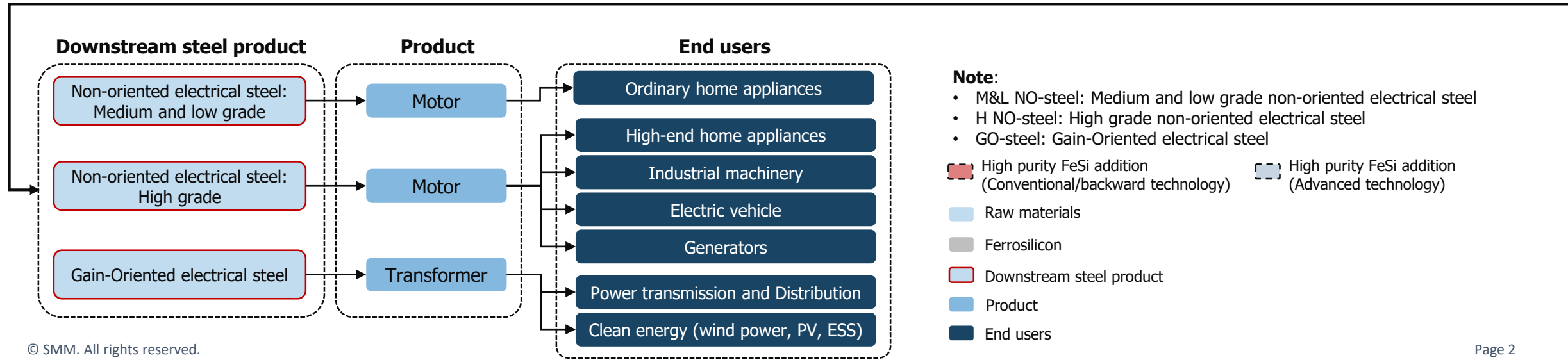
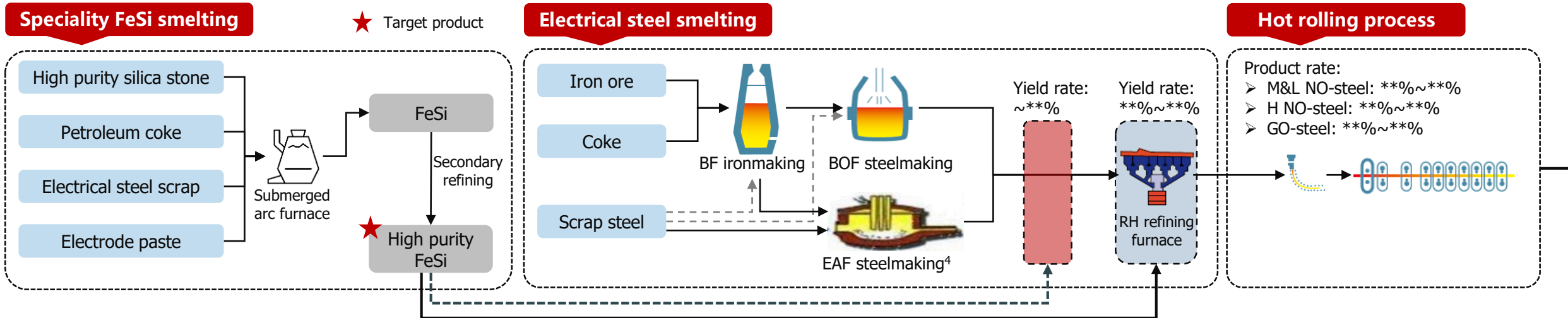


A dark, industrial background featuring a large, glowing orange and yellow molten metal structure, possibly a ladle or furnace, with a shower of bright sparks falling from it. The scene is dimly lit, emphasizing the intense heat and light of the metal.

