

The 9th World Materials Forum
July 5-6, 2023, Nancy, France

Decarburization Pathway and Technologies of China Steel Industries

Xinping Mao

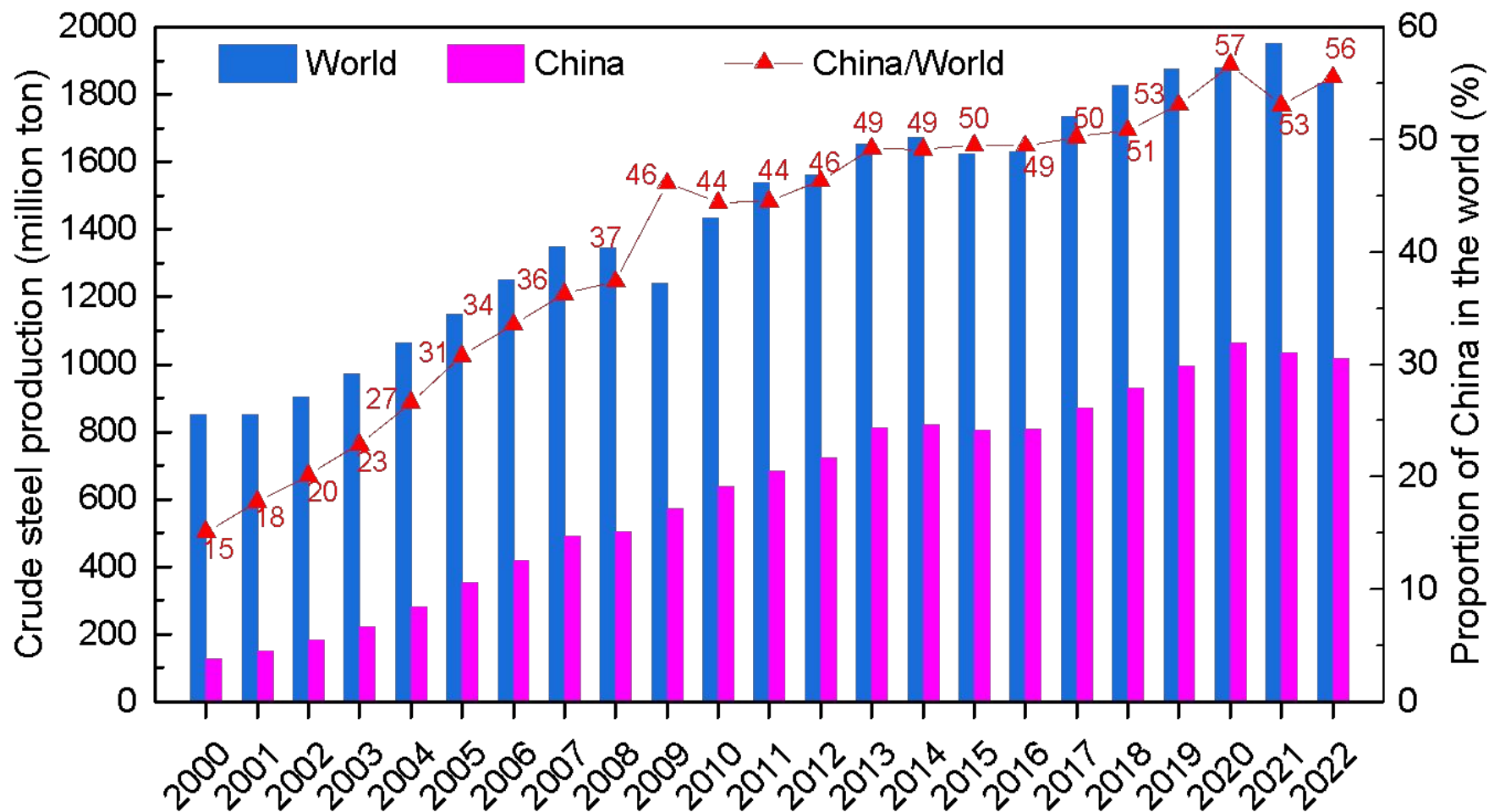
Chinese Academy of Engineering
University of Science Technology Beijing

