2017
THE PROGRESS OF CHINA'S CARBON MARKET

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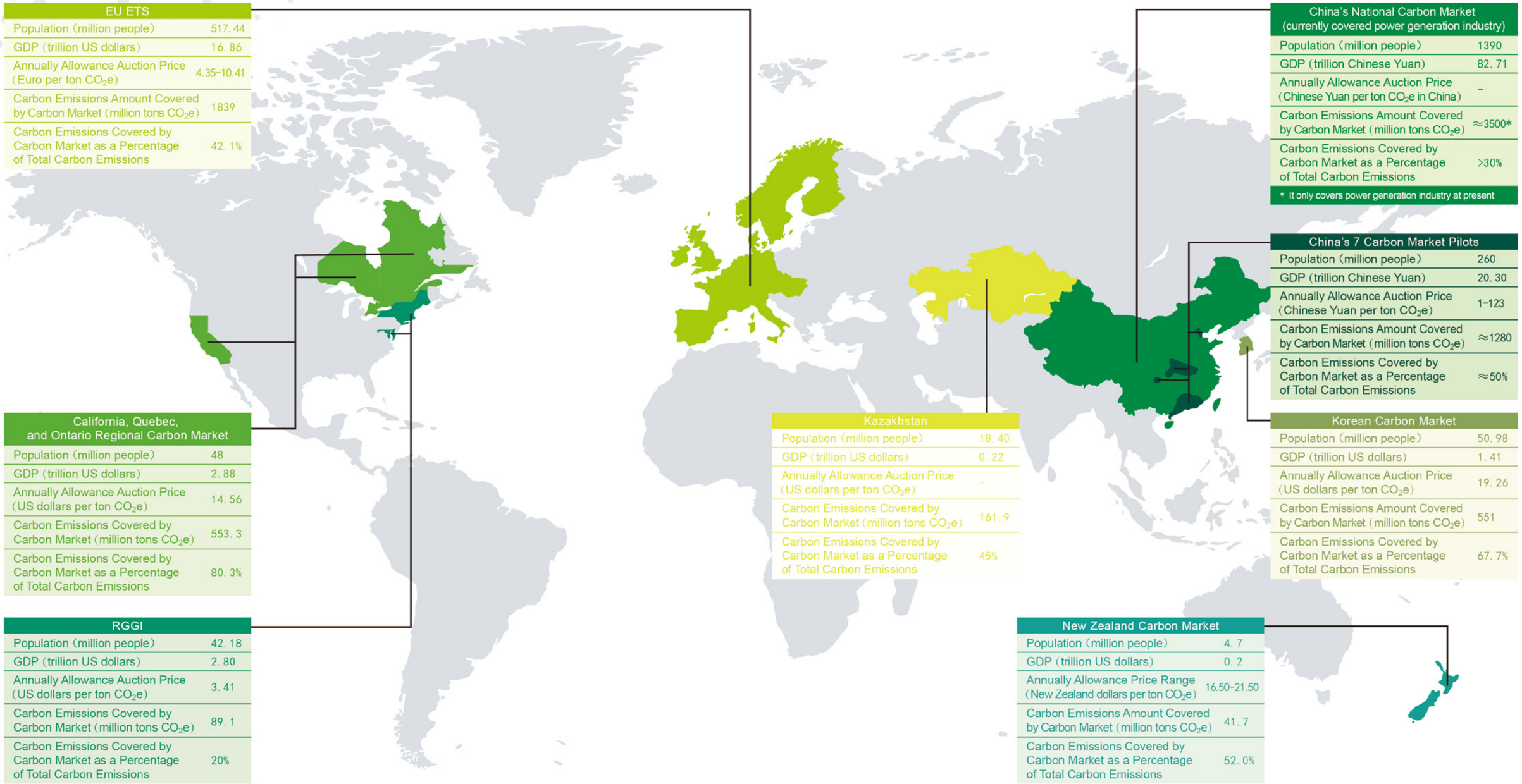
国家发展和改革委员会能源研究所
Energy Research Institute National Development And Reform Commission

INTRODUCTION

Climate change is the biggest global challenge of the 21st century, and impacts the survival and development of mankind. The Paris Agreement is the international climate agreement that came into force in 2016. It reflects the broad consensus that nations need to work together to address climate change, and clearly states the goal of “holding the increase in the global average temperature to well below 2°C above pre-industrial levels”. It requires that the global carbon emissions peak as soon as possible and achieve zero emissions in the second half of this century.

“Climate Change is the greatest market failure the world has ever seen” .Taxation and environmental markets are two basic economic policy instruments that can help solve for the market failure and have achieved good results when used to manage traditional environmental pollutants. Carbon trading is the policy mechanism that uses the market to promote greenhouse gas (GHG) emission reductions, requires entities emitting GHGs to pay for emitting, reflects the "polluter pays" principle, helps reduce the overall cost to society of the reduction of carbon emissions, and is considered the "jewel in the crown" of climate policies. More and more countries choose to promote low-carbon economic and social transformation through carbon trading.