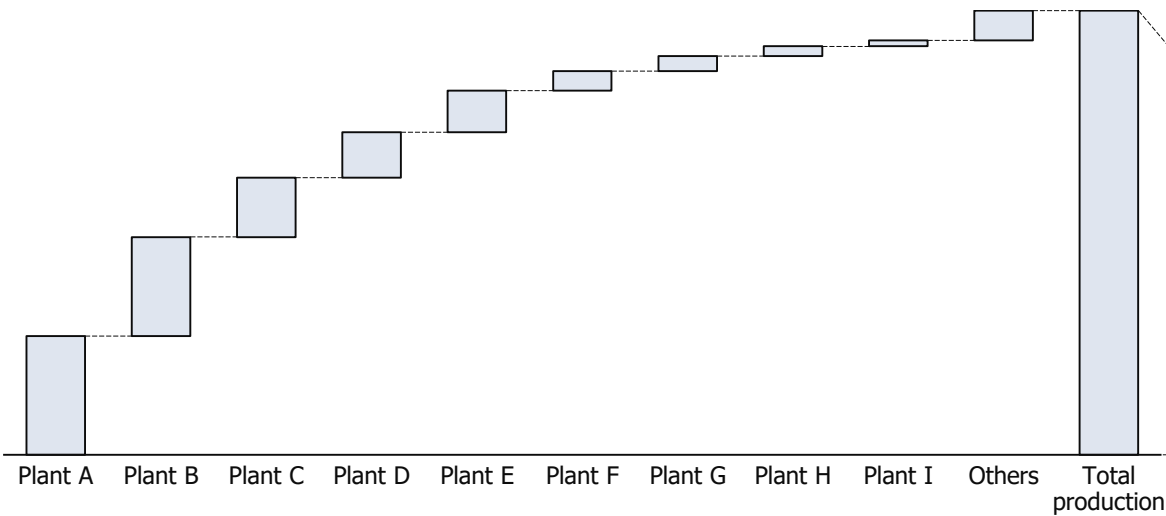
China High purity Ferrosilicon Downstream Industry Applications

Supply chain of ferrosilicon (High purity FeSi)

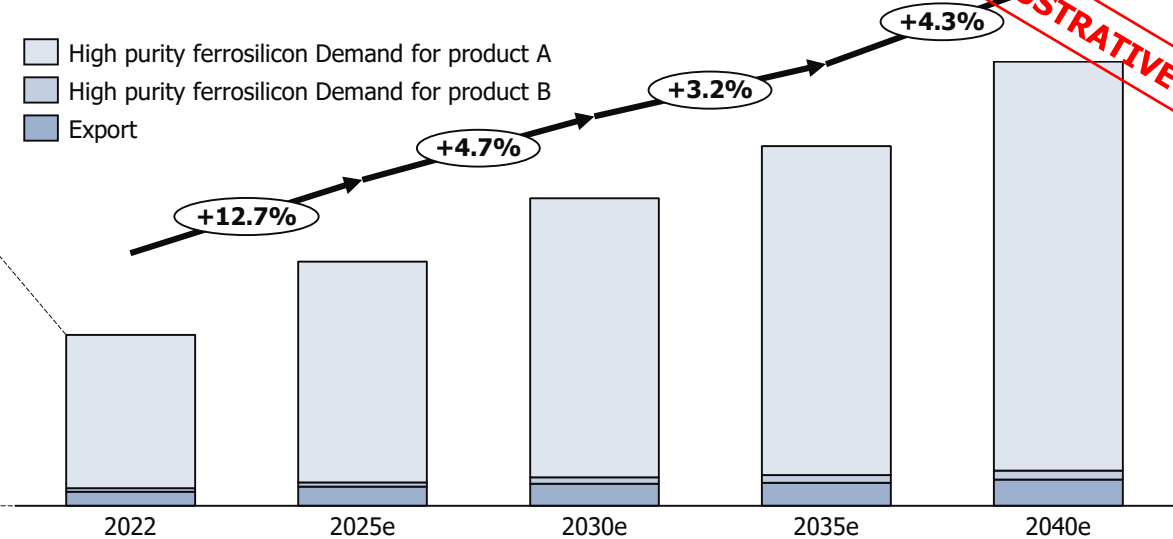


High purity ferrosilicon mainly for electric steel smelting in domestic; and top 5 plants account for more than 80% of the total output

