宁波市发展规划研究院
NingBo Development Planning Research Institute

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Decarbonizing Cooling Sector in Ningbo - Issues and Solutions

宁波制冷部门减碳-问题和解决方案

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01

基本情况
Basic Information

1. 基本情况 Basic Information

The global response to climate change and its impact on the refrigeration industry

- **Stage 1：** Mainly focus on the destruction of the ozone layer by refrigerants, and promote the replacement of the first and second generation refrigerants.
- **Stage 2：** Focus on reducing carbon dioxide emissions and promoting the replacement of third generation refrigerants.
- **Stage 3：** Mainly focusing on the goal of "carbon peak and carbon neutralization", shifting from global refrigerant replacement to both refrigerant replacement and energy efficiency improvement of refrigeration equipment.

- **China attaches great importance to the "dual carbon" work,** China will strive to peak its carbon dioxide emissions before 2030 and achieve carbon neutrality before 2060.
- **From the perspective of the refrigeration industry,** as the world's largest manufacturer, consumer and trader of refrigeration and air conditioning products, China's refrigeration power consumption accounts for more than 15% of the total social power consumption.
- **In terms of practical needs,** in the summer of 2022, many parts of China experienced extreme weather conditions. Under the pressure of achieving the "dual carbon" goal, with tight timelines and heavy tasks, urgent action is needed to fully unleash the enormous potential of energy-saving and greenhouse gas emission reduction in the refrigeration industry, to help achieve the "dual carbon" goal.

1. 基本情况 Basic Information

■ About Ningbo。。。

- In the future, with the rapid development of manufacturing in Ningbo, the demand for industrial refrigeration will increase rapidly. Additionally, with the expansion of Ningbo's urban space, population growth, and increasing income levels of residents, there will be a further increase in demand for refrigeration in areas such as residential, commercial, public services, and cold chain logistics. **Ningbo has the conditions and demands for large-scale green refrigeration projects**.

未来，随着宁波制造业快速发展，工业制冷需求量将高速增加。此外，随着宁波城市空间拓展、常住人口增长、居民收入水平提升，居民生活服务、商业、公共服务、冷链物流等领域的制冷需求将进一步提高。

- **Natural Geographic Conditions：** Located in the southern wing of the Yangtze River Delta, the area boasts excellent transportation advantages with rivers, seas, air, and land all interconnected. The region has a high demand for humidity control, with the main focus on cooling, while also considering heating needs.

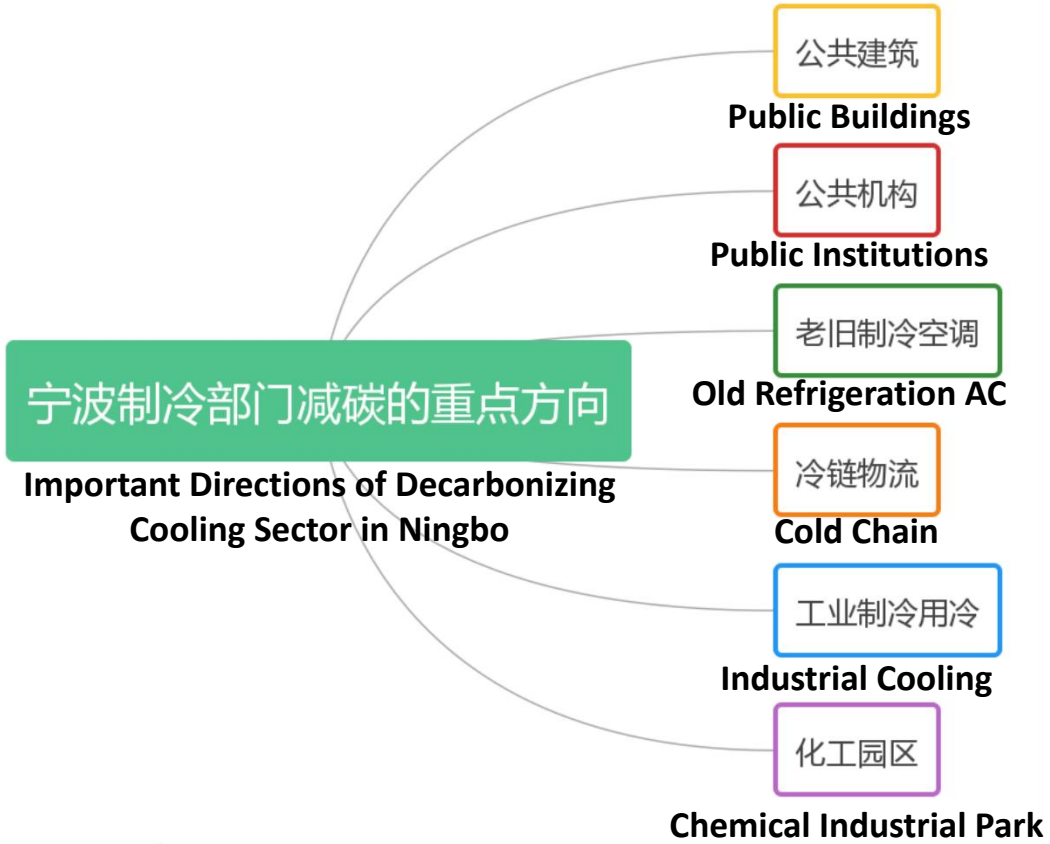
- **Economic and social development：** In 2022, the city's GDP reached 1.57 trillion yuan, ranking 12th among urban areas in China. The manufacturing industry is well-developed, with industrial added value reaching 668.17 billion yuan, ranking seventh in the country.

