

Member Country Report -China

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Agenda

- Overview


- Policy

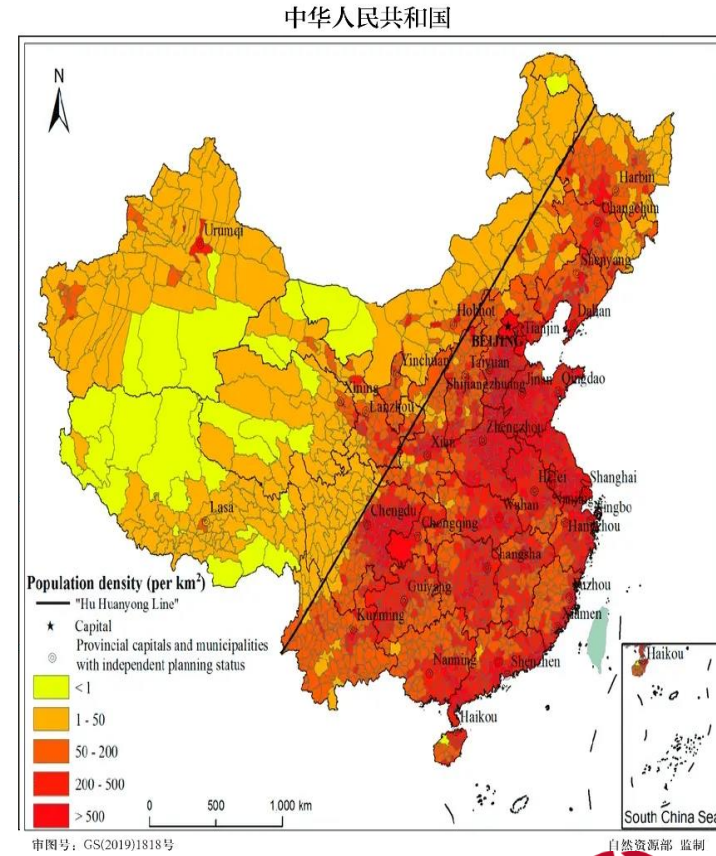
- Market

- Research & Application

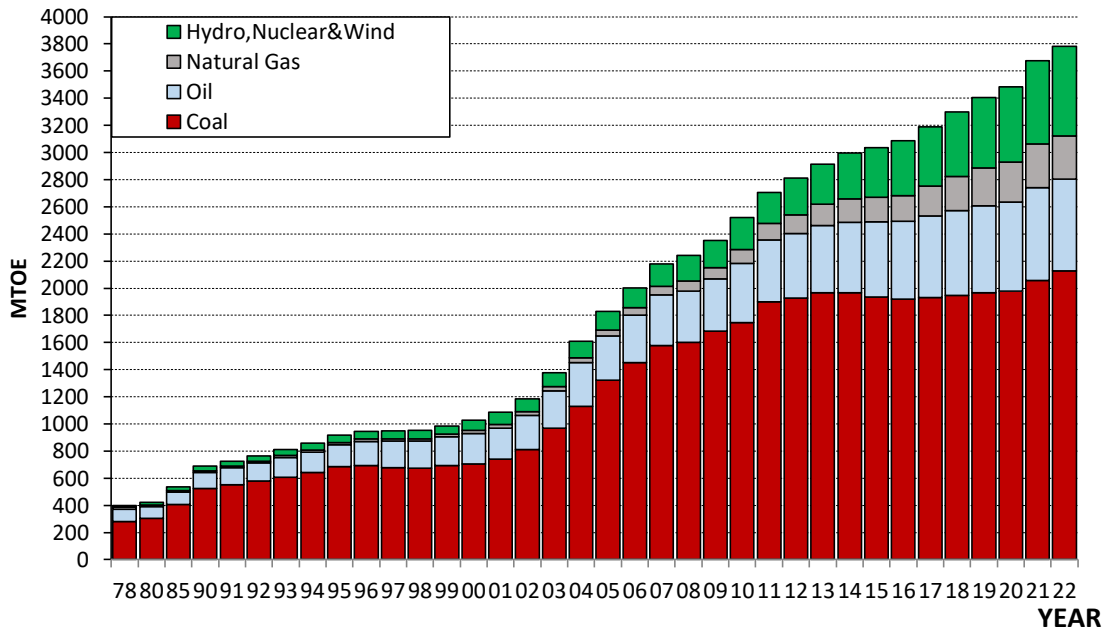
- Summary

Overview

- Land Area: about 9.6 million km²
- Sea Area: about 4.73 million km²
- Population: 1.4 billion
urban 0.92 billion (65.2%), rural 0.49 billion (34.8%)
- Households: 0.49 billion
1-17%, 2-24%, 3-21%, 4-19%, 5-10%, ≥6-10%
- Population density (p/km²) 

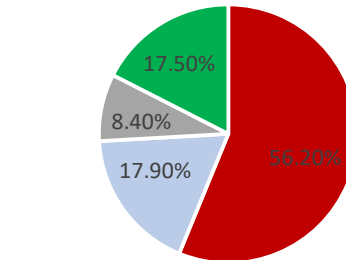


Overview

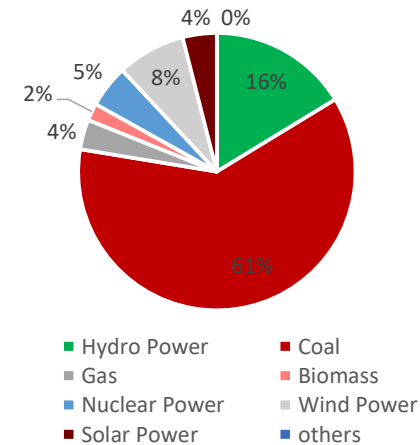


Energy consumption curve of China

Source: China National Bureau of Statistics



Percentage of energy consumption types



Percentage of power source

Source: China Electricity Council



Overview

Demand for energy transformation

With the urgency of energy structure transformation and climate change, heat pump technology, as an efficient and environmentally friendly heating method, has received widespread attention



Policy support

The Chinese government has issued a series of policies to encourage the development of new energy and energy-saving environmental protection industries in recent years, providing strong support for the promotion and application of heat pump technology

Market potential

As one of the world's largest energy consumers, China has great potential for the development of the heat pump market. Promoting heat pump technology is of great significance for reducing energy consumption and environmental pollution.



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National Level Policies