2022 China High purity ferrosilicon market size and main producers





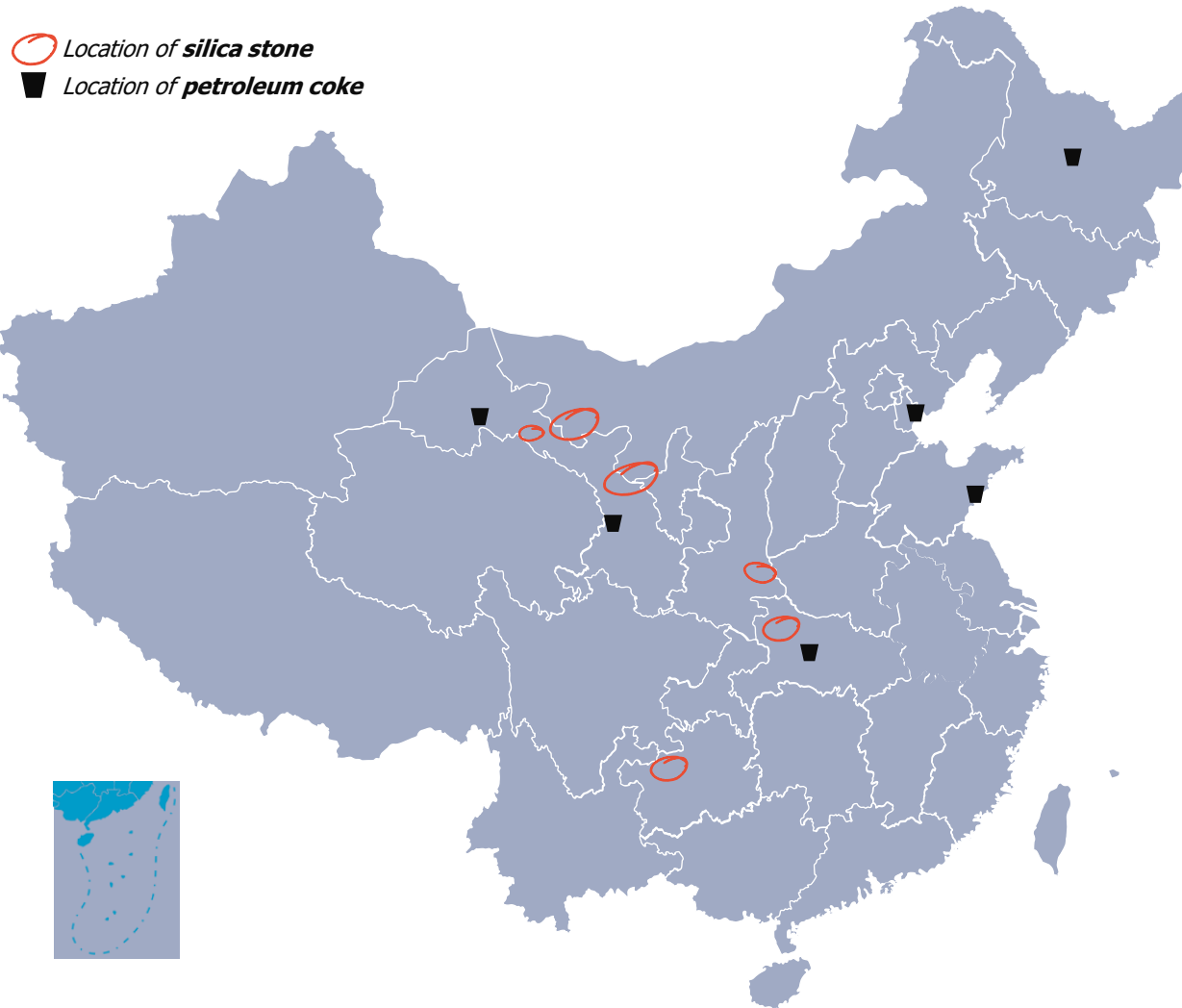
2022-2040e China High purity ferrosilicon supply by downstream



- Due to the explosive growth of downstream demand, the demand for high purity ferrosilicon in China will also show a rapid growth trend, with CAGR expected to maintain a **% growth by 2040.
- According to SMM's interviews with current producers and steel mills, China's high purity ferrosilicon will still be mainly used for domestic electrical steel smelting in the future;
- high purity ferrosilicon **demand for special steel**: high purity ferrosilicon can also be used for the smelting of special steel, such as cord steel, bearing steel, etc. However, due to the low production of such steel in China at present, the demand only accounts for about *% of the total output. However, with the rapid growth of China's special steel in the future, it is expected that the demand for high purity ferrosilicon will maintain a CAGR of about **% by 2040, faster than the overall growth of high purity ferrosilicon.
- **Exports**: Due to China's increasing restrictions on high energy consumption enterprises and the weakening of downstream demand caused by the pandemic in the past two years, some Chinese producers have withdrawn from the Chinese market and established plant production high purity ferrosilicon in southeast Asia, such as Vietnam. The production capacity of southeast Asia and other countries is mainly oriented to markets outside the Chinese Mainland, so **the export demand will hardly grow significantly**;

