CCUS Roadmap of China

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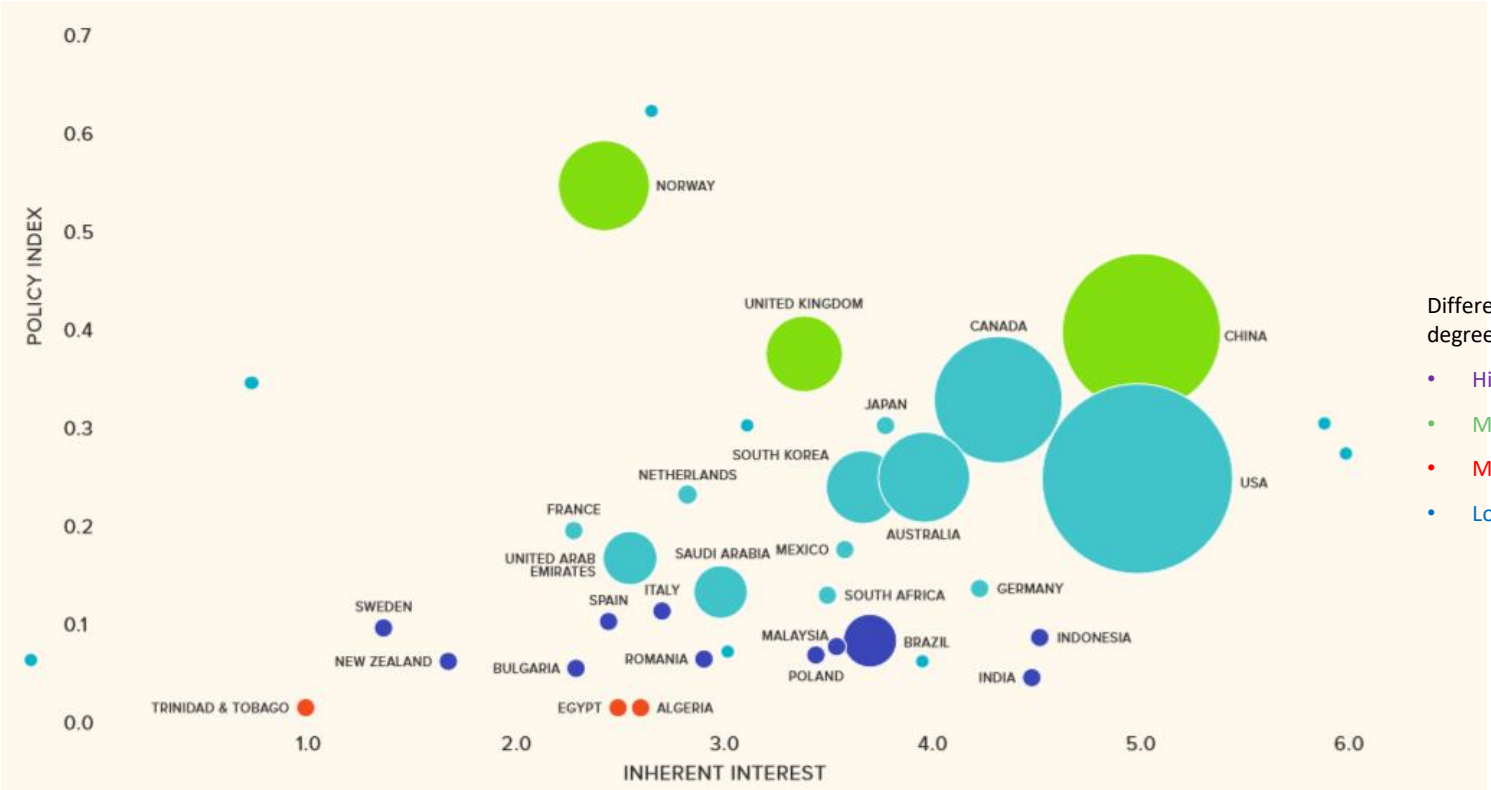
Global CCS Policy Overview