National Energy Efficiency Targets

Energy conservation law, Renewable energy——Promote the development and utilization of renewable energy, increase energy supply and improve energy structure.

Climate and Energy Strategy

Air pollution prevention action plan——Government provides subsidies and other financial support to allocate the option of heat pumps, 88 cities, more than 100 billion.

Carbon Reduction

Carbon peak action plan before 2030——Promote clean and low-carbon heating such as heat pump.





Regional Level Policies



Regional energy plans

Heat pumps are often included in regional energy plans as a strategy to reduce fossil fuel consumption and green house gas emissions

Funding programs

Regional governments may provide funding programs to support the installation of heat pumps in homes and businesses



Collaboration and partnerships

Regional governments collaborate with manufacturers, utilities, and other stakeholders to promote the use of heat pumps





Local Level Policies



Beijing

Give financial subsidies to ground source heat pumps and thermal storage systems
The proportion of renewable energy capacity in the new heat source is not less than 60%.



Shanghai

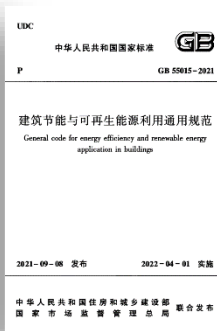
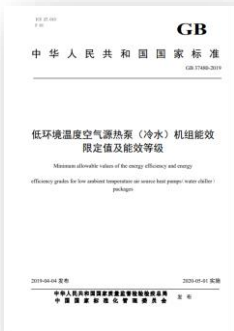
Prohibit the use of fossil energy heating systems in low-energy buildings
Encourage the application of renewable energy and heat pump technology



Codes and Standards



GB/T 25127.1/2-2020



- ◆ The capacity of A/W for household unit is lower than 35kW, for industrial & unit is larger than 35kW.