- **Energy production and consumption：** The city's primary energy consumption is 75.97 million tons of standard coal(coal 39%, natural gas and renewable energy 7.2%). The industrial electricity consumption accounts for over 70% of the total social electricity consumption.

- **Government support：** The Carbon Peaking and Carbon Neutrality Work Leading Group led by the Secretary of the Municipal Party Committee and the Mayor; a wealth of project experience; a green investment and financing mechanism; extensive external cooperation

1. 基本情况 Basic Information

Ningbo City possesses significant potential for energy conservation and emission reduction in the refrigeration and cooling sector. It also boasts a strong economic foundation, favorable investment environment, sound policy support system, and well-developed financial support system. With these conditions in place, advanced technologies, innovative business models, and financing methods can be applied to achieve efficient and environmentally friendly refrigeration and cooling in the city.



A survey was conducted on 1,846 existing public buildings in the city, including government offices, cultural and educational institutions, healthcare facilities, and hotels, as well as 628 market entities with outdated air conditioning systems. The survey focused on their sub-item energy consumption data and energy-saving retrofit implementation. The results revealed considerable energy-saving potential, with a strong willingness to achieve energy conservation and carbon reduction in public institutions. However, there is a lack of motivation for commercial sectors, small and micro-enterprises, as well as insufficient incentives for retrofitting and replacing outdated air conditioning systems.

Ningbo City has a significant number of cold chain logistics enterprises, with approximately 140 companies equipped with cold storage facilities. There is ample room for energy conservation through measures such as refrigerant replacement, equipment upgrading, and the implementation of intelligent control systems, which can effectively reduce energy consumption and carbon dioxide emissions.

The energy-saving potential in the city is enormous, and it brings noticeable economic benefits. However, the energy utilization in the petrochemical industry is complex, with high process requirements and technical difficulties. Therefore, in addition to strengthening technological promotion and innovation, it is necessary to actively explore reasonable business models and profit-sharing mechanisms.

02

存在问题
Existing Problems

2. Existing problems

The research team analyzed the potential in areas such as public buildings, old air conditioning systems, industrial central air conditioning, cold storage, residual energy refrigeration in chemical parks, and RDF steam in industries. They found that Ningbo has the advantage to deploy green and efficient refrigeration projects, but its potential has not been fully tapped. In addition to personalized issues and demands for advanced technology in each field, there are also problems with funding, renovation motivation, and profit models in implementing the projects.

- **Market entities:**
- Equipment owners lack motivation for energy-saving renovations, energy service companies lack guarantees, and construction entities face financial difficulties.

- **Technology applications:**
- The cost of replacing the new generation of refrigerants is high, and the promotion of new energy-saving technologies is difficult.

- **Technical standards:**
- The development and updating of standards is slow, and mandatory energy-saving standards have a narrow coverage.