EU ETS	
Population (million people)	517. 44
GDP (trillion US dollars)	16. 86
Annually Allowance Auction Price (Euro per ton CO_2e)	4.35–10.41
Carbon Emissions Amount Covered by Carbon Market (million tons CO_2e)	1839
Carbon Emissions Covered by Carbon Market as a Percentage of Total Carbon Emissions	42. 1%

China's National Carbon Market (currently covered power generation industry)	
Population (million people)	1390
GDP (trillion Chinese Yuan)	82. 71
Annually Allowance Auction Price (Chinese Yuan per ton CO_2e in China)	–
Carbon Emissions Amount Covered by Carbon Market (million tons CO_2e)	≈3500*
Carbon Emissions Covered by Carbon Market as a Percentage of Total Carbon Emissions	>30%

* It only covers power generation industry at present

China's 7 Carbon Market Pilots	
Population (million people)	260
GDP (trillion Chinese Yuan)	20. 30
Annually Allowance Auction Price (Chinese Yuan per ton CO_2e)	1–123
Carbon Emissions Amount Covered by Carbon Market (million tons CO_2e)	≈1280
Carbon Emissions Covered by Carbon Market as a Percentage of Total Carbon Emissions	≈50%

California, Quebec, and Ontario Regional Carbon Market	
Population (million people)	48
GDP (trillion US dollars)	2. 88
Annually Allowance Auction Price (US dollars per ton CO_2e)	14. 56
Carbon Emissions Covered by Carbon Market (million tons CO_2e)	553. 3
Carbon Emissions Covered by Carbon Market as a Percentage of Total Carbon Emissions	80. 3%

Kazakhstan	
Population (million people)	18. 40
GDP (trillion US dollars)	0. 22
Annually Allowance Auction Price (US dollars per ton CO_2e)	–
Carbon Emissions Covered by Carbon Market (million tons CO_2e)	161. 9
Carbon Emissions Covered by Carbon Market as a Percentage of Total Carbon Emissions	45%

Korean Carbon Market	
Population (million people)	50. 98
GDP (trillion US dollars)	1. 41
Annually Allowance Auction Price (US dollars per ton CO_2e)	19. 26
Carbon Emissions Amount Covered by Carbon Market (million tons CO_2e)	551
Carbon Emissions Covered by Carbon Market as a Percentage of Total Carbon Emissions	67. 7%

RGGI	
Population (million people)	42. 18
GDP (trillion US dollars)	2. 80
Annually Allowance Auction Price (US dollars per ton CO_2e)	3. 41
Carbon Emissions Covered by Carbon Market (million tons CO_2e)	89. 1
Carbon Emissions Covered by Carbon Market as a Percentage of Total Carbon Emissions	20%

New Zealand Carbon Market	
Population (million people)	4. 7
GDP (trillion US dollars)	0. 2
Annually Allowance Price Range (New Zealand dollars per ton CO_2e)	16.50–21.50
Carbon Emissions Amount Covered by Carbon Market (million tons CO_2e)	41. 7
Carbon Emissions Covered by Carbon Market as a Percentage of Total Carbon Emissions	52. 0%

GLOBAL CARBON MARKET DEVELOPMENT STATUS

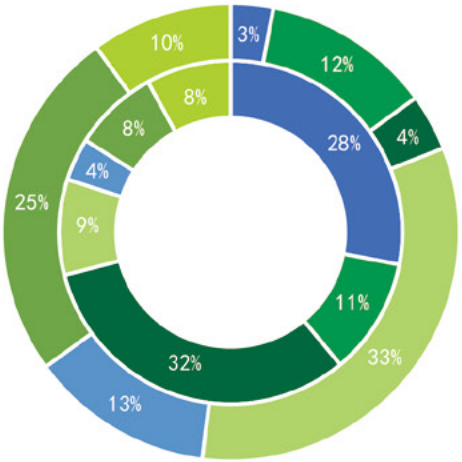
At present, 21 regional carbon markets are in operation, covering 51 countries, states, and provinces around the world. These regional markets account for 15% of global carbon emis sions and 50% of the world economy. Another 5 regional markets are in planning stage. While, about 40% of the 158 submitted Nationally Determined Contributions (NDCs) documents plan to use carbon market for achieving their carbon emission reduction targets.

CHINA'S CARBON MARKET PILOTS DEVELOPMENT STATUS

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 systems. The pilots made great efforts in system design, technical development and capacity building. 7 pilot carbon markets with different characteristics were launched between 2013 and 2014.

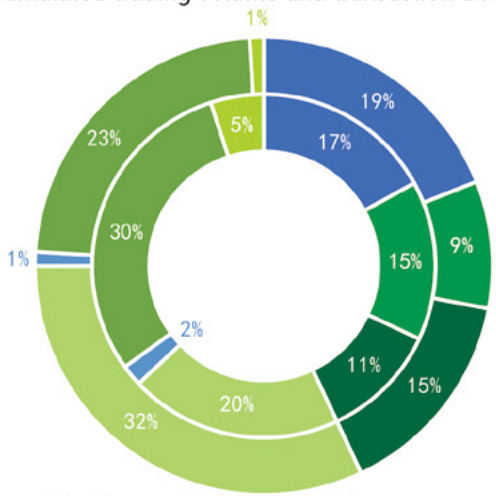
By the end of September 2017, these pilots covered almost 3,000 entities from more than 20 industry sectors. The total trading volume reached 200 million tCO_2e, and total trading value was about 45.1 billion yuan with a price range between 1-123 yuan/tCO_2e. China Certified Emission Reduction (CCER) is allowed to be used for compliance purpose and its total traded volume is 130 million tCO_2e with a total value of 920 million yuan.