Distribution map of main raw materials

-  Location of **silica stone**
-  Location of **petroleum coke**

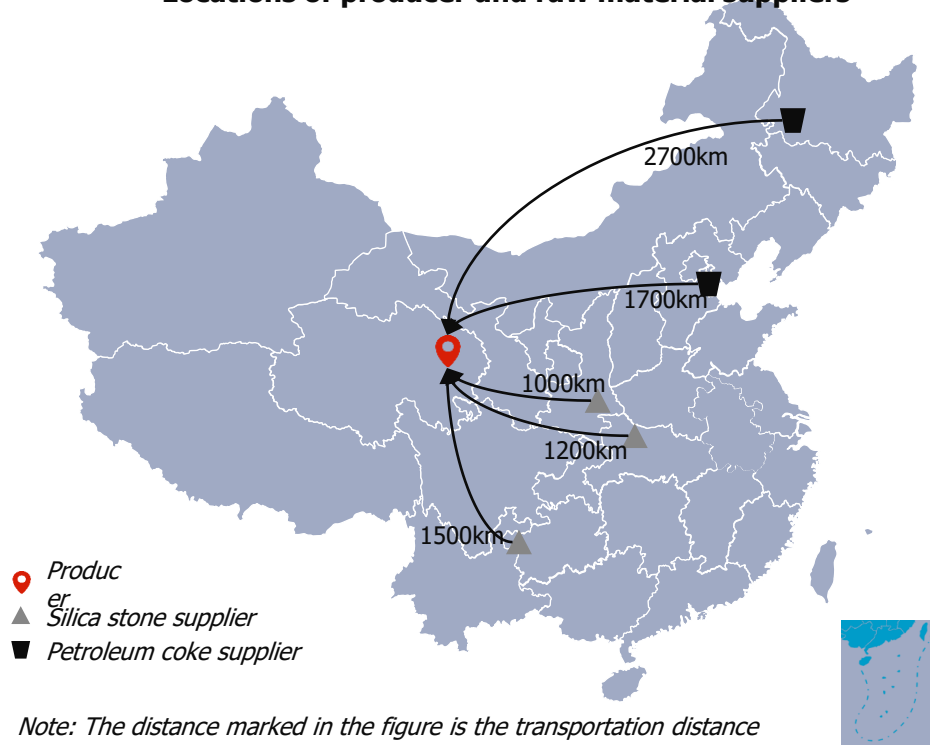


- ILLUSTRATIVE**
- Silica stone is the most important raw material for High purity ferrosilicon smelting, and its distribution determines the convenience of producers in obtaining raw materials, as well as the level of cost.
 - **Requirements for silica stone:** Generally, the SiO_2 content is required to be no less than **% (most enterprises require no less than **% when purchasing). If there is a high content of impurity elements, it is necessary to increase the refining time. Generally, refining 1 mt of products requires 2000~2500kWh of electrical. Therefore, **high impurity content will greatly increase the power cost of smelting, and even lead to unqualified products.**
 - The **importance** of Silica stone to the enterprise:
 - Exclusive and confidential supply of high-quality silica stone.** High quality and low impurity silica stone can greatly reduce smelting costs and increase the stability of product quality. Currently, almost all producers have their own exclusive high-quality silica stone supply sites, and these suppliers are considered the top secret of the enterprise.
 - Ratio of silica into furnace.** Each producers purchase different quality silica stone from different regions and mixes the silica stone in different proportions to improve the reactivity of the silica stone, reduce unit consumption, and control the content of various metal components. This requires a lot of production experience and data accumulation, and requires higher production requirements for enterprises.