Lifeng Zhang

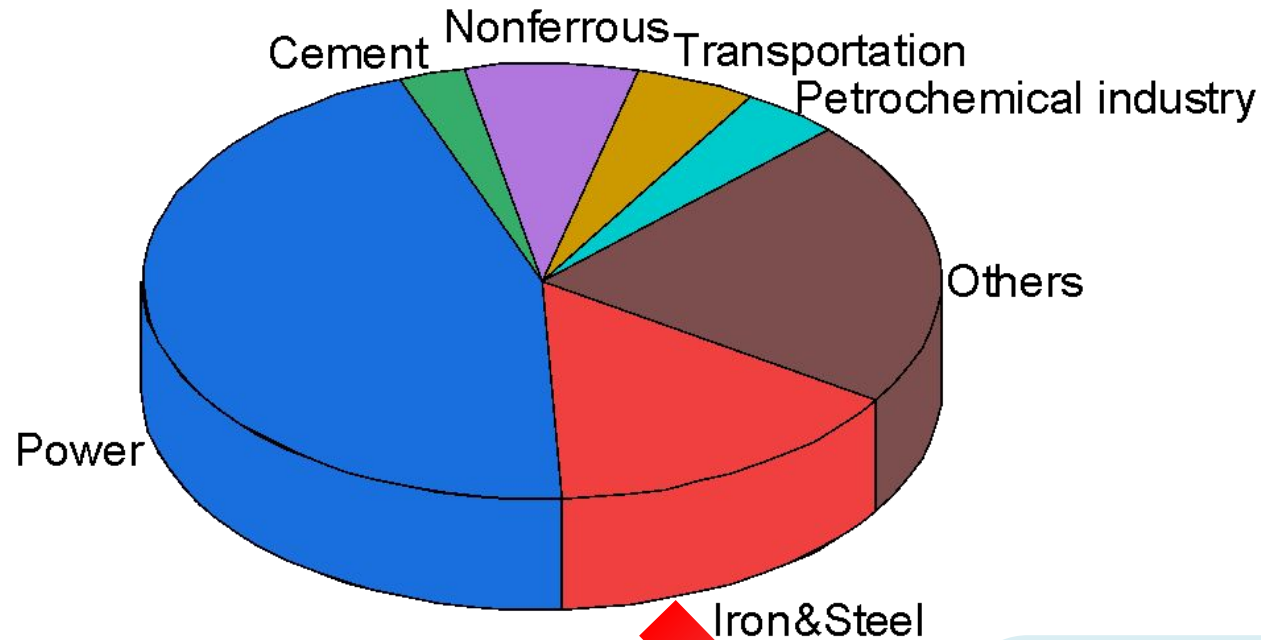
North China University of Technology



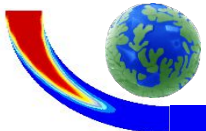
One Billion Tons Steel in China, ~ 56% of the World in 2022



