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Climate finance to support the carbon-neutral transition of China's iron and steel industry

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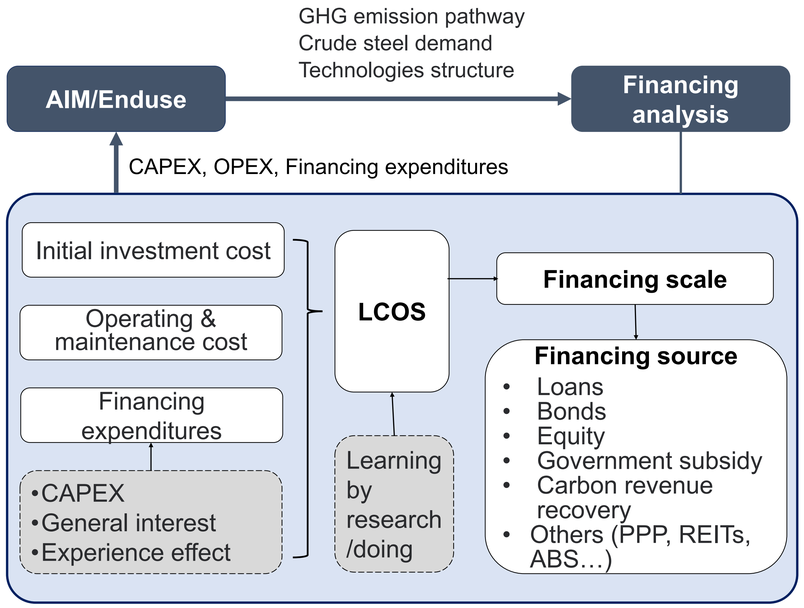
Introduction

- The iron and steel industry is one of the world's most carbon-intensive industries, while China produced 1.018 billion tons of crude steel in 2022, which supplied more than half of the world's crude steel, generating 1.65 billion tons of CO2, facing a huge challenge of decarbonization transformation.
- Low-carbon investments are necessary to drive the transformation of the iron and steel industry required by China's climate goals. However, the related financing needs and capital availability of the path of decarbonization of the iron and steel industry have not been fully explored.
- This paper tries to bridge this gap by analyzing the investment and financing path of China's iron and steel industry's decarbonization transformation to realize the Carbon peak and Carbon neutrality goal using a combination of AIM/Enduse model and a finance module.

Methodology



- We model China's iron and steel industry transformation financing pathways in three steps:
- First, we use AIM/Enduse model to find the appropriate decarbonization pathways affected by various factors such as changes in production structure, carbon taxes and so on by 2060. The scenario settings are summarized in Table 1.
- Second, we use the initial investment cost, financing expenditures and O&M cost of different technologies to calculate the LCOS (Levelized cost of crude steel). Especially, by considering the experience effect, learning by research and doing, we get dynamically changing LCOS. And by using reginal technology and production scale, we get the financing scale needed. Then we considering different costs of financing sources, financial policies and so on to reach cost-efficient financing pathways.
- Third, the capital cost of different steel production technologies will be entered into the AIM/Enduse model as parameters, so as to carry out repeated iterations to predict financing scale and pathways in China's iron and steel industry to 2060.

Table 1. Summary of scenario settings

Scenario	Share of BOF	Share of EAF	CCS	Carbon Tax
BaU	Free	Free	-	-
CM1	Low	High	-	-
CM2	Free	High	CCS	T2500

Preliminary results & Discussion

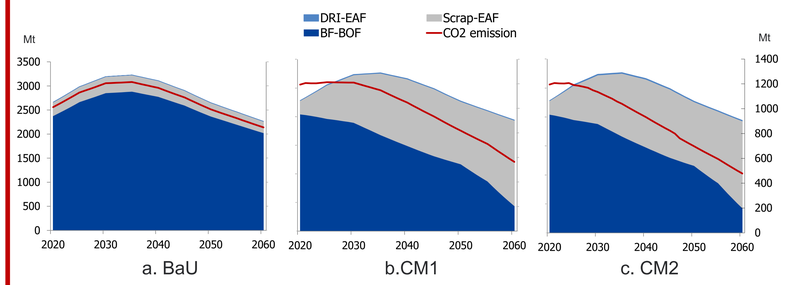


Fig.1 China's crude steel demand (Mt) and CO2 emission (Mt) pathways from 2020 to 2060.

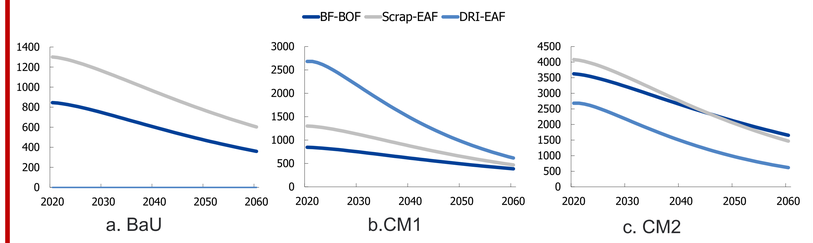


Fig.2 LCOS for different production technologies is from 2020-2060 (¥).

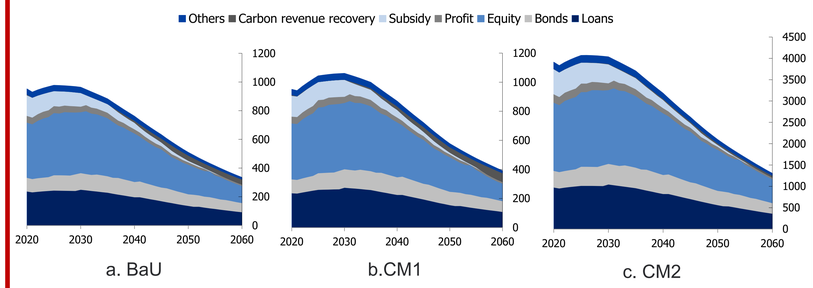


Fig.3 Financing scale distributed from 2020 to 2060 (¥ billion).

- From our expected results, first, steel demand will decline after peaking between 2030 and 2040, accompanied by the upgrading of more steel production technologies, and emissions will also show a significant downward trend after the peak of steel demand. Second, for BF-BOF, Scrap-EAF and DRI-EAF, with the continuous advancement of learning by research and learning by doing, the unit cost of the crude steel will keep falling. Finally, CAPEX, OPEX and financing expenditures continue to decrease, and the capital scale required for low-carbon transformation of the steel industry also shows a downward trend after a short rise. Moreover, according to pecking order theory, we expect the proportion of loans and bonds to continue to rise, while the proportion of equity will decline.
- Further, we will consider regional policies and financial market developments, incorporate more technical considerations, and refine our exploration of financing channels.