all the products. Next in terms of compliance period, it is one calendar year and covered entities have until the end of June of the following year to surrender allowances.

The average loss traded price in secondary market was around \$5.1 and total revenues since the beginning amounted to approximately \$22 million since the beginning of the program. Lastly, we have Chongqing pilot market. It was launched in June, 2014. This emission trading system covers around 51% of the city's emissions as per the 2020 data and 152 entities are covered.

It is running and implemented in one phase since 2014 and ongoing. In this market banking is allowed and borrowing is not allowed. In terms of market types, the primary allocations so far allowances are mainly allocated for pre and auctioning was introduced in 2021 without a fixed schedule. Two auctions have been held so far. The secondary market trading include products like spot market at Chongqing carbon emission trading center for trading of allowances, CCRs. Due to the financial market related regulations in China, no forward markets or derivatives are allowed yet.

In terms of market stability provisions, the draft measures state that a certain number of allowances from the cap could be set aside for several purposes including market stability. However, there are no details for the market stability mechanism yet. The compliance market runs from calendar year to calendar year. The exact date for the covered entities to surrender allowances is set by the government on an annual basis and varies across the years. To summarize, in this video we discussed the key market microstructure details of the Chinese pilot market including Tianjin, Chongqing and Shenzhen.

The details included their launch, the coverage of the market, the implementation in phases, the provisions for banking borrowing, market ties including primary market issuances and the mechanism for secondary trading, the instrument traded in secondary markets. We also discussed their market stability provisions and the compliance period details. In this video, we will introduce China's national carbon market. China's national commission trading system or national carbon market began trading in July 2021 and currently operates in parallel with the number of pilot schemes, each is called pilot scheme. China's ability to peak emissions by 2030 and be carbon neutral by 2060 is called 3060 strategy which relies in part on its ability to demonstrate to the world that it has the necessary infrastructure in place to maintain the integrity of the system and has created to realize its 2060 strategy.



China's national ETS

- China's National ETS began trading in July 2021 and currently operates in parallel with a number of pilot schemes (each a "Pilot Scheme") with the objective of contributing to the effective control and gradual reduction of carbon emissions.
- China's ability to peak emissions by 2030 and be carbon neutral by 2060 (the "30/60 strategy").
- Currently only China Emissions Allowances (or "CEAs"), each representing one metric tonne of carbon dioxide emissions, may be traded on the National ETS
- China's national ETS is the world's largest in terms of covered emissions, estimated to cover more than 4 billion tCO₂ and accounting for over 40% of the country's carbon emissions.
- 2162 entities are covered under China national ETS (2020).
- China's National ETS is set to become the world's largest carbon market by both trading volume and value. The expansion of China's National ETS beyond its existing parameters has the capacity to revolutionise global carbon trading trends, including as the rising demand for removal-credits (a sizeable proportion of which will originate in China) causes the price of carbon to climb.

The Chinese national market or national ETS is a regulated cap and trade based system, it is a regulated cap and trade based system covering 2162 entities. These are called covered entities, each of which emit at least greater than 26000 tons of carbon in one or more years between 2013 and 19. The national ETS is a mandatory regulated scheme with which all covered entities must apply. First compliance period for the national ETS concluded at the end of 2021 with the Ministry of Ecology and Environment reporting that covered entities representing 99.

5% of the emissions have complied. Now, China's emission controls are expanding both in terms of industry sector coverage and the volume of energy consumed. While there is currently no timetable in place, the national entities will gradually expand to cover more

entities, more sectors and more products. Around 17 carbon intensive industries have been identified by the National Development and Reform Commission as candidates for coverage by the national ETS including iron, steel, non-ferrous metals, cement, flat glass, ceramic, paper, construction and non-ferrous metals and oil refining. Now, currently only China emission allowances, each representing one metric ton of carbon dioxide emissions are traded on national ETS. These CA's are allocated free of charge at entity level according to 70% of historical output multiplied by the benchmark factor that is according to the volume and source of the energy produced.