名义制热量 (或者义制热量) kW	限定出水温度	能效等级			
		1	2	3	制热性能系数 (COP _a , W/W)
$H \leq 35$ (或 $CC \leq 50$)	35 °C ^a	3.40	3.20	3.00	2.40
	41 °C ^b	3.20	2.80	2.60	2.10
	55 °C ^c	2.30	1.90	1.70	1.60
$H > 35$ (或 $CC > 50$)	35 °C	3.40	3.20	3.00	2.40
	41 °C	3.00	2.80	2.60	2.30
	55 °C	2.10	1.90	1.70	1.60

- ◆ 35°C -floor radiant system
- ◆ 41°C -fan coil
- ◆ 55°C-radiator

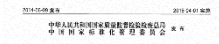
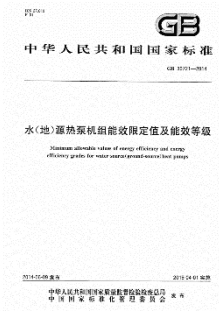
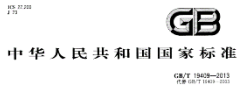
机组类型	严寒地区	寒冷地区
冷热风机组 A/A	1.8	2.2
冷热水机组 A/W	2.0	2.4

- ◆ In severe cold and cold area, the COP at the local design temperature should not be lower than the values.

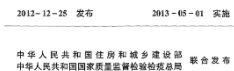




Codes and Standards



GB/T 19409-2013 GB30721-2014



GB/T 50801-2013

- ◆ Annual Coefficient Of Performance is used to indicate the comprehensive performance of water-source heat pump units. $ACOP=0.56EER+0.44COP$

类 型	名义制冷量 (CC) kW	全年综合性能系数 (ACOP) W/W			
		1 级	2 级	3 级	
冷热风型 W/A	水环式	—	4.20	3.90	3.50
	地下水式	—	4.50	4.20	3.80
	地埋管式	—	4.20	3.90	3.50
	地表水式	—	4.20	3.90	3.50
冷热水型 W/W	水环式	$CC \leq 150$	5.00	4.60	3.80
		$CC > 150$	5.40	5.00	4.00
	地下水式	$CC \leq 150$	5.30	4.90	3.90
		$CC > 150$	5.90	5.50	4.40
	地埋管式	$CC \leq 150$	5.00	4.60	3.80
		$CC > 150$	5.40	5.00	4.00
	地表水式	$CC \leq 150$	5.00	4.60	3.80
		$CC > 150$	5.40	5.00	4.00

- ◆ Energy Efficiency Rating Table for Ground Source Heat Pump System

性能	1级	2级	3级
供热性能系数	$3.5 \leq COP_{sys}$	$3.0 \leq COP_{sys} < 3.5$	$2.6 \leq COP_{sys} < 3.0$
供冷能效比	$3.9 \leq EER_{sys}$	$3.4 \leq EER_{sys} < 3.9$	$3.0 \leq EER_{sys} < 3.4$



Agenda

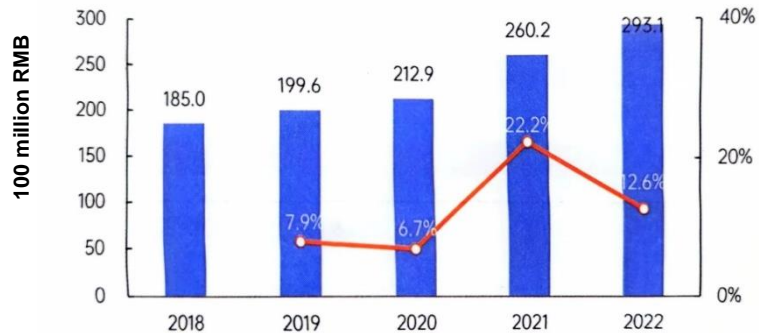
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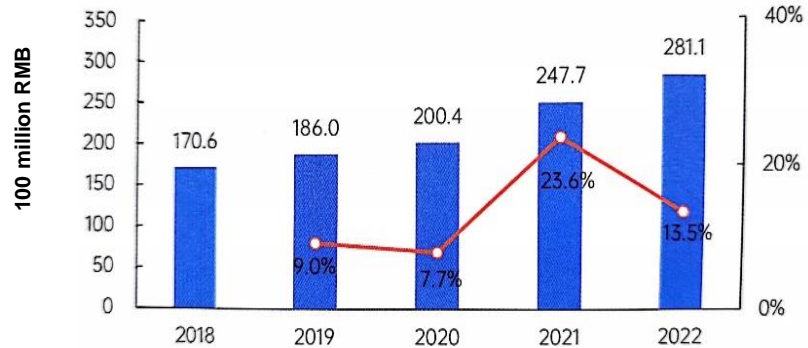
- **Market**