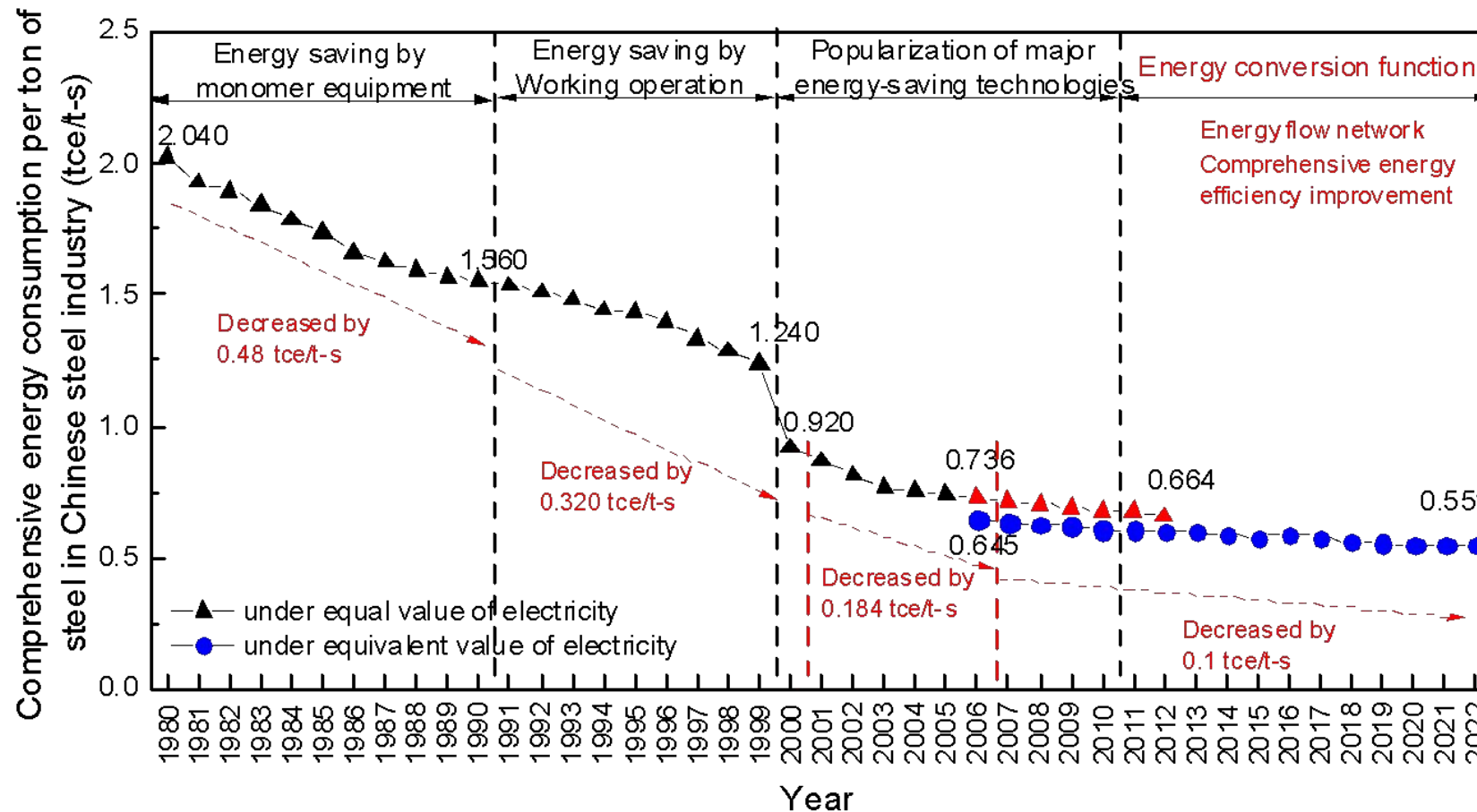
Source of CO₂ emission in China in 2022



In 2022, steel industries in China generated 1.815 billion tons of CO₂ emissions, ~ 15% of the total;