- **Requirements for petroleum coke:** The main requirements are fixed carbon greater than **%, ash less than **%, and volatile matter content less than **%; In addition, it is generally required to have a vanadium content of less than ** ppm, sulfur content less than **%, and moisture content less than **%.
- **The origin of petroleum coke products is relatively centralized and the suppliers are relatively transparent.**

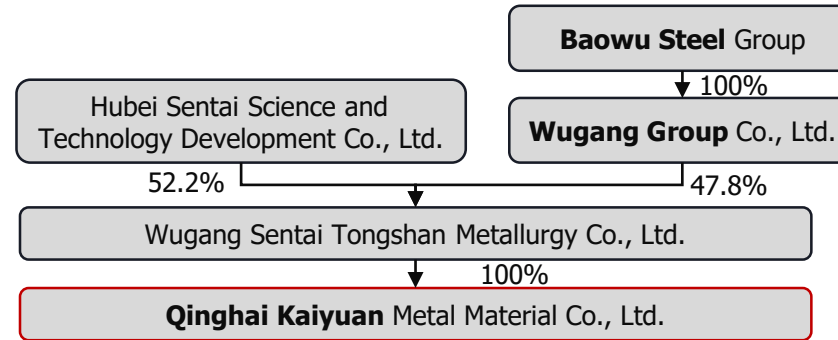
Plant case study

Locations of producer and raw material suppliers



	Silica stone supplier	Petroleum coke supplier
Name	***	***
Location	***	***
Production capacity	***	***