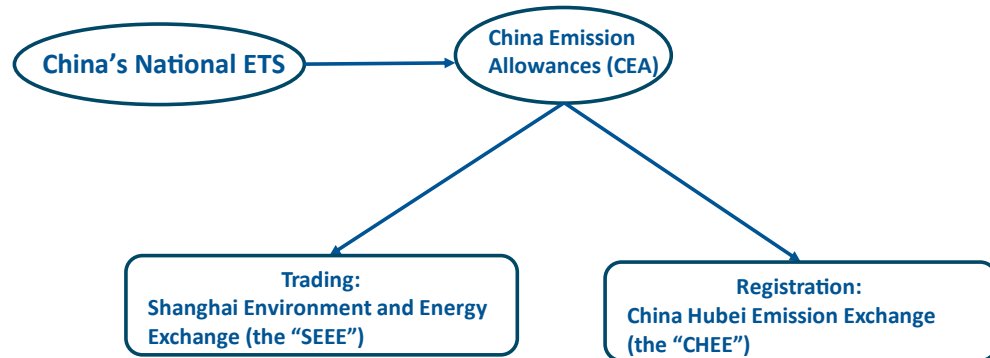
China's national ETS

- **Participants** currently only onshore Covered Entities may trade CEAs.
- **Exchanges** the Shanghai Environment and Energy Exchange (the "SEEE") is responsible for trading CEAs whilst the China Hubei Emission Exchange (the "CHEE") is responsible for registration of CEAs.
- **Trading method** trading of CEAs is conducted electronically and on spot delivery terms (i.e. trading carbon certificates with immediate payment and delivery) by way of 'one-way bidding' or 'transfer by agreement'.
- **Trading declaration** shall include the trader's number, trading number, code of product, trading direction, declaration amount, declaration price and other information required by the SEEE.
- **Single trades** the maximum threshold for a single trade is 100,000 tonnes of carbon and pricing may fluctuate +/- 10% from the previous day's trading.
- **Block trades** the minimum threshold for a block trade is 100,000 tonnes of carbon and pricing may fluctuate +/- 30% from the previous day's trading. Block trades may only be carried out by way of 'one way bidding'.
- **Trading accounts** a Covered Entity may open a single account, in its own name, in order to trade CEAs.
- **Restrictions on same-day transfer** CEAs that have been purchased may not be sold again on the same day

Chinese ETS is the world's largest in terms of covered emissions estimated to cover more than 4 billion ton of CO₂ and accounting for 40% of the country's emissions. The emissions cap under the national ETS is the aggregate of all the CEA's that are allocated to all the covered entities for the relevant period and the cap is currently set to by reference to 2019-2020 output levels. Historically, China has only set intensity-based target rather than absolute cap on tons of carbon dioxide emitted. Also, China has indicated that it will move away from the free allocation of CEA's towards a paid, a bidding auction kind of system in alignment with its 60-30 strategy.



China's National ETS



CEA's, these CEA's can be traded on a dedicated platform operated by Shanghai Environment and Energy Exchange, SEEE. Covered entities must surrender sufficient CA's to cover their actual emissions for the relevant compliance period after surrendering the volume of CEA's required to offset their actual emissions. Covered entities with surplus CEA's may either sell them to covered entities whose actual emissions exceed their CEA location or carry them to the next compliance period. Trading of CEA's is currently on spot terms only. However, the China Securities Regulatory Commission issued a statement confirming that it plans to establish a carbon emission futures market to supplement the national ETS to be operated by the Gaozhou Futures Exchange.

However, there is no currently timetable in place. Lastly, the covered entities may offset up to 5% of their annual verified emissions for compliance purposes through the purchase of CCR, China Certified Emission Reductions, CCERs. It is intended that the pilot schemes will eventually form part of the national ETS. However, there is no currently timetable for the same. It is expected that disintegration of pilot schemes into national ETS will take place on a staggered basis.

This CCR is essentially an offset mechanism. It was launched in 2013. So the CCER scheme was halted in 2017 and then resurrected in 2021 when the ME issued a notice allowing covered entities to use pre-existing CCERs to offset up to 5% of their annual verified emissions for the compliance purposes with no restrictions on project type or vintage. The national trading platform for CCR is hosted by Beijing Green Exchange. China is expected to relaunch the national CCR scheme during 2020 in order to reduce the balance between the fossil fuel-based energy producers and renewable energy companies. These CCERs may be traded within the voluntary market subject to compliance with the

rules applicable to the applicable pilot scheme and participants may trade CCERs within the pilot scheme even if the project generating the CECR is located in a different region. The following are some of the key provisions under the national measures and the implementation rules for China's national ETS.