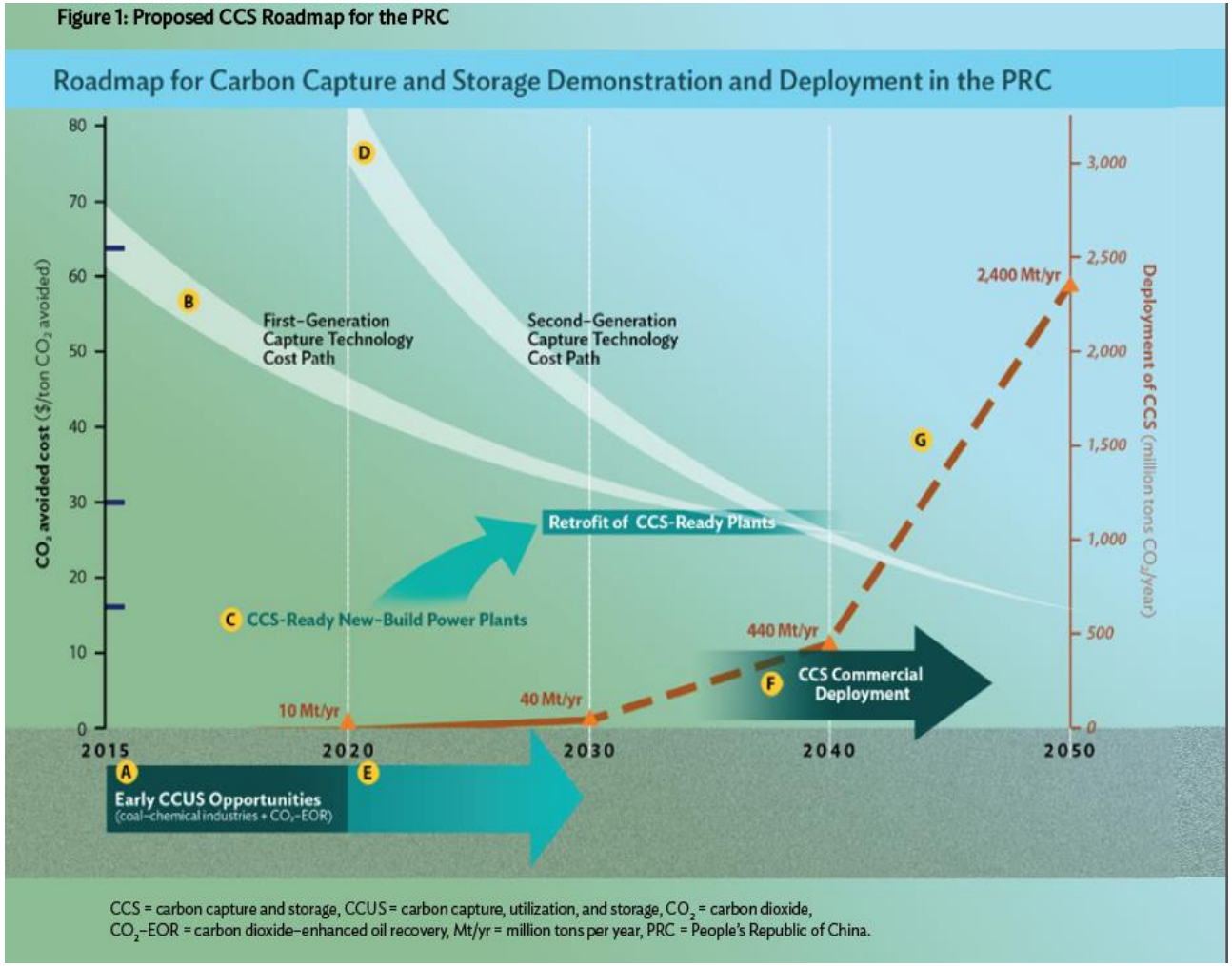
Different colours represent different degrees of policy support:

- High
- Medium high
- Medium low
- Low

GCCSI Policy Index 2017[3]（*The circle size represents the number of large-scale CCS projects in the country*）

Source： GCCSI, 2017

CCUS Roadmap of PRC published in 2014 by ADB



ADB CCUS Roadmap Update Project

- Update on the progress achieved during 13th FYP
- Revisit and revise the key numbers and conclusions of the CCUS roadmap 2014
- Extension of the sector coverage
  - Cement
  - Iron and Steel
  - Hydrogen+CO_2 utilization
- New analysis of the role of CCUS deployment
  - Integrating CCUS deployment analysis with 2/1.5 degree target