Ownership structure

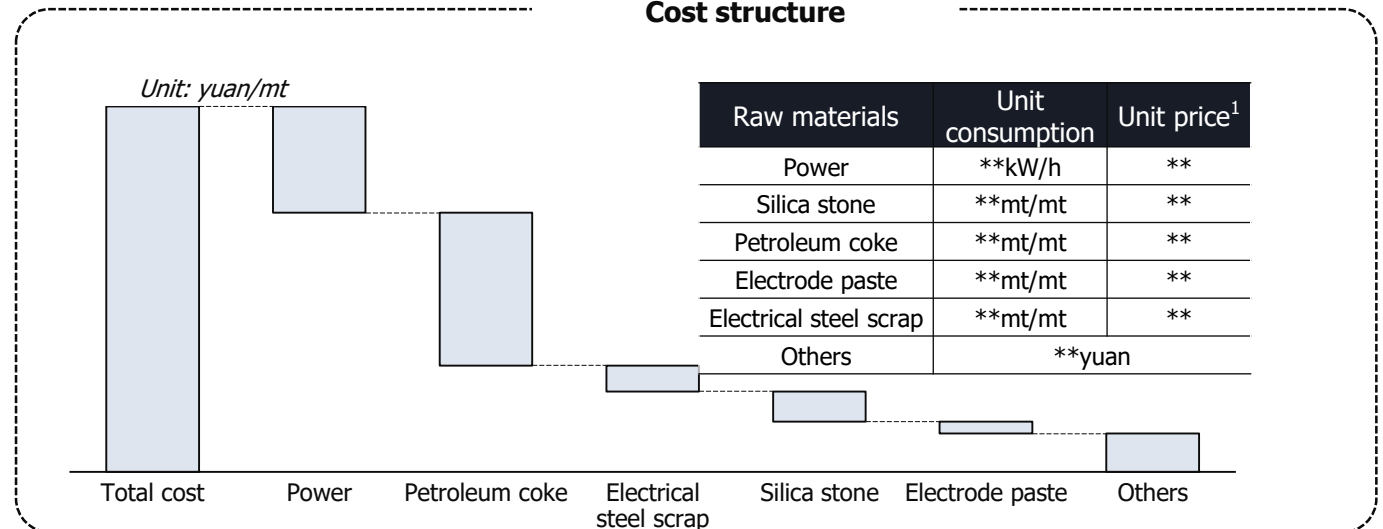


Note: Qinghai Kaiyuan, Wugang Sentai and Hubei Sentai are the same legal person

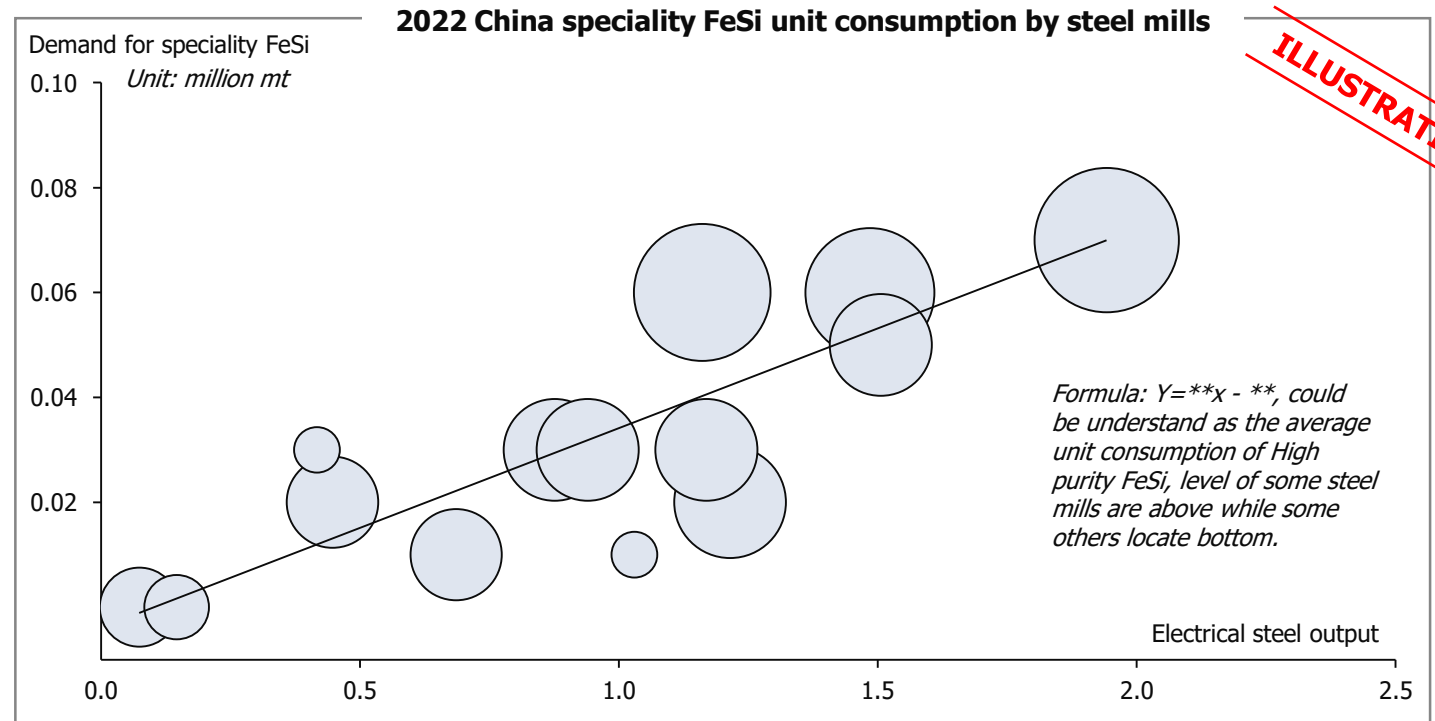
Capacity and Production

Equipment	Grade (Ti%)	Output (1000 mt)
8 sets: 14000kVA	0.010	**
	0.015	**
	0.020	**
	0.030	**
	0.050	**

Cost structure



High purity FeSi demand will grow fast in the future



➤ High purity FeSi demand

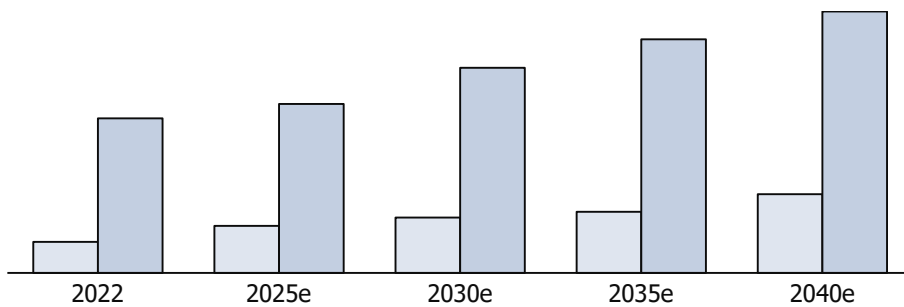
- Total demand:** in the future, China steel mills will be expected to consume around ** million mt, ** million mt, **million mt and **million mt, by 2025, 2030, 2035 and 2040, respectively. With steel mills expanding their electrical steel production capacity, the demand for speciality FeSi will be inevitable to rise in the next years. Top 13 steel mills will still expect to account for around **% of total market demand.
- By steel mills:** BAOWU GROUP still is the largest electrical steel producer and the demander for speciality FeSi, then SHOUGANG follows. It expects that BAOSTEEL and SHOUGANG will account for around **% and **% speciality FeSi demand of overall demand by 2040.