- Research & Application

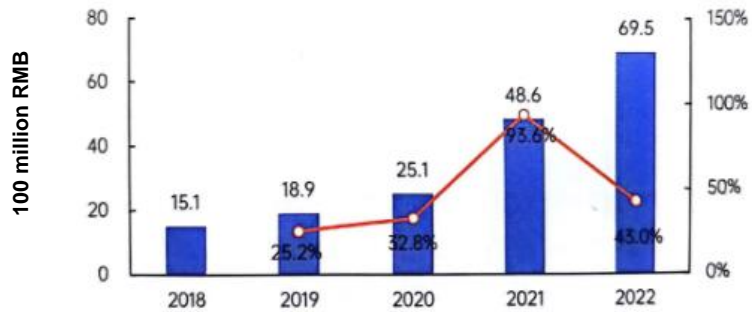
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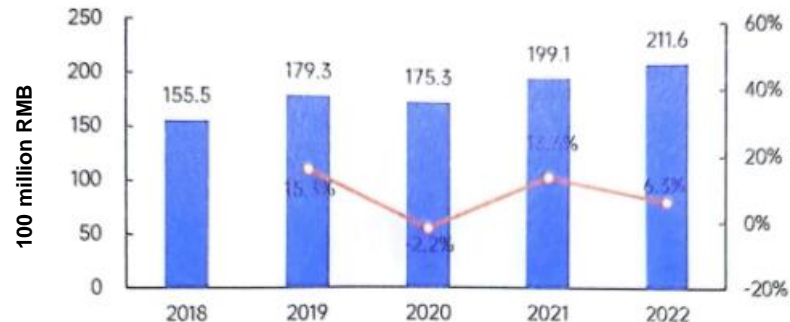
Sales of heat pump