CCUS development and Deployment during 13th FYP

- China's policy support for CCUS, its inherent interest and the number of large-scale CCS projects are all in the leading position in the world.
- CCUS deployment in 2020 could lead to 1.6 millions ton of CO_2 avoidance, but far less than the targeted 10 millions as shown in the CCUS roadmap 2014
- CCUS deployment by sector
  - Chemical engineering sector: 1.1 million ton
  - Power generation: 0.5 million ton
- Barriers to CCUS deployment
  - Technology
  - Cost
  - Transport infrastructure
  - Institution

project	capture mode	transport mode	storage/ utilization	scales	status
Shanghai Shidongkou Power Plant of China Huaneng Group	capture after combustion of coal-fired power plant	by tank car	utilization in food industry or in industrial field	120,000 t/a	put into operation in 2009 intermittent operation
Tianjin green coal power project of China Huaneng Group	pre-combustion capture for IGCC	by pipeline distance: 50 - 100km	planned EOR of Dagang Oilfield in Tianjin	60,000 t/a	Carbon capture unit completed. Carbon storage project delayed.
Demonstration of CCUS in Shengli Oilfield, Sinopec	Capture after combustion of coal-fired power plant	by pipeline distance: 80km	EOR of Shengli oil field	40000 t/a in the first stage, 1 million t/a in the second stage	Phase I put into operation in 2010
Shuanghuai power plant in Chongqing of China Power Investment Corporation	capture after combustion of coal-fired power plant	no	For welding protection, gas replacement of hydrogen cooling generator in power plant, etc.	10,000 t/a	put into operation in 2010, in operation
35 MW Oxygen-Enriched Combustion Project of HUST	oxygen-enriched combustion in coal-fired power plant	by tank car	marketing, utilization in industrial field	100,000 t/a	Built in 2014, suspension of operation
Lianyungang clean coal power system research facility	pre-combustion capture for IGCC	by pipeline	geological storage of saline water layer	30,000 t/a	put into operation in 2011, in operation
Tianjin Beitang power plant CCUS project	capture after combustion of coal-fired power plant	by tank car	marketing, utilization in food industry	20,000 t/a	put into operation in 2012, in operation
Haifeng Power Plant of Huarun Power	capture after combustion of coal-fired power plant	By pipeline	utilization in food industry and geological storage of saline water layer	20,000 t/a	Operation in 2019

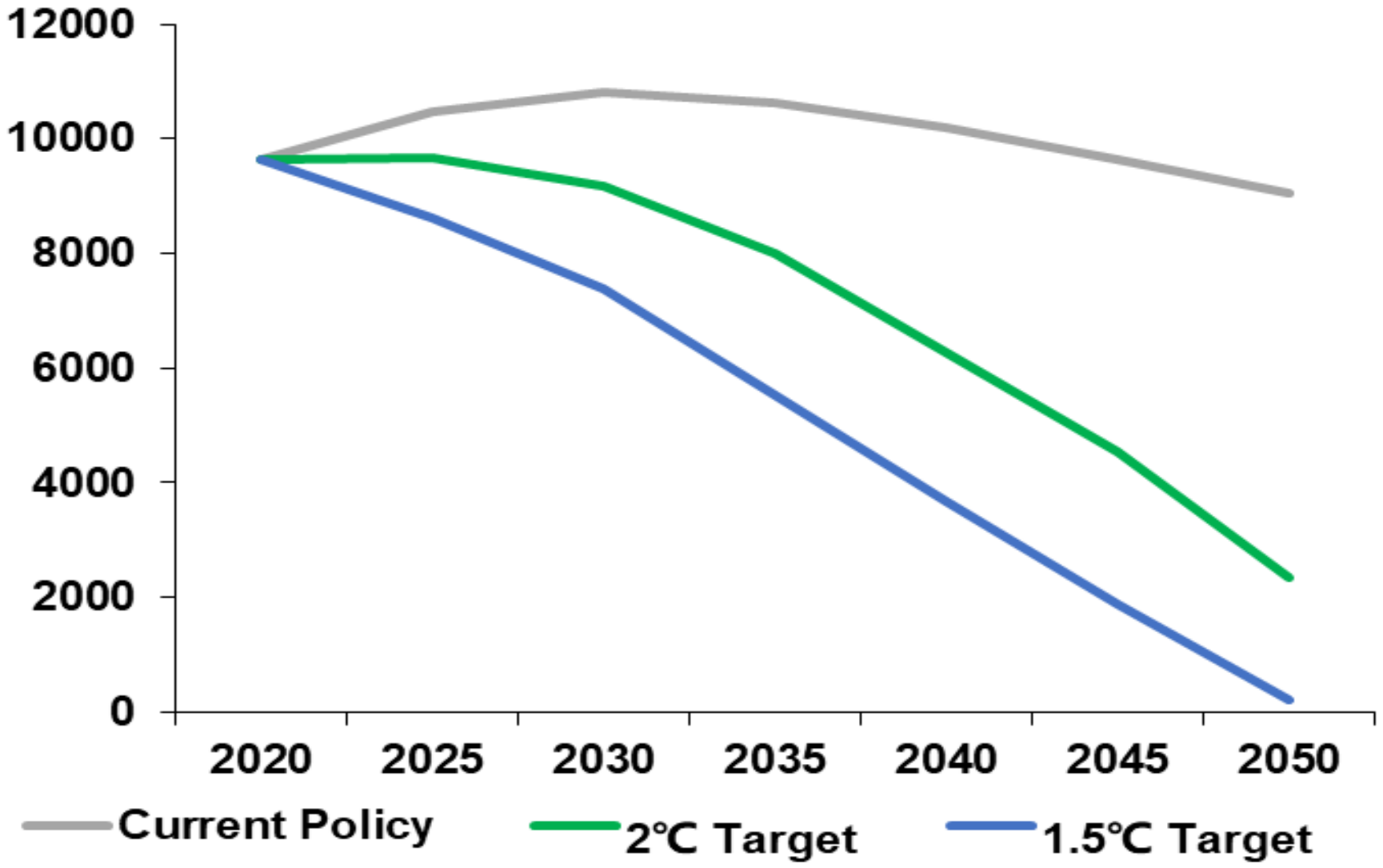
Resource: MI Jianfeng, Proceedings of the CSEE, Vol.39 No.9