- **Green finance:**
- Financing channels for green and low-carbon projects are limited, and financial institutions have low recognition of green projects. There is also a lack of bidirectional communication mechanisms between financial institutions and enterprises.

- **Government measures:**
- Local government policy tools are relatively few, the digital regulatory system is not perfect, and the effectiveness of policies is low.

03

解决方案
Solutions

3.解决方案 Solutions

- **Implement diversified solutions.** Improve the refrigeration energy efficiency of public buildings from the equipment level and the technical level, give full play to the energy-saving demonstration role of public institutions and take reasonable measures to carry out energy-saving transformation, promote the replacement of old air conditioners in advance on a large scale, optimize the refrigeration central air conditioning system of industrial enterprises, upgrade the refrigerants of cold chain logistics enterprises, intelligentize the transformation of refrigerants, use waste heat for refrigeration in chemical parks, and make full use of LNG cold energy in large data centers.

- **Play a guiding role in government regulation.** Establish and improve the implementation mechanisms of government energy-saving supervision and energy consumption limit management, establish and improve the energy-saving credit system, and promote the construction of a cross-departmental and cross-domain digital energy monitoring platform.

- **Accelerate the research and application of energy-saving technologies.** Improve the green and efficient refrigeration technology standard system, improve the green and efficient refrigeration technology innovation system, and strengthen the promotion of new technologies and demonstration cases.

- **Build a diversified financing channel.** Establish and improve a two-way communication mechanism between financial institutions and enterprises, actively introduce sovereign loans, introduce the "Super Energy Management Contract" model to implement projects in packages, rely on financial innovation to explore the financing, revenue distribution, and risk compensation mechanisms for enterprises and projects, and reduce the admission threshold and risk of energy service enterprises.

3.解决方案 Solutions

- **General Ide总体思路**
- **Driven by innovation and guided by greening, digitization, and low-carbon development，while considering both economic and environmental benefits, we will focus on key refrigeration areas such as industry, commerce, cold chain logistics, chemical parks, public institutions, and data centers.We will fully tap the potential of energy-saving and consumption reduction in areas such as equipment upgrades, system optimization, resource recycling, and distributed energy networks.**