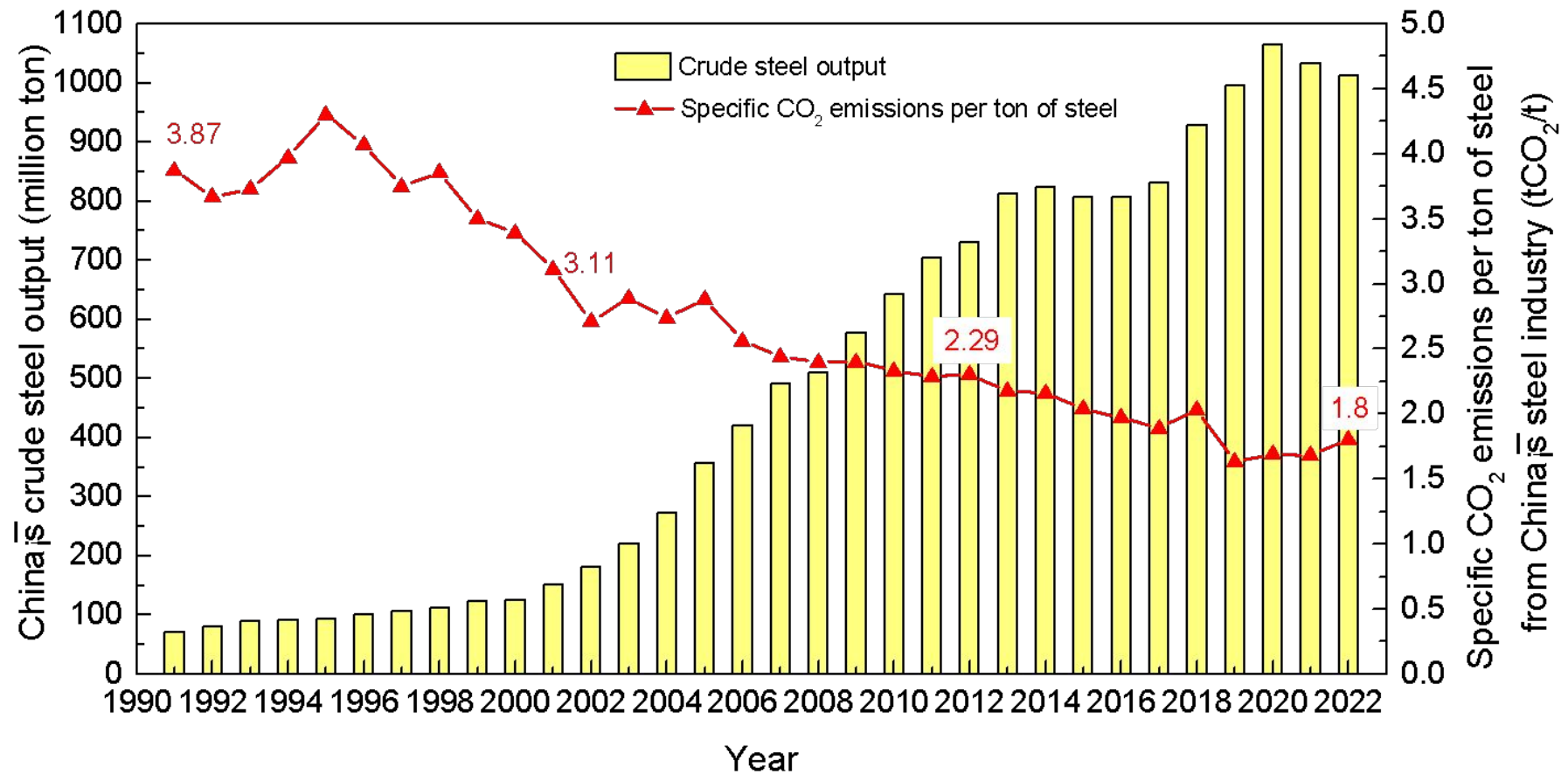


Constant Decreasing of Energy Consumption Per Ton Steel in China



From 2.04 tce to 0.551 tce, ~ 73% decrease.