Entities amount and carbon emissions amount



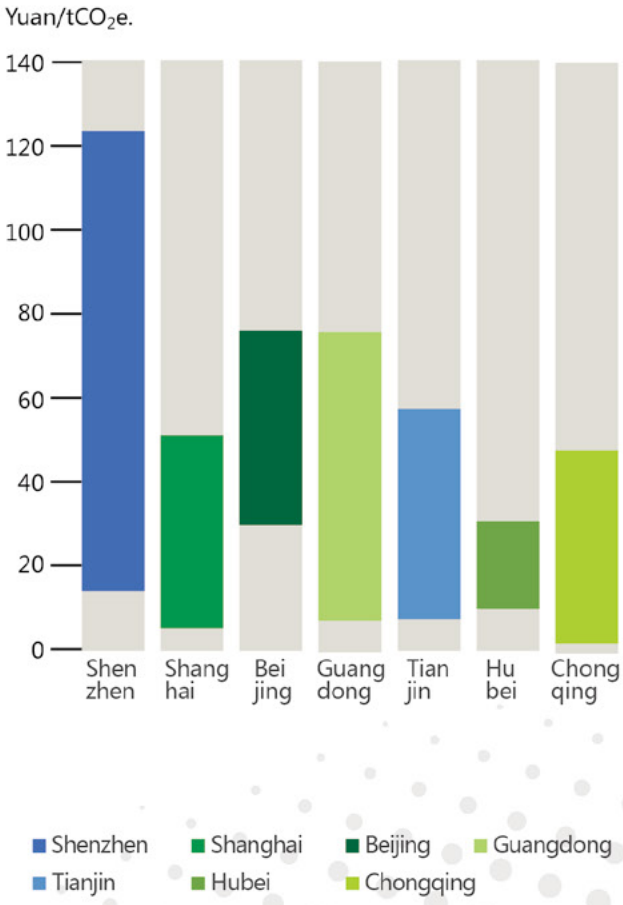
Inner circle: Entities amount
Outer circle: Carbon emissions amount

Accumulated trading volume and transaction amount



Inner circle: Accumulated trading volume
Outer circle: Accumulated Trading Value

Secondary market carbon price range by pilots



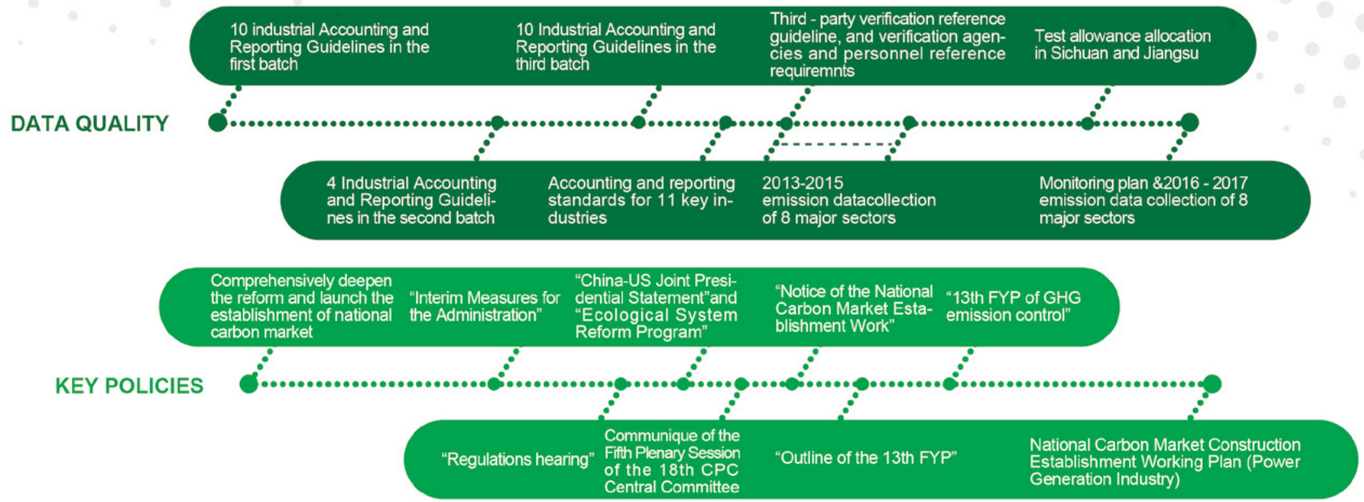
PROGRESS OF CHINA NATIONAL CARBON MARKET DEVELOPMENT

History of China National Carbon Market Development

In 2013, the Third Plenary Session of the 18th CPC Central Committee passed *The Decision of the CPC Central Committee on Several Important Issues for Comprehensively Deepening the Reform*, which identified the establishment of China national carbon market as one of the key tasks of China's comprehensive in-depth reform. It also marks China's formal entry into the national carbon market establishment phase.

The 13th Five-year Plan together with a series of key national policy documents emphasis the requirements of building a national carbon market, which illustrated the Chinese government's determination to build a unified national carbon market. *Interim Measures for the Carbon Emissions Trading Management* firstly built the overall framework of the national carbon market, while legislation process of national carbon market continued to move forward. Data quality and foundation of national carbon market was strengthened, as a result of continuous improvement of industrial carbon emissions monitoring, reporting, and verification (MRV) rules and standards, the progress made in third party verification agencies selection, and key emission entities' historical carbon emissions verification. The market foundation became more solid and stronger with establishment and operation of eight national carbon market capacity building centers as well as announcement to build key supporting infrastructures. The establishment of National Carbon Market Facilitative Office and actions taken by local governments and large scale enterprises also provided critical supports for the launch of national carbon market.

In December 2017, with the efforts from multiple stake holders, a press conference to launch China national carbon emission trading system and the issuance of the *National Carbon Emission Trading Market Establishment Working Plan (Power Generation Industry)* marked the completion of the overall design of the national carbon trading system, thus the establishment of national carbon market has stepped into a new stage.