The participants currently only onshore covered entities may trade CEAs, exchanges the Shanghai environment and energy exchanges SEEE is responsible for trading of CEAs while the China Hubei emission exchange SEEE is responsible for registration of CEAs. Trading method, trading of CAs is conducted electronically and on-spot delivery terms that is trading carbon certificates with immediate payment and delivery by way of one-way bidding or transfer of agreement. In terms of trading declaration, it shall include the trader's number, trading number, code of product, trading direction, declaration amount, declaration price and other information as may be required by AAS T equally. Single trades, the maximum threshold for a single trade is 1 lakh tonne of carbon and pricing may fluctuate plus minus 10 percent from the previous day trading. For block trades, the minimum threshold for a block trade is 1 lakh tons of carbon and the pricing may fluctuate 30 percent from the previous day trading.

So, block trades may only be carried out by one-way bidding. Trading accounts, a covered entity may open a single account in its own name in order to trade CEAs and restrictions on the same day transfer. So, CEAs that have been purchased may not be sold again on the same day. The settlement period here are the trades are settled on the delivery versus payment delivery versus payment basis at the end of the trading day. So, to summarize the Chinese national ETS, it is regulated by ME which operates through the exchanges of two of the pilot schemes. First the Shanghai environment and energy exchange, SEE which is responsible for trading of CEAs and the China-Hubei exchange, emission exchange which is responsible for registration of CEAs.

The legal basis and governance structure of the national ETS was established in 2021 percent to the national measures of the administration of trading and carbon emission rights, the national measures. The national measures are supplemented by the detailed implementation rules relating to the registration, trading and settlement of CEAs which is China emission allowances which together form the legislative framework and basis for the operation of national ETS. These CEAs can be traded on a dedicated platform operated by the Shanghai environment and energy exchange and covered entities must surrender sufficient CEAs to cover their actual emissions for the relevant compliance period. After surrendering the volume of CAs required to offset their actual emissions, the covered entities with surplus CEAs may either sell them to the covered entities whose actual emissions exceed their CEA location or carry the surplus CEAs over to the next compliance period. However, covered entities may offset up to 5% of their annual verified emissions

for compliance purposes through the purchase of CCER generated through a pilot scheme.

To summarize, in this video we discussed the mechanisms and operation of Chinese national ETS.



UK-ETS

- The UK Emissions Trading Scheme (UK ETS) began operating in January 2021, following the departure of the UK (excluding power operators located in Northern Ireland) from the EU ETS.
- Verified emissions from stationary UK ETS operators currently cover around a quarter of the UK's territorial GHG emissions.
- The first phase of the UK ETS runs until 2030.
- The UK ETS covers around 1,000 entities in the power and industrial sectors, as well as aviation within the UK and flights departing the UK to Switzerland and the European Economic Area (EEA).
- Allowances are primarily allocated through auctioning, with a portion freely allocated to safeguard the competitiveness of emissions-intensive trade-exposed (EITE) sectors and minimize the risk of carbon leakage.
- As of 2021, 1006 entities are covered under UK-ETS
- Compliance Period One calendar year. Covered entities have until the end of April of the following year to surrender allowances. These provisions are the same as under the EU ETS
- Trading hours: 7:00 AM - 5:00 PM (UK GMT)

In this video, we will discuss the key features of UK emission trading system. To begin with, the UK emission trading system started operating in 2021 following the departure of UK from European Union, UTS. Verified emissions from the stationary UK ETS operators currently cover around a quarter of the UK's territorial greenhouse gas emissions. The first phase of UK ETS runs till 2030. UK ETS covers around 1000 entities in the power industrial sectors as well as aviation within the UK and flights departing from UK to Switzerland and the European Economic Area.

Allowances are primarily allocated through auctioning, with a portion freely allocated to safeguard the competitiveness of emissions-intensive trade-exposed sectors and minimize the risk of carbon leakage. As of 2021, 1000 entities are covered under UK ETS. Compliance period runs from calendar year to calendar year. Other entities have until the end of April of the following year to surrender the allowances.



UK-ETS

- Market Types:
- Primary: The majority of allowances are allocated through auctioning. Auctions are held every two weeks, with dates and allowance amounts set out in the auction calendar. Compliance entities, financial institutions, and business groupings and public bodies acting on behalf of compliance entities can participate. Auctions are managed by ICE Futures Europe.
- Secondary: UKAs are traded on the ICE Futures Europe exchange. Contracts for daily futures, futures and options on futures contracts are available. Participants in the secondary market must meet the requirements of the ICE Futures Exchange and have an account in the UK registry. Participants may also trade allowances over the counter.