Carbon capture project at Baima Cement Plant in Wuhu City with a CO_2 capture capacity of 50Kt ton per year

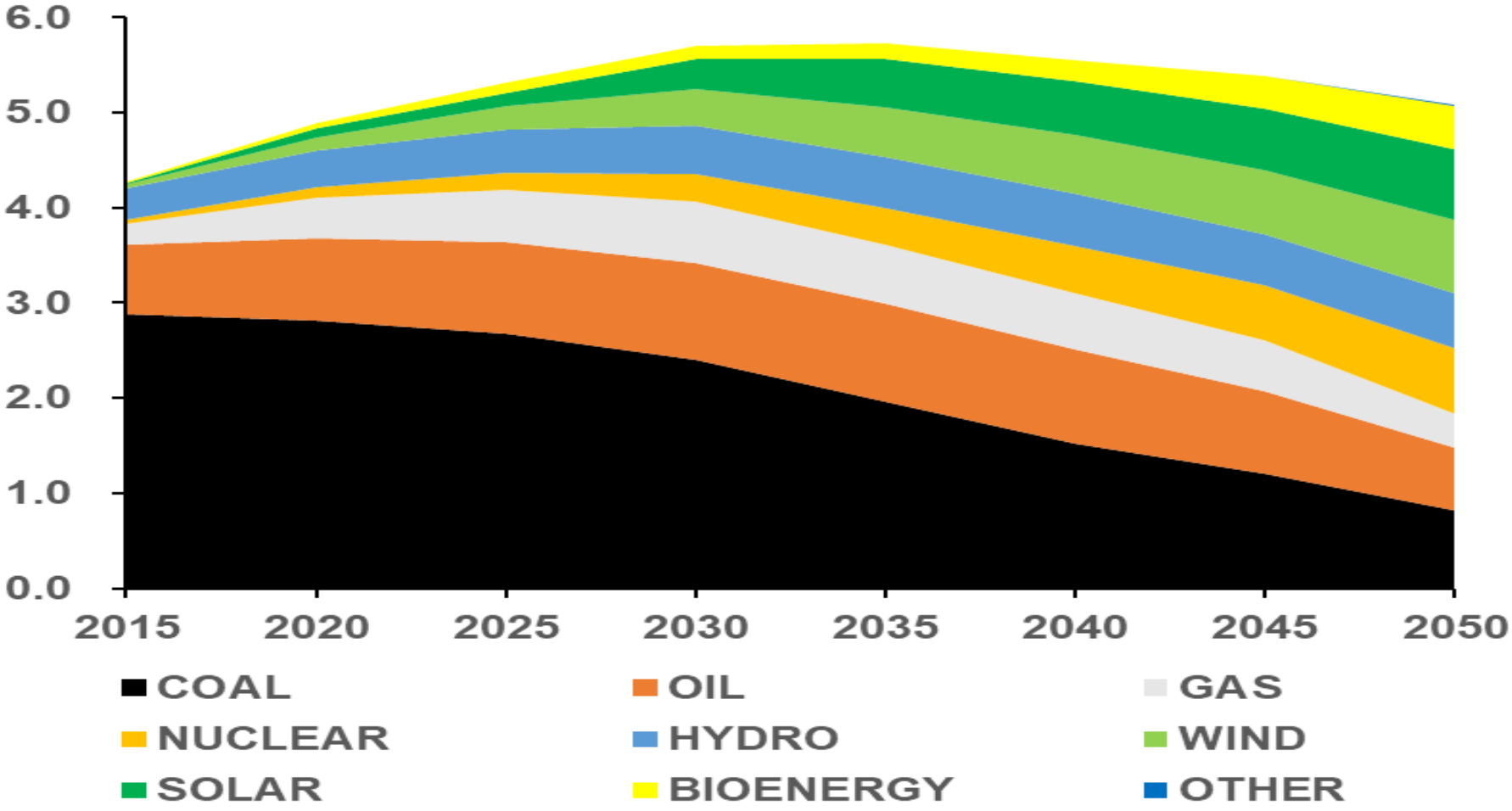
CO_2 utilization pilot and demonstration projects