Downstream and end-users application: Due to the explosive growth of the electric automobile and clean energy, the demand for high purity ferrosilicon is grow fast

Industry status and future demand trend

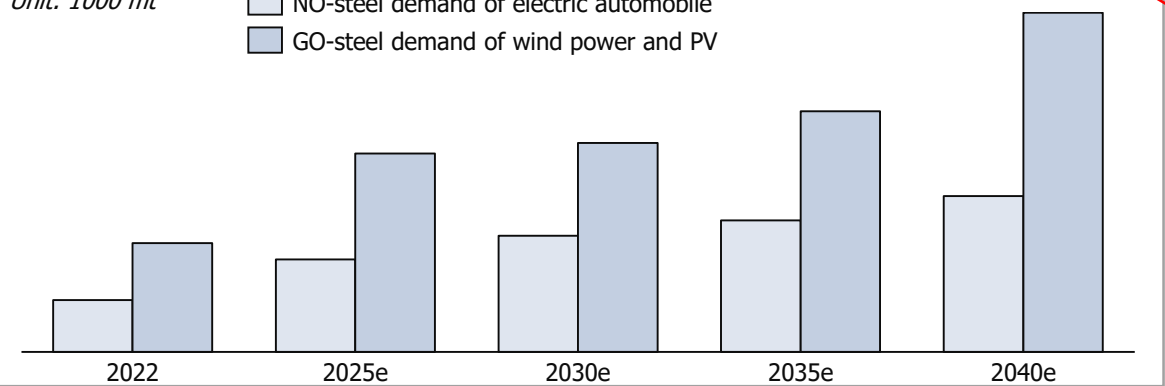
2022-2040e downstream product development by different product

Unit: 1000 mt (electrical steel)
 Product A1 Product A2



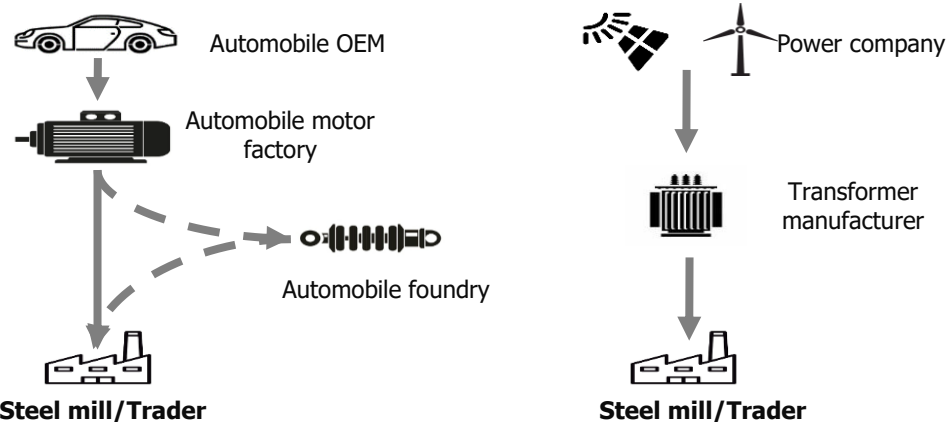
2022-2040e electric steel demand by industry (electric automobile/energy)

Unit: 1000 mt
 NO-steel demand of electric automobile
 GO-steel demand of wind power and PV



ILLUSTRATIVE

How to flow to end users



- **2022 demand volume:**
 - Electric automobile: Product A1 rose rapidly because of the industry explosive growth.
 - Wind power and PV: Product A2 rose steadily due to clean energy grew but coal power withdrew gradually.
- **Future demand trend:**
 - Electric automobile: Product A1 demand may reach ** million mt in 2040, with CAGR of 6.3%.
 - Wind power and PV: Product A2 demand is expected to be ** million mt in 2040, with CAGR of 6.5%.