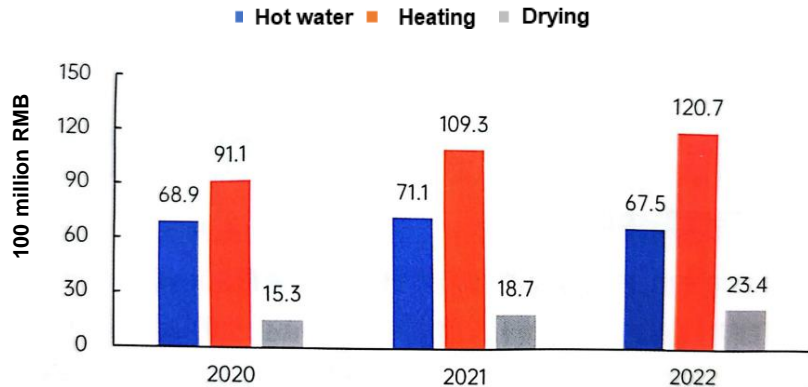
Sales of ASHP



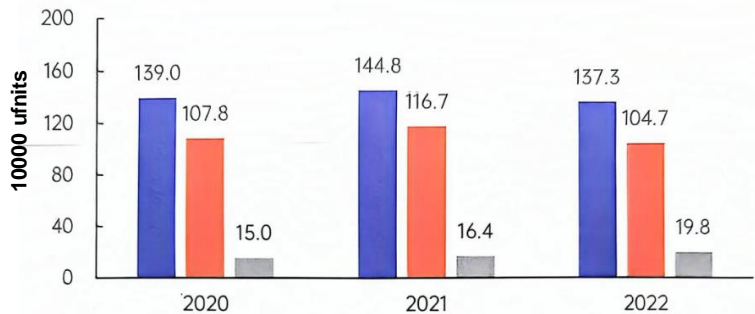
Export sales of ASHP



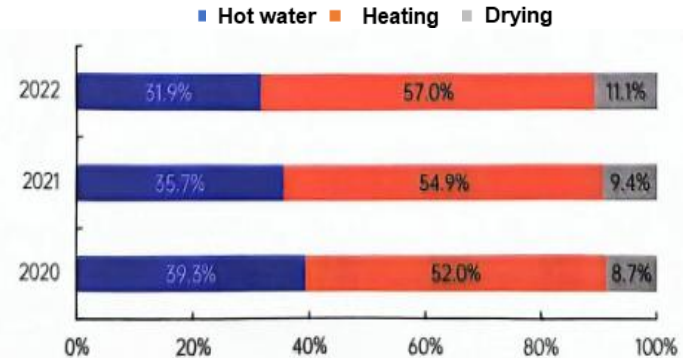
Domestic sales of ASHP



Application markets of air source heat pump

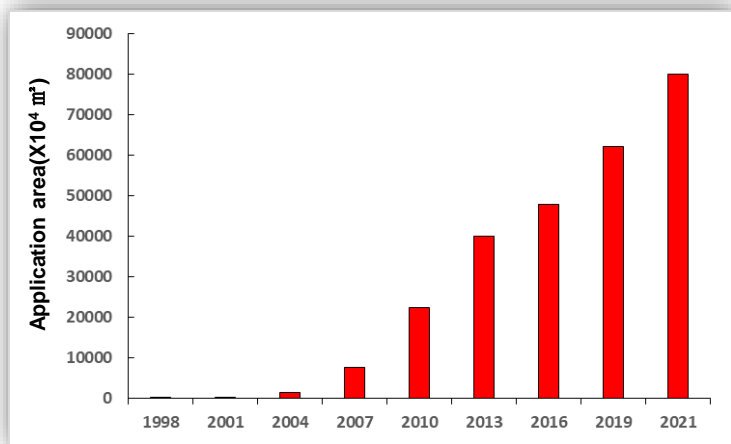


Application markets of air source heat pump

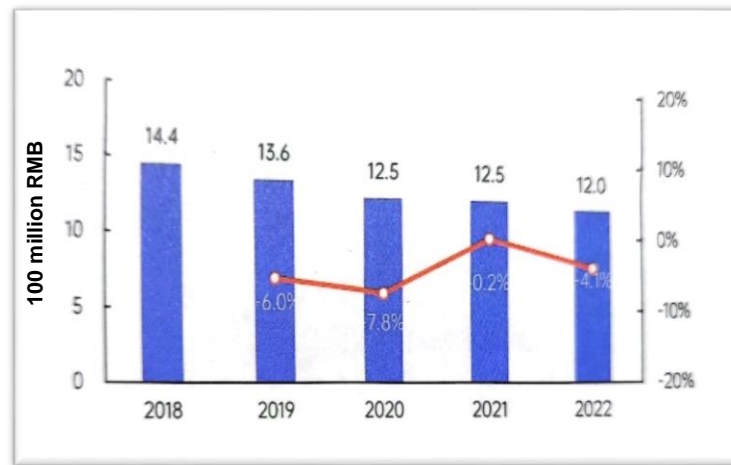


Application division of different air source heat pumps





Application of GSHP



Sales of GSHP units

- Affected by high investment, the number of projects has decreased, and the application in residential buildings has declined.

- Guided by the goal of carbon neutrality, the application of large-scale projects is a good choice for areas with both winter heating and summer cooling.