No.	Project	Location	Scale	Status
1	Yanchang CO_2 capture and EOR Demostration	Shaanxi	100K ton/year	Started in Sep 2012
2	CO_2-EOR Demonstration in Ordos basin by PetroChina and Shenhua	Changqing	1M ton/year	**Started in July 1, 2017**
3	CO_2-EOR in Xinjiang Oil field by PetroChina	Xinjiang	0.5M ton/year	Pilot started
4	CO_2 EOR in Daqing Oil field	Daqing	O.5M ton/year	Pilot started
5	CCUS Hub in Xinjiang by PetroChina	Xinjiang	3M ton/year	planned
6	Microalgae fixation of CO_2	Zhengzhou	80 ton/year	Started in2017
7	Hydrogenation of CO2 to methanol	CNOOC	5000 ton	2019
8	Synthesis gas from CO2	Shanxi	20K ton/year	2017
9	Direct mineralization of steel slag and dust and utilization of flue gas CO2	Shanxi	0.5M ton/year	2020

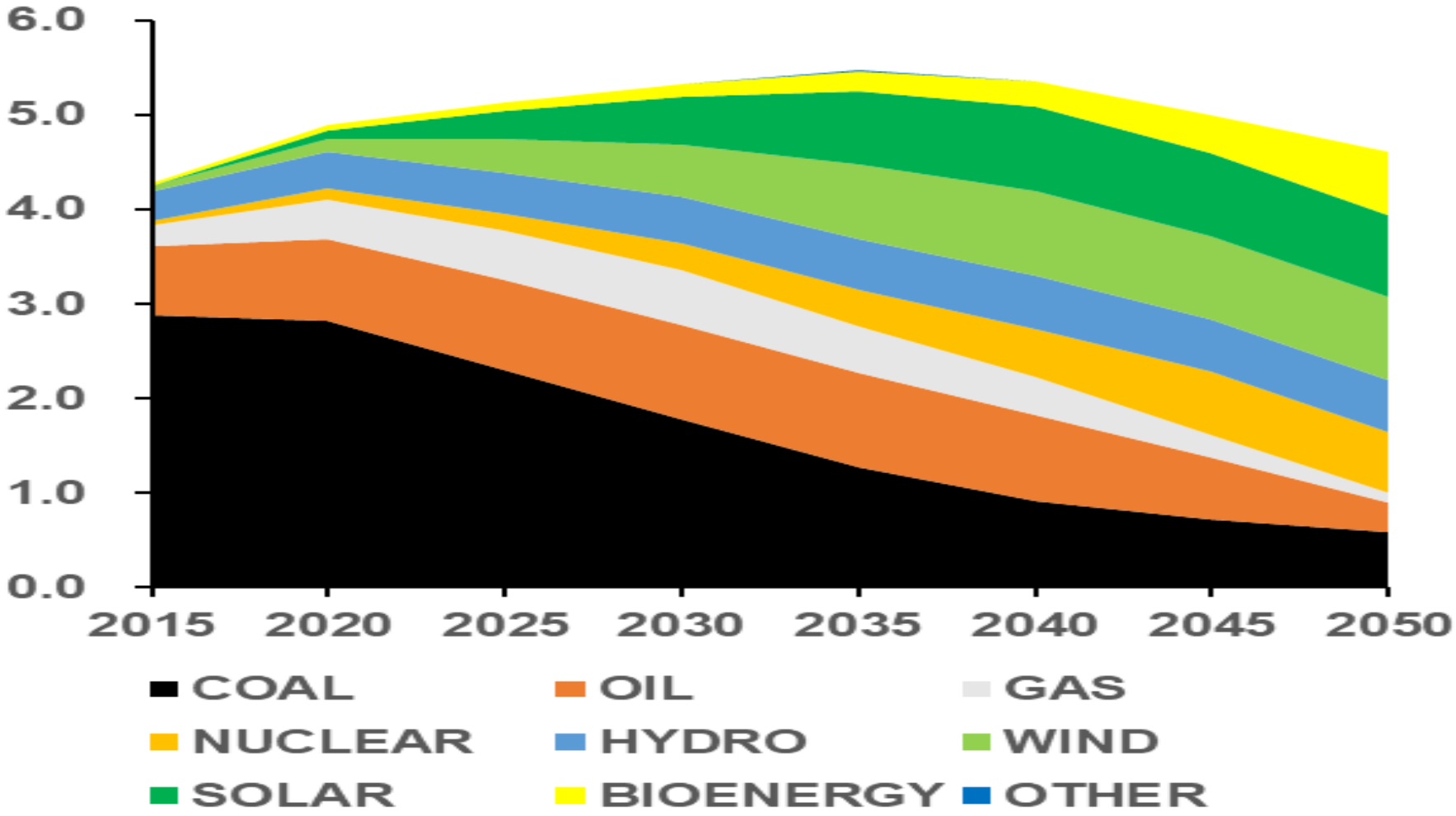
Energy-Related CO_2 Emission, Mt/yr



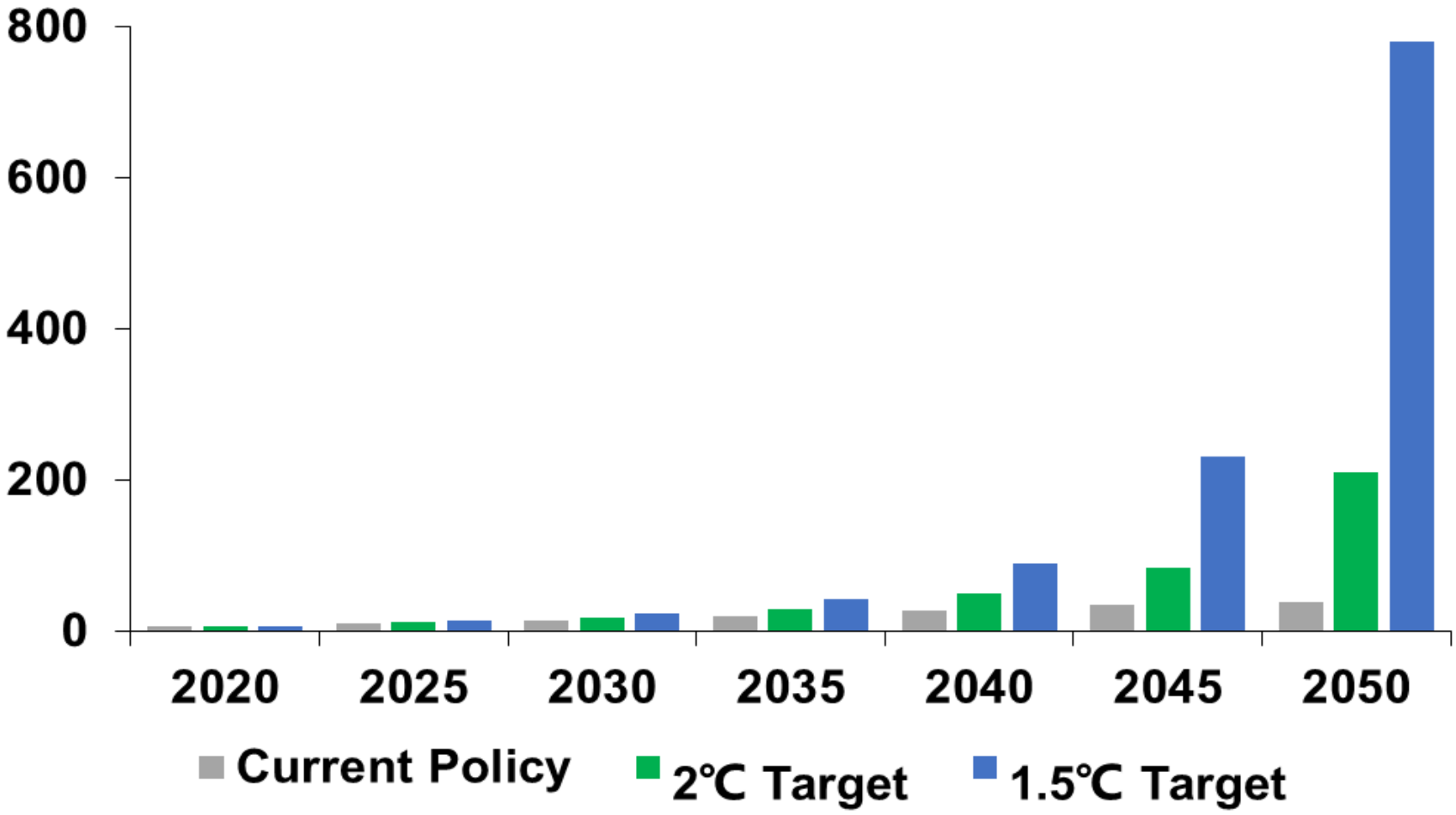
Total primary energy supply - 2℃ Target , Gtce