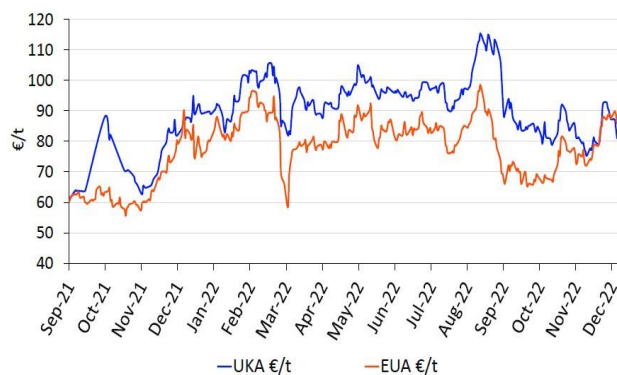
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These provisions are the same as under EU-ETS. The trading hours are from 7 am to 5 pm UK time. In terms of market types, the primary issuances take place through majority of allowances are allocated through auctioning. Auctioning is held every two weeks with dates and allowances amount set out in the auction calendar. Compliance entities, financial institutions and business groupings and public bodies acting on behalf of compliance entities can participate. Auctions are managed through ICE Futures Europe.



EU-ETS vs UK-ETS



Given that the size of the UK ETS (in terms of covered emissions) is about seven percent of its EU counterpart, the two schemes are comparable in terms of turnover. Total market value was also similar proportionally, with the UK ETS transactions collectively worth some €47 billion or about seven percent of the EU ETS's €751 billion market value in 2022.

Source: Refinitiv Report-2023

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Secondary market instruments include UKs which are traded on the ICE Futures Europe exchange. Contracts for daily futures, futures and options on futures contracts are available. Participants in the secondary market must meet the requirements of the ICE Futures Exchange and have an account in the UK registry. Participants may also trade

allowances over the counter. Looking at the price fluctuations of allowances in UTS and UK ETS, it seems that the prices at UK ETS are slightly higher but they move pretty much in tangent with the EUA allowances.

As we can see here, there seems to be high correlation and they fluctuate together. And given that the size of UK ETS is about 7% of its U counterpart, the turnover is also similar in terms of the fraction. For example, the total market value was similar proportionally with the UK ETS transactions collectively worth around 47 billion or about 7% of the EUETS 751 billion market value in 2022 and they seem to be pretty much co-integrated. In fact, UK ETS the installations were earlier part of EUETS only. To summarize in this video, we discussed the market microstructure and key features of UK ETS which is one of the major trading systems, emission trading systems in the world. To summarize this video, international credits are financial instruments that represent 1 tonne of CO₂ removed or reduced from the atmosphere as a result of an emission reduction project.

Predominantly, two such mechanisms exist namely Clean Development Mechanism, CDM and Joint Implementation JI. The CDM mechanism allows emission reduction or emission removal projects in developing countries to earn certified emission reductions or CERs, each equivalent to 1 tonne of CO₂. These CERs can be traded and sold and used by industrialized countries to meet part of their emission reduction targets under the Kyoto Protocol. Joint implementation that is JI represents a way for industrialized countries or annex one parties with a commitment inscribed Kyoto Protocol to take part in emission reduction projects or a project that enhances removals by sinks in the territory of another industrialized country that is annex one party with an annex B commitment. It differs from the Clean Development Mechanism in the sense that it represents a way for industrialized countries that is annex one parties with a commitment inscribed in annex -B of the Kyoto Protocol to take part in emission reduction projects or a project that enhances removals by sinks in the territory of another industrialized country for example annex one party with an annex B commitment.

Next we discuss the Chinese ETS market. China's emission trading system comprises one national and eight regional pilot markets including Beijing, Guangdong, Hubei, Shanghai, Shenzhen, Tianjin Chongqing and Fujian. The total volume in these markets amounted to 51.52 million tonne in terms of volume and 370.32 million euros in terms of value. The average price was 7.19 euro per tonne. All these markets include heavily traded spot markets including China certified emission reduction credits. The launch allocation is done through grandfathering, benchmarking and auction mechanisms. The compliance period followed is calendar year. These markets also create provisions for market stability in the form of circuit breakers and allowance results.

Lastly, UK ETS has grown into a successful scheme after Brexit. The price evolution in the UK ETS is similar and heavily correlated with the European Union emission trading system.