DATA QUALITY
10 industrial Accounting and Reporting Guidelines in the first batch
10 Industrial Accounting and Reporting Guidelines in the third batch
Third - party verification reference guideline, and verification agencies and personnel reference requiremnts
Test allowance allocation in Sichuan and Jiangsu
4 Industrial Accounting and Reporting Guidelines in the second batch
Accounting and reporting standards for 11 key industries
2013-2015 emission datacollection of 8 major sectors
Monitoring plan &2016 - 2017 emission data collection of 8 major sectors
KEY POLICIES
Comprehensively deepen the reform and launch the establishment of national carbon market
"Interim Measures for the Administration"
"China-US Joint Presidential Statement"and "Ecological System Reform Program"
"Notice of the National Carbon Market Establishment Work"
"13th FYP of GHG emission control"
"Regulations hearing"
Communique of the Fifth Plenary Session of the 18th CPC Central Committee
"Outline of the 13th FYP"
National Carbon Market Construction Establishment Working Plan (Power Generation Industry)
Shanghai and Beijing pilots launch
Gangdong and Tianjin pilots launch
Chongqing pilots launch
kick off preparation of pilot carbon markets
Shenzhen pilot launch
Hubei pilots launch
Fujian market launch
Infrastructure period
Simulation run period
Deepening and perfecting period
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
SUPPORTING SYSTEMS
National CCER Registry
Bidding of national carbon registry and trading system
Construction of carbon emission data direct reporting system
Decision of Hubei and Shanghai to lead the construction of the national carbon registry and trading system
CAPACITY BUILDING
National Carbon Market Capacity Building (Shen zhen) Center
National Carbon Market Capacity Building (Guangdong) Center, (Beijing) Center,(Chongqing) Center
National Carbon Market Facilitative Office
National Carbon Market Capacity Building (Hubei) Center
National Carbon Market Capacity Building (Chengdu) Center,(Shanghai) Center
National Carbon Market Capacity Building (Tianjin) Center