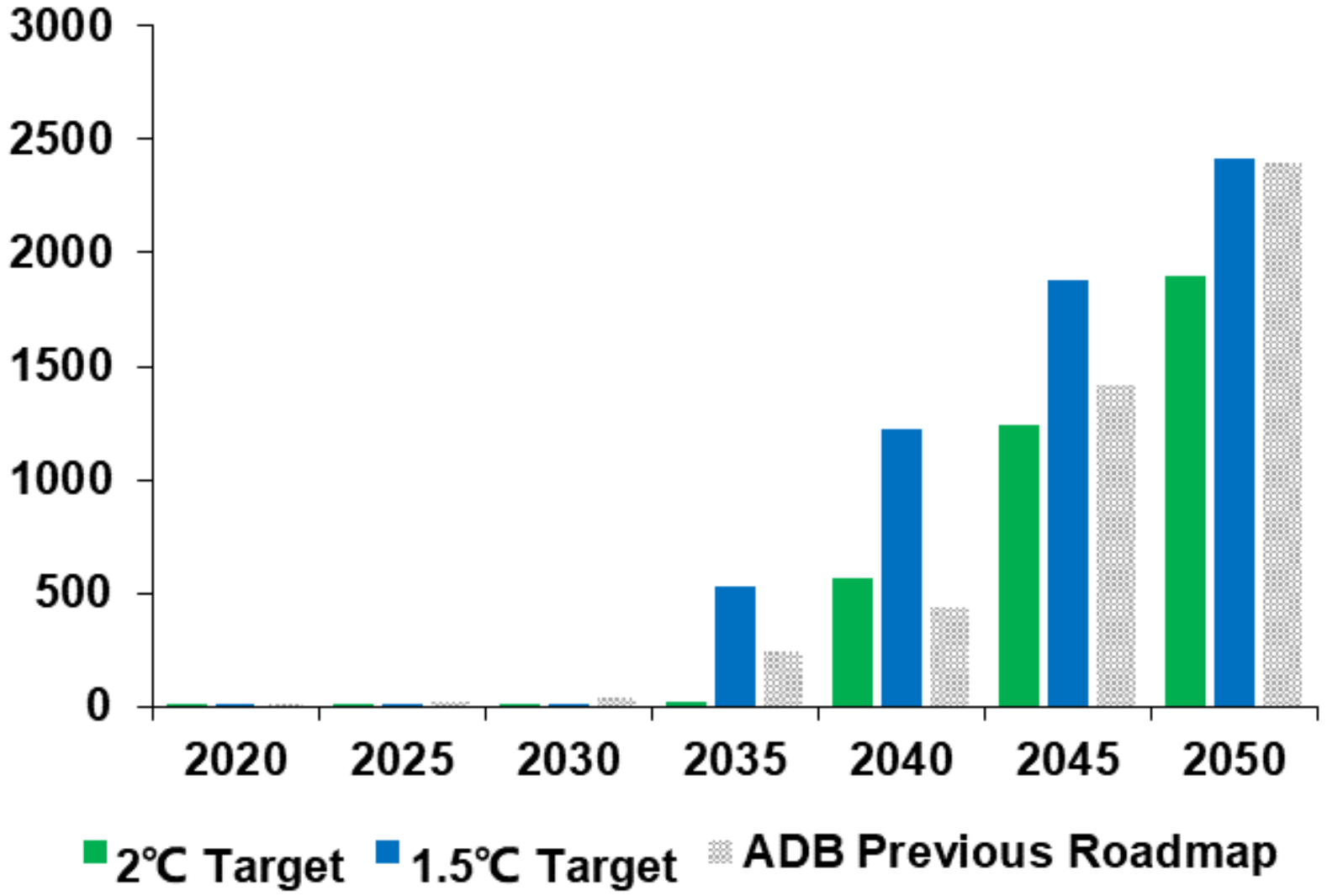
Total primary energy supply – 1.5℃ Target , Gtce