Constant Decreasing of CO₂ Emission Per Ton Steel in China



From 3.87 t to 1.8 t, ~ 53% decrease

China Steel Industries Are Taking Actions

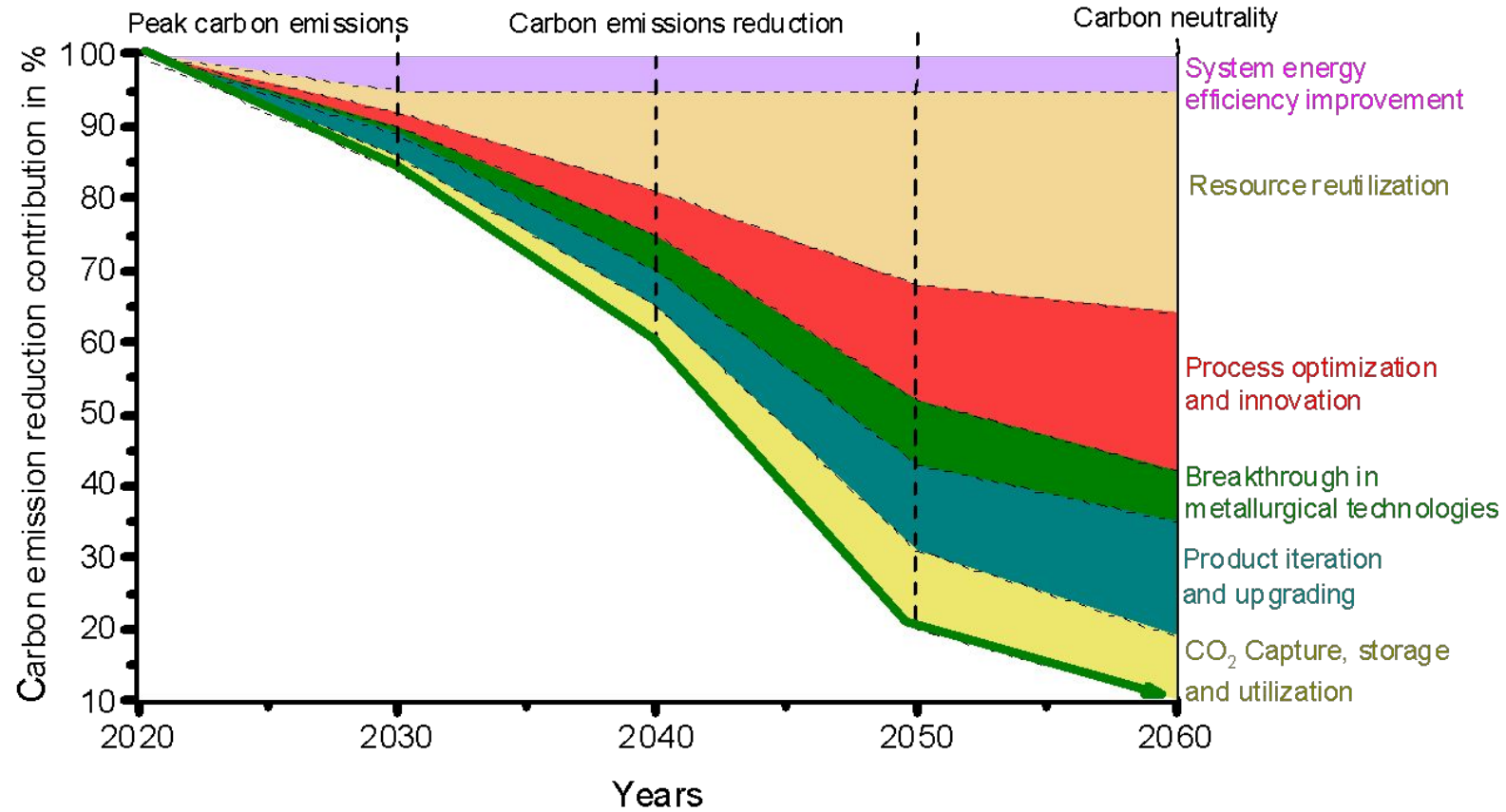
- On November 22, 2022, Beijing Benz and Baosteel signed the "Memorandum of Cooperation on Building a Green Steel Supply Chain". Baosteel will provide low-carbon emission steel for automobiles in 2023. **By 2026**, with the technical path of hydrogen-based vertical furnace-electric furnace, Baosteel will reduce the carbon emission intensity of automotive steels by 50%-80%, **the CO₂ emissions for automotive steels will decrease 95%.**



- On August 4, 2022, BMW Group and HBIS Group signed "Memorandum of Cooperation on Building a Green Low-Carbon Steel Supply Chain". Starting from mid-2023, HBIS will reduce CO₂ emissions for automotive steel by 10-30%. **By 2026**, based on processes such as green power and electric furnace, **the CO₂ emissions for automotive steels will decrease 95%.**