Current China national carbon market system design and operational processes

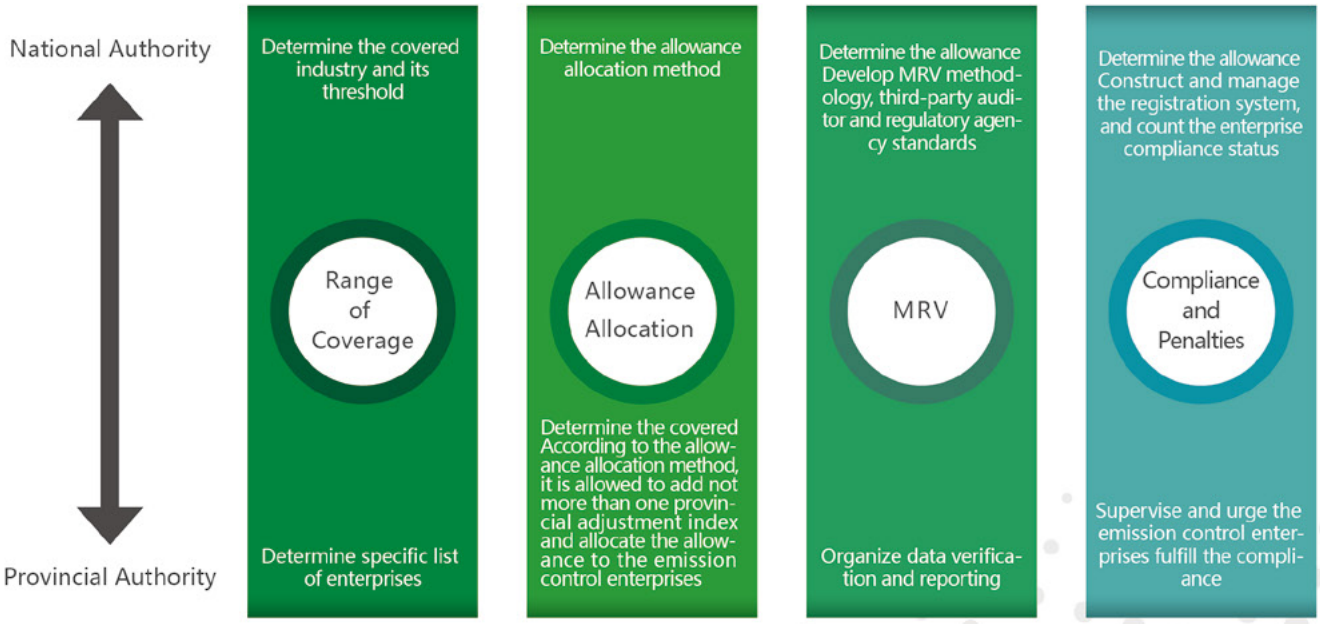
Overall Ideology

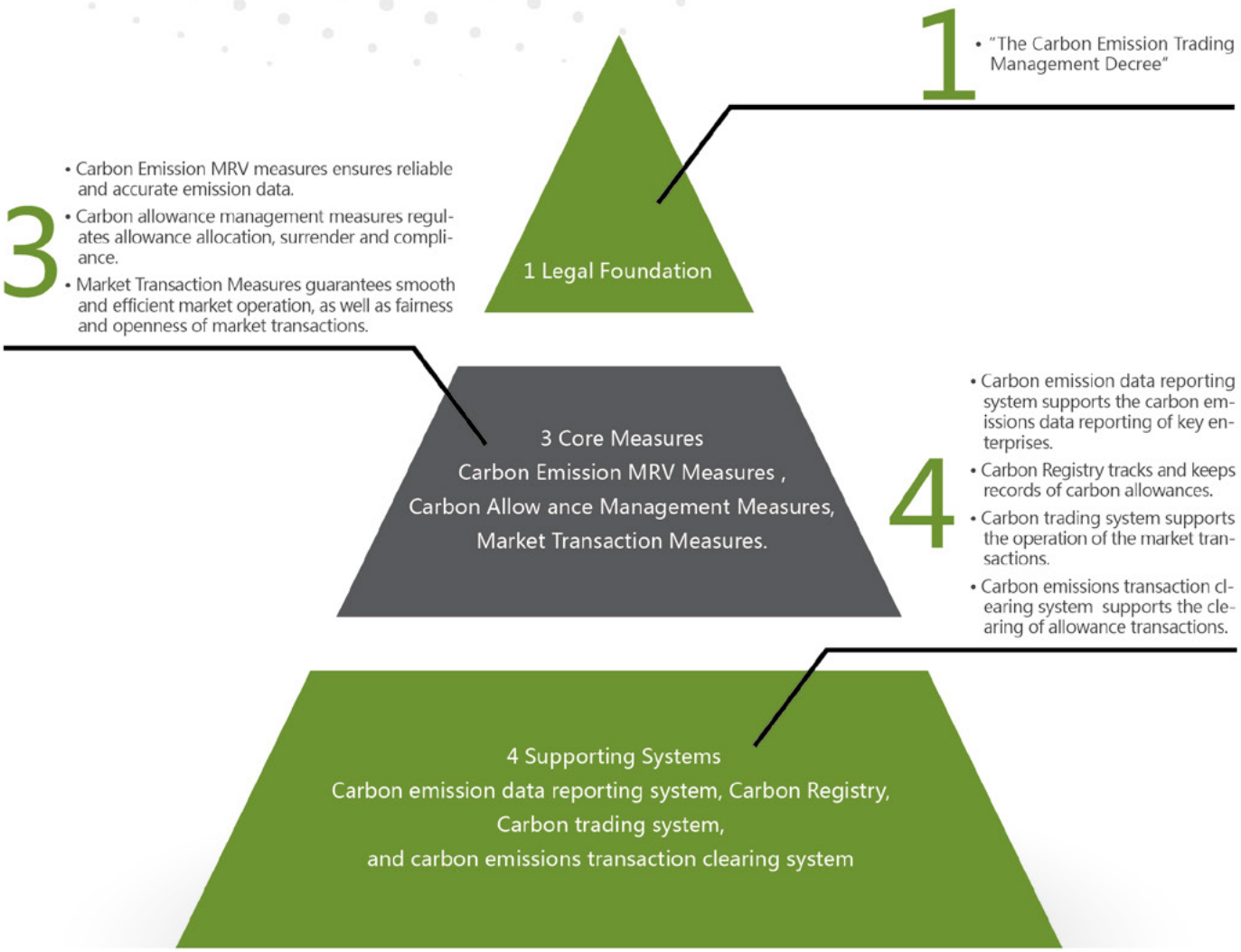
The government identify key sectors and threshold of covered companies, who receive carbon emission allowance from the government at a yearly basis. Covered companies shall monitor and report their carbon emissions, and surrender the allowances that equals to their actual carbon emissions to the government annually to fulfill their compliance obligation.

Market Framework

The basic framework of China's national carbon market is "1+3+4", which means one Management Decree as the legal basis, three core management measures, and four supporting infrastructure systems.