Carbon price , US$/t CO_2 (2011 constant price)



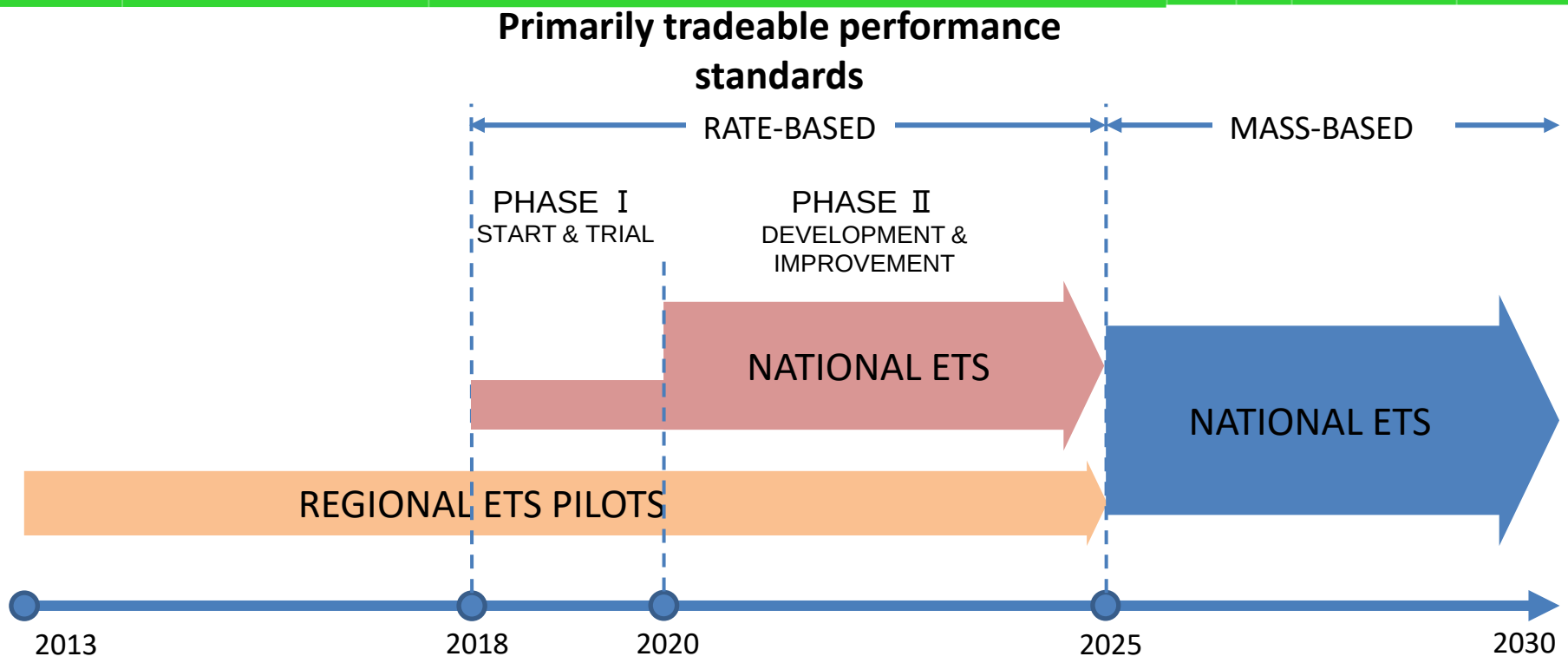
Deployment of CCS, Mt/yr



Highlights of the new analysis

- Total deployment of CCUS in terms of CO_2 avoidance
  - 3.5 Mt for 2025, 10 Mt for 2030, 1200Mt for 2040, and 2400 Mt for 2050 to achieve the 1.5℃ target
- Priority sectors for CCUS deployment before 2035
  - Chemical engineering
  - Natural gas processing
  - Power generation
- Priority sectors for CCUS deployment from 2035 to 2050
  - Coal-fired power generation
  - Bioenergy CCS (BECCS)
  - Iron & Steel
  - Cement
  - Hydrogen production
- Carbon pricing is a key enabling policy instrument

Implementation roadmap of China's national ETS



It will start with the *power generation* and ultimately extend to 8 sectors, including iron & steel, non-ferrous metal, construction material, petrochemical engineering, chemical engineering.

Thank you for your attention.

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