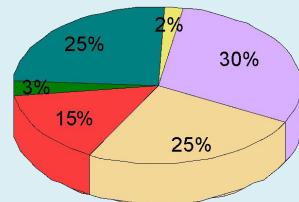


Technological Path for Decarbonization of China Steel Industries



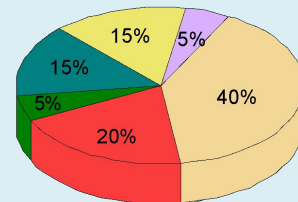
2020~2030

Reduce carbon intensity by 15%



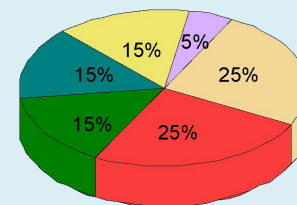
2030~2040

Reduce carbon intensity by 25%



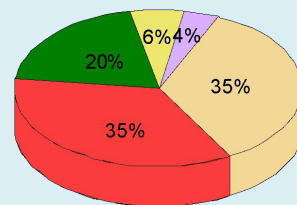
2040~2050

Reduce carbon intensity by 40%



2050~2060

Reduce carbon intensity by 10%

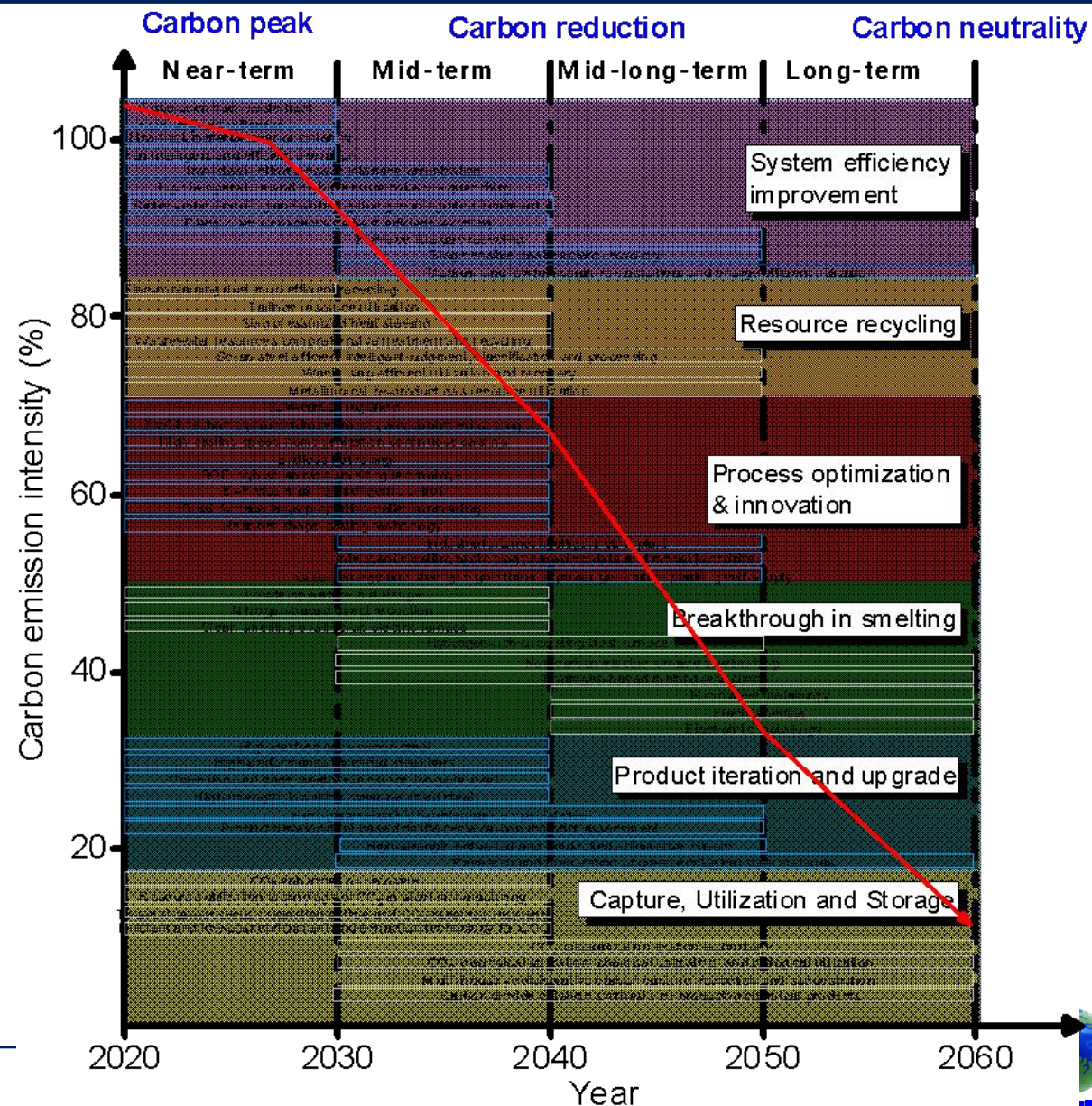


Technologies for Decarbonization of China Steel Industries

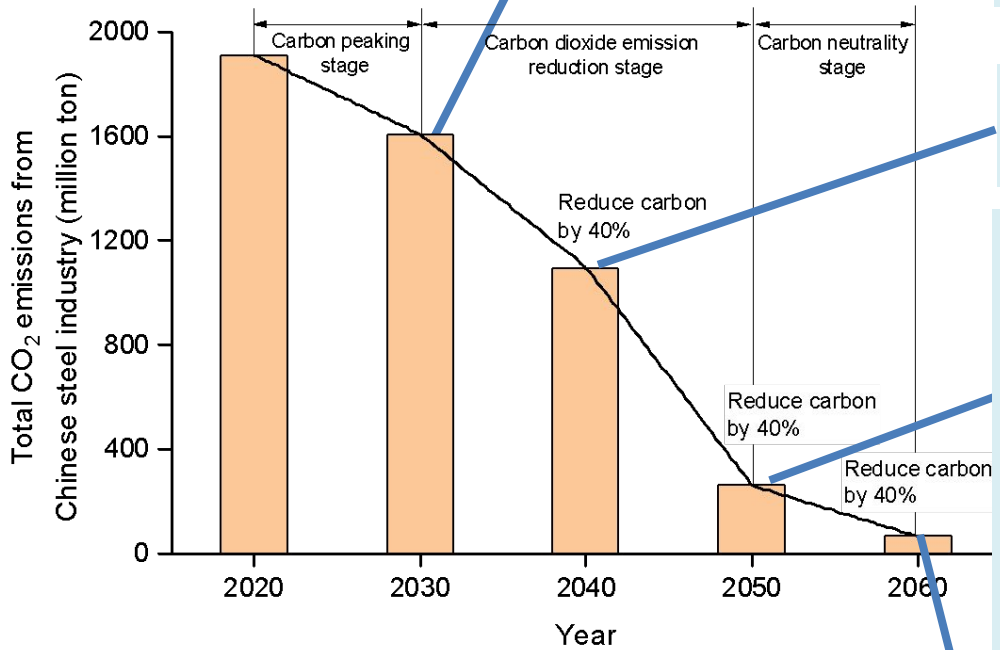


From “C peaking” to “C neutrality” :

- Six technology pathways with different roles and key technologies
- Some technology within the entire process, some in separate pathways
- Six technology pathways combining together = carbon neutrality of steel industries



Objectives at Every 10 Year of China Steel Industries

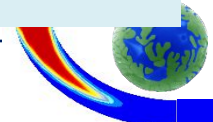


By 2030 (near future), reaching CO₂ peak emission by 2030, reducing CO₂ emission by 15% comparing 2020 by resource conditions and technological capabilities.

By 2040 (medium term), decreasing CO₂ emission by 40% comparing 2020.

By 2050 (medium and long term), decreasing CO₂ emission by 85% comparing 2020, through industrial chain coordination, upgrading and application of higher performance steel products and other measures;
Reducing ~ 280 million tons of carbon by downstream industries, nearing carbon neutrality.

By 2060 (long term), 95% CO₂ emission lower than that in 2020 and achieving carbon neutrality.



A high-speed photograph of a single water droplet hitting a blue surface, creating a series of concentric ripples. The droplet is captured in mid-air, just above the point of impact, with a small stem of water connecting it to the surface. The background is a soft, out-of-focus blue gradient.

**Thanks for your kind
attention!**

zhanglifeng@ncut.edu.cn