National Carbon Market's National and Provincial Management Systems



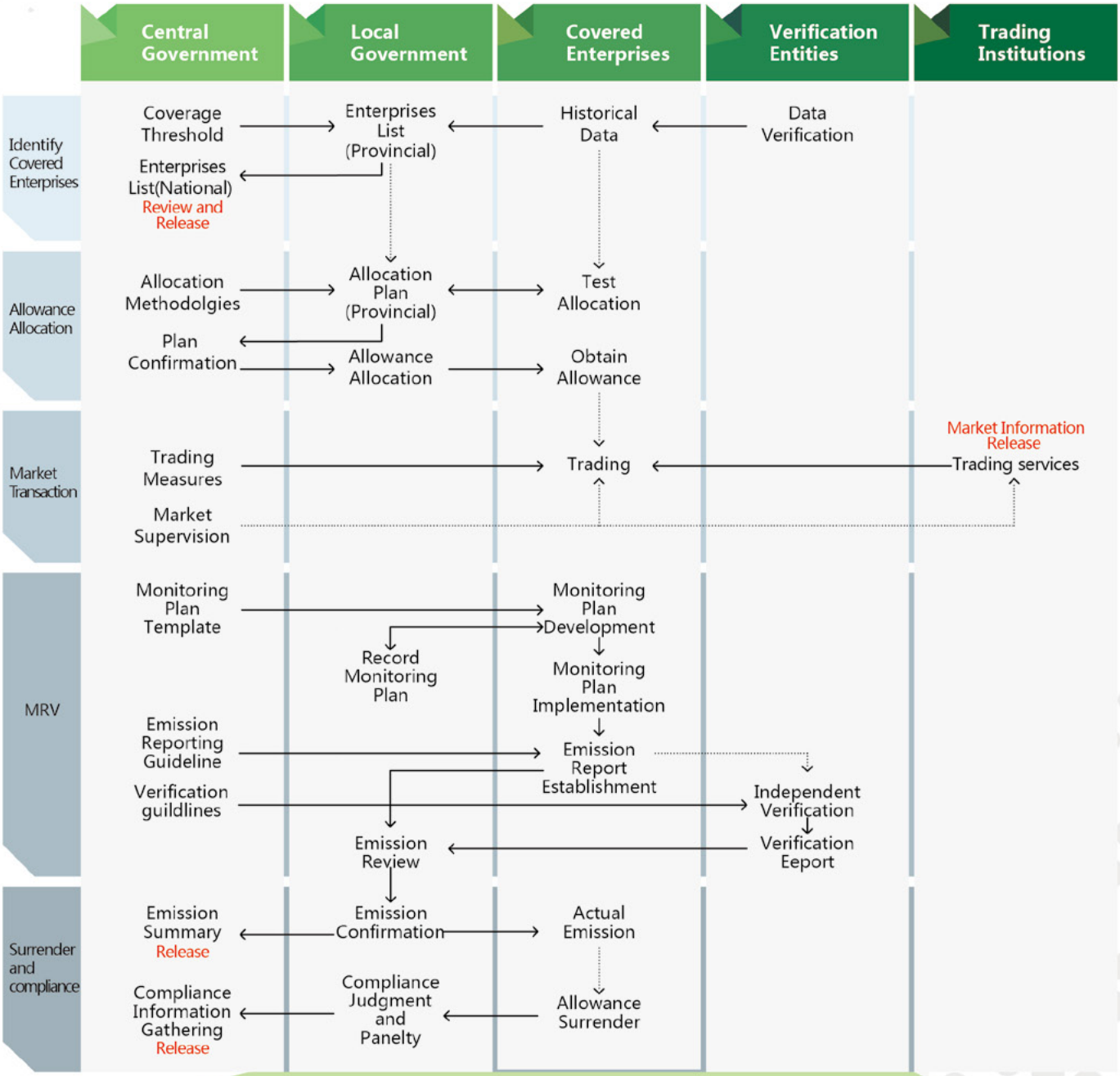

1
• "The Carbon Emission Trading Management Decree"
1 Legal Foundation
3
• Carbon Emission MRV measures ensures reliable and accurate emission data.
• Carbon allowance management measures regulates allowance allocation, surrender and compliance.
• Market Transaction Measures guarantees smooth and efficient market operation, as well as fairness and openness of market transactions.
3 Core Measures
Carbon Emission MRV Measures ,
Carbon Allow ance Management Measures,
Market Transaction Measures.
4
• Carbon emission data reporting system supports the carbon emissions data reporting of key enterprises.
• Carbon Registry tracks and keeps records of carbon allowances.
• Carbon trading system supports the operation of the market transactions.
• Carbon emissions transaction clearing system supports the clearing of allowance transactions.
4 Supporting Systems
Carbon emission data reporting system, Carbon Registry,
Carbon trading system,
and carbon emissions transaction clearing system

Operation Process

The operation of the market consists of five steps: determination of the list of covered companies, allowance allocation, trading, MRV, and compliance.

The role of the government is to formulate measures and rules, supervise market activities, and provide relevant services. The central and local governments have different focuses on formulating implementing measurements and rules. Covered enterprises shall participate in various processes, includes accounting and reporting their carbon emissions accurately and compliance on time. Third-party verification entities and trading institutions provide enterprise's carbon emissions verification and market transactions services respectively.

National carbon market operation flow chart



CHINA'S NATIONAL CARBON MARKET DEVELOPMENT PROSPECTS

In December 2017, the launch of China national carbon market marks the completion of the market top level design. Building of a carbon trading system is an important and complicated institutional innovation. It requires an effective management mechanism, a robust legislation system, a reliable trading system, accurate emission data and strong capacity at all levels. China still has a long way to go to establish a carbon market with clear authorization, strict regulation, smooth transaction, efficient supervision, that is open, transparent, and have significant international influence. In order to achieve this goal, China needs to issue detailed and operable market rules, establish a corresponding support and management system, therefore accelerate the pace toward building of a full operation carbon market.