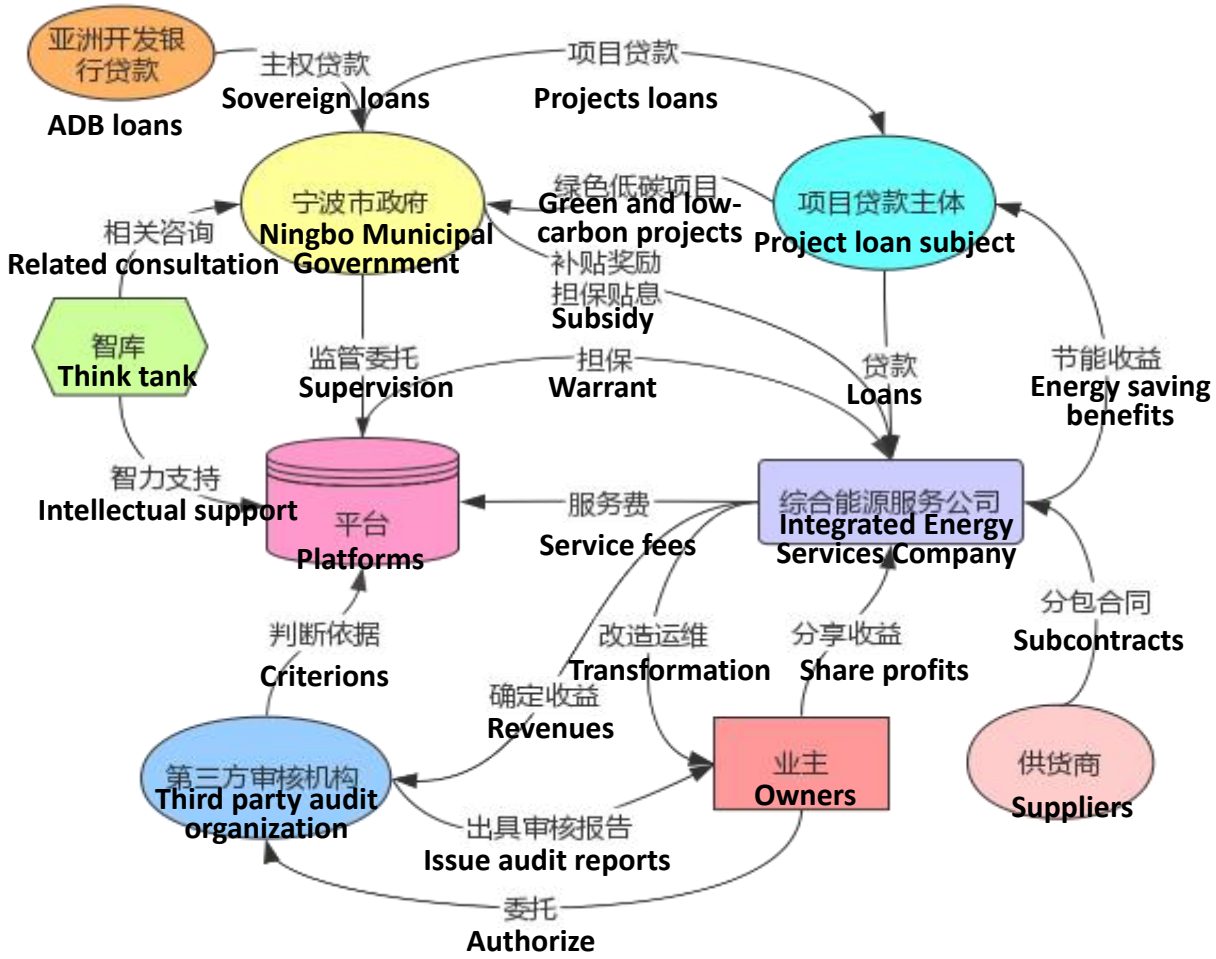
以创新为驱动，以绿色化、数字化、低碳化为方向，兼顾经济效益和环境效益，围绕工业、商业、冷链物流、化工园区、公共机构、数据中心等重点制冷领域，充分挖掘设备更新、系统优化、资源循环利用、分布式能源网络等领域的节能降耗潜力，强化“政府+市场”合力，探索“金融+财政”模式，着力培育第三方服务机构，大力发展绿色金融产业，加强国际合作，推进示范项目建设，全方面助力宁波“双碳”目标实现、城市绿色低碳发展。

3.解决方案 Solutions

- **Main objectives**
- **Actively promote energy-saving and carbon reduction projects to achieve green and low-carbon development in the city.** It is expected that the first batch of projects will save 190,000 tons of standard coal per year and reduce carbon dioxide emissions by approximately 682,000 tons per year.
- **Utilize sovereign loans from the Asian Development Bank to innovate investment and operation models.T**hrough government guidance, innovative investment and operation models for projects can be realized.
- **Cultivate energy-saving service enterprises and develop the energy-saving service industry.** Small and medium-sized enterprises will be supported to focus on the development of low-carbon and energy-saving industries.
- **Enhance government's energy-saving management capabilities and improve relevant functions.** We will establish a green and low-carbon statistical, accounting, and assessment system, and explore the establishment of a market trading mechanism.

3.解决方案 Solutions

- **Operational framework：**



Organizational structure: The Carbon Peak and Carbon Neutrality Working Group of Ningbo City is fully responsible for the carbon peak and carbon neutrality work in the city, and leads the implementation of this project. The Development and Reform Commission of Ningbo City takes the lead, together with relevant departments such as the Finance Bureau, Energy Bureau, districts (counties, cities), as the executive agency of this project, and Ningbo Development Planning and Research Institute provides technical support.

Technical architecture: The Development Planning and Research Institute of Ningbo City serves as the main technical support, and together with relevant departments, researches and formulates the key areas and main directions for the annual refrigeration energy efficiency improvement project selection.

Loan subject: The local banks in Ningbo, including Ningbo Bank, Tongshang Bank, and Donghai Bank, serve as the loan subjects, and assume the debt and repayment responsibilities, while the city finance department takes the guarantee responsibility.

Repayment model: The average loan period of the Asian Development Bank is 20 years, of which the first five years are grace period (paying interest but not principal), and the loan interest rate is a single US dollar loan floating rate plus the Asian Development Bank's comprehensive funding cost (currently the annual interest rate is 1.8%). The loan principal and interest are repaid twice a year.

Thanks

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