ITEMS		STATUS	DEGREE OF COMPLETION	RECENT DIRECTION	URGENCY
Detailed operational elements and rules	Covered Enterprises	•All provinces have completed and submit the list of covered enterprises (over 26,000t CO_2e per year emission in 8 key industries)	◓	•Disclose the list of covered enterprises in power generation industry (over 1,700 enterprises)	★★★
	Allowance allocation	•State Council has approved the total emission allowance amount setting and the allocation principle method (free allocation in the initial phase, methods include grandfathering, historical intensity and benchmarking) •Allowance allocation methodology for key industries have preliminarily formulated. Power generation industry expected to use benchmark method. Test allocation were done in some provinces	◓	•Disclose the allowance allocation standard and method for power generation industry (total cap setting, pre-allocation, post-adjustment, and detailed measures) •Clarify the emission allowance management method of new entrants and closing enterprises	★★★
	Monitoring	•The template of emission monitoring plan and the verification reference guide of emission monitoring plan have been released	◓	•Provinces supervise covered enterprises to develop and implement monitoring plan	★★★
	Reporting	•24 industry MRV guidelines and 11 national MRV standards for key industry are released •2013-2015 historical carbon emission data of covered enterprises is collected, and 2016 and 2017 emission data collection is in process	◓	•Provinces shall report emission data on time •Unify the technical details in relevant MRV guidelines, national standards and supplementary data form	★★★
	Verification	•The third-party verification entities and verifiers requirements and carbon emission verification reference guideline for enterprises have been published	◓	•Clarify the third-party verification entities and verifiers certification management requirements, and disclose the list of verification entities and verifiers •Refine the verification, its review process and operation standard	★★☆
	Trading Products	•Spot trading only in the initial phase, CCERs and other trading products will be added when conditions are mature	◓	•Define the timelines for adding other trading products	★☆☆
	Trading Method		○	•Clarify the specific rules of on-site trading and OTC trading	★☆☆
	Trading Entities	•Only covered enterprises are allow to trade in initial phase, and other institutions and individuals will be allowed to trade when conditions are mature	◓	•Clarify timelines and criteria for institutions and individuals to participate in market	★☆☆
	Compliance Mechanisms	•Compliance on a yearly basis •Penalty will be imposed to noncompliance enterprises, and information be recorded on the national credit information sharing platform	○	•Clarify the timeline of compliance, detailed penalty rules, offset mechanism, and emission allowance borrowing and banking measures	★★★
Supporting infrastructure systems	Data Reporting System	•Construction of the national level data reporting platform has been completed, and test run has been done. Some provinces and cities have built their own local level data direct reporting systems	◓	•Complete connection of different level of carbon emission data reporting system	★★☆
	Registration System	•Hubei leads the construction in cooperation with NDRC and other 8 provinces and cities •The CCER registry was online in 2015	◓	•Construct the national registry and its data center, connect registry with trading system, and establish corresponding management system	★★☆
	Trading System	•Shanghai leads the construction in cooperation with NDRC and other 8 provinces and cities	◓	•Construct the national carbon trading system and its data center, connect trading system with registry, and establish corresponding management system	★★☆
	Trading Clearing System		○	•Clarify leader of system construction, responsible institutions, and clearing methods •Clarify plan to link local exchanges with national clearing system	★☆☆
Legislation System		•*Interim Measures for the Carbon Emissions Trading Management* (departmental rules) has taken effect •Hearing and public consultation of 'National Carbon Emission Trading Management Decree' has been organized, and await the approval from the State Council. Enterprise carbon emission report management measures, market transaction management measures, and verification entities management measures are being drafted	◓	•Continue the work to pass the Management Decree and the process of formulating relevant regulations	★★☆
Market Management System		•Clarified the central and local 2-level management system	◓	•Clarify the regulatory measures of verification entities, trading institutes, clearing institutions, and investment institutes •Establish coordination mechanism between different government departments	★★☆

While refining the critical elements of market, the smooth operation of China's national carbon market also needs improvement of policies transparency and operability of rules, and market effectiveness, in order to ensure the institutional arrangement of carbon market meet the overall requirements of the China domestic ecological civilization construction.

Direction of Future Improvements of China's National Carbon Market Top-Level Design

Improve policy transparency	Enhance the rules operability	Ensure the market effectiveness
Define the roadmap of merging the pilot carbon markets with the national carbon market and the development of the national market	Clarify the policy cohesion between carbon trading policies and local low-carbon target assessment policies	Coordinate the carbon market operation with non-fossil energy resource management and environmental protection related tasks

The complexity of carbon market design imply that a carbon market cannot be established in a single step. China's future carbon market needs to uphold its initial goal of serving the GHG emission reduction, respect the law of market operation and co-evolve with economic and social development in the actual operation.

Impact of Current Carbon Market on Power Sector

Influence mechanism

All thermal power plants are covered by china's national carbon market, in which the actual constraints faced by each plant are mainly determined by its corresponding benchmark (kilowatt-hour carbon emissions). At present, non-fossil energy power plants are not directly affected by the carbon market.

Carbon emission reduction contributions

The carbon emission reduction potential in the power sector is mainly derived from the energy conservation of electricity consumption end user (reduction of unit GDP power consumption), power supply structure optimization (growth of non - fossil energy power generation) and fossil energy power plant efficiency improvement (reduction of kilowatt-hour carbon emissions). The carbon emission reduction potential from efficiency improvement is estimated to be 0.09 billion tCO_2 compared with 2016, in accordance with total fossil fuel power generation reaching 4.88 trillion kWh and its average efficiency of 305gce/kWh by 2020. However, an increase of 0.6 trillion kWh in non-fossil fuel power generation from 2016 level by 2020 will contribute 0.51 billion tCO_2 carbon emission reduction. That means, due to relatively limited efficiency improving potential for fossil fuel power generation and fixed power price system, the emission reduction can be directly touched by carbon market only accounts for approximate 20% of the total.

Compliance cost

The compliance cost of each thermal power plant is determined by the difference between its own carbon intensity and benchmark, the total amount of power generation, and the market carbon price. According to the 11 benchmark set for the thermal power sector, the average benchmark of coal fired power plants is about 0.883tCO_2/MWh based on the weighted average electricity production for all types of power plants in 2015. If the average power generation carbon intensity of the coal fired power sector in 2020 is reduced to 0.893tCO_2/MWh and the carbon price is 30 yuan/tCO_2, the total compliance cost of the coal fired power plants is about 1 billion yuan, which is expected to account for less than 0.2% of its electricity sales income. The average compliance cost of the power plant with allowance deficit is about 1 million yuan.

The power sector is unique in the carbon market. Due to double counting of carbon emissions at the production side and consumption side, it is needed to further clarify the carbon emission reduction responsibilities of power producers and consumers. With majority state-owned enterprises and highly regulated policy environment, carbon trading system needs to be coherent with the state-owned enterprises reform and the electricity market reform. With the rapidly advancing of the new round of electric power system reform and the electricity price determined by markets, thermal power sector's carbon emission reduction costs will be transferred to the consumer side. Therefore, the sector's carbon allowance allocation method will need to be adjusted.

ANNEX: MILESTONES IN CHINA'S CARBON MARKET PROGRESS

1 Pilot phase

October 2011 -- NDRC published *Notice of Carbon Emission Trading Pilot*, which identify 7 carbon emission trading pilots

June 2013 -- Shenzhen pilot launched

November 2013 -- Shanghai and Beijing pilots launched

December 2013 -- Guangdong and Tianjin pilots launched

April 2014 -- Hubei pilot launched

June 2014 -- Chongqing pilot launched

2 National preparation phase

Major policy documents

November 2013 -- The Third Plenary Session of the 18th CPC Central Committee passed *The Decision of the CPC Central Committee on Several Important Issues for Comprehensively Deepening the Reform*. The national carbon market establishment has become one of the key tasks of China overall in-depth reform. This decision marks China's formal entry into the national carbon market establishment phase

December 2014 -- *Interim Measures for the Carbon Emissions Trading Management [No.17 Order of the NDRC of the People's Republic of China]* was officially promulgated, which defined the overall framework of the national carbon market.

July 2015 -- The NDRC organized a public hearing of *National Carbon Emissions Trading Management Decree (Draft)*.

September 2015 -- China-US Joint Presidential Statement on Climate Change indicated that China would launch a national carbon trading system in 2017.

September 2015 -- *Reform of the Ecological Civilization System* proposed to gradually establish the national carbon emission trading market, formulate the national total amount of carbon emission trading and allowance allocation methodologies, improve the carbon trading registration system, and establish the carbon emissions trading market supervision system ".

October 2015 -- *The Communique of the Fifth Plenary Session of the 18th* CPC Central Committee put forward the "establishment and improvement the initial allocation system of energy usage rights, water usage rights, pollution discharge rights, and carbon emission rights".

January 2016 -- Public consolation of *Carbon Emissions Trading Management Decree (Draft for Approval)*, and NDRC published *Notice on Earnestly Starting the Key Work of National Carbon Emission Trading Market*

March 2016 -- *Outline of the 13th Five-Year Plan for National Economic and Social Development of the People's Republic of* China put forward to promote the establishment of a unified national carbon emission trading market, the implementation of carbon emission reporting, verification, certification and allowance management system for key entities.

October 2016 -- *the 13th Five-Year Plan for Controlling Greenhouse Gas Emissions [GF[2016]No.61]* says in the part of "establishment and operation of the national carbon emission trading market", "establish the national carbon emission trading system, start the operation of the national carbon emission trading market, and strengthen the national carbon emission trading basis support capacity."

December 2017 -- *National Carbon Emission Trading Market Establishment Working Plan (Power Generation Industry) [FGQHG[2017]2191]*

Data quality

October 2013 -- Accounting method and reporting guideline for (10) greenhouse gas emission industries in the first batch

December 2014 -- Accounting method and reporting guideline for (4) greenhouse gas emission industries in the second batch

July 2015 -- Accounting method and reporting guideline for (10) greenhouse gas emission industries in the third batch

November 2015 -- Release the national standards of accounting method and reporting for 11 key greenhouse gas emissions industries

January 2016 -- Third-party verification reference guideline of national carbon emissions trading (No.57 file), Third-party verification agencies and personnel reference conditions of National carbon emissions trading

January ~ June 2016 -- Report the list of 8 key industries' enterprises and 2013~2015 carbon emission history data inventory

March 2016 -- Enterprises' greenhouse gas accounting and reporting guidelines self-study materials for 24 key industries in 3 batches

May 2017 -- Trial calculation of allowance allocation in Sichuan and Jiangsu

December 2017 ~ May 2018 -- 2016 and 2017 8 industries' key emission entities' carbon emission report and verification and monitoring plan development, Enterprise emission monitoring plan template, emission monitoring plan verification and emission report verification reference guide

December 2017 -- National carbon market help platform - MRV technical issues

System construction

January 2015 -- National CCER Registry online

April 2015 -- Construction of carbon emission data direct reporting system

May 2017 -- Bidding of national carbon market registration system and national carbon market trading system

December 2017 -- Determination of Hubei and Shanghai to lead the construction of the national carbon market registration system and trading system

Capacity building

March 2016 -- National Carbon Market Capacity Building (Shenzhen) Center operated

April 2016 -- National Carbon Market Capacity Building (Hubei) Center operated

May 2016 -- National Carbon Market Capacity Building (Guangdong) Center, National Carbon Market Capacity Building (Beijing) Center, and National Carbon Market Capacity Building (Chongqing) Center operated

July 2016 -- National Carbon Market Capacity Building (Chengdu) Center and National Carbon Market Capacity Building (Shanghai) Center operated

September 2016 -- National Carbon Market Capacity Building (Tianjin) Center operated

March 2017 – Establishment of National Carbon Market Facilitative Office

3 Future arrangements

2018 -- Infrastructure period: Complete the construction of data submission system, registration system and trading system; Develop the capacity building; Implement the construction of carbon market management system

2019 -- Simulation run period: Implement the allowance trading simulation in power sector, and verify the effectiveness and reliability; Strengthen the market risk warning, prevention and control mechanism; Improve the carbon market management system and support system

2020 -- Deepening and perfecting period: Implement the allowance spot trading among main entities of the power sector; Gradually expand the market coverage and enrich the trading varieties and trading methods; Introduce the CCER transactions as early as possible

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