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Research & Application

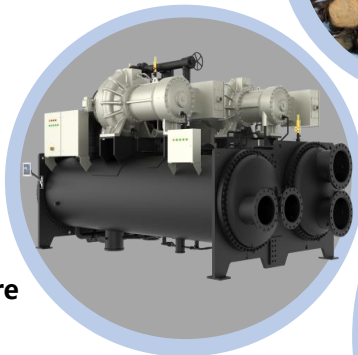
Air source heat pump

- ◆ Low GWP refrigerant
- ◆ Low temperature performance improvement
- ◆ Improvement of low-temperature heating stability



High temperature heat pump

- ◆ Increase the heating temperature of the heat pump unit
- ◆ Improve the heating capacity of the heat pump unit
- ◆ Heat pump steam supply



High efficiency heat pump system

- ◆ Developing a new medium-deep geothermal heat pump system
- ◆ Multi-energy hybrid heat pump high-efficiency system



Low temperature ASHP



Fixed-frequency unit can operate stably at -35°C to meet heating demand



Variable-frequency unit can operate at -40°C, and the heating capacity does not attenuate within the range of -12 to -20°C



CO₂ as refrigerant, the maximum water temperature of the unit can reach 90°C

Cloud computing service



Management system

Mobile App



4G/5G



Cloud service module



ASHP

- ◆ Identify the characteristics of building load and energy consumption habits, consider the stabilizing effect of building thermal inertia on room temperature fluctuations, and actively control heat pump heating from the perspective of supply and demand matching
- ◆ Optimal parameters (frequency, valve position, temperature control range) under target load
- ◆ Optimizing the regulation of multiple units can improve the heat supply regulation, enhance system efficiency, and reduce energy consumption

High temperature heat pump



120°C⁺ Industrial high-capacity high-temperature centrifugal heat pump



80°C high-capacity centrifugal heat pump

Condensation temperature 120°C⁺

Temperature increase of 65°C⁺

Refrigerant R1233zde GWP<1

COP: 4.36/6.14

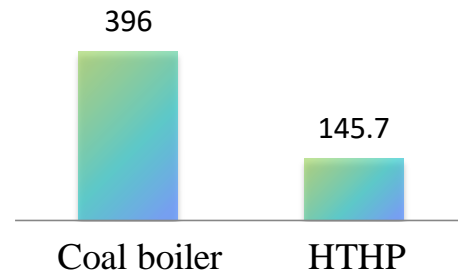
Capacity: 9MW



HTHP in a steelworks

- ◆ The Lingshan project of Ansteel adopts a 9MW heat pump to replace coal-fired boilers to meet the heating needs of 180,000 square meters of residents.
- ◆ The COP of HTHP reaches 6.67.
- ◆ The heat pump system saves RMB 2.5 million yuan per year compared to municipal heating, reducing carbon emissions by 9450 t/a
- ◆ The use of high-temperature heat pumps to recover 30-40°C wastewater during steelmaking has significant energy-saving and environmental benefits

Heating cost/10000 yuan

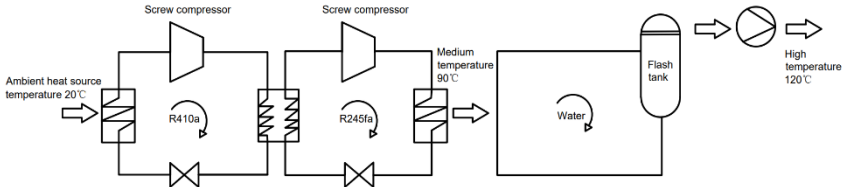


Heat pump steam supply

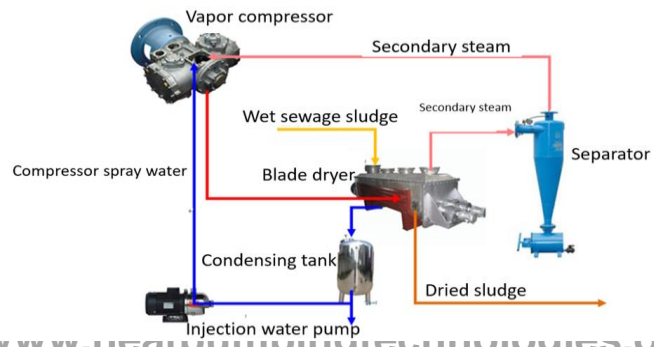


High-Temperature Heat Pumps

This Annex gives an overview of available technologies and close-to-market high-temperature heat pumps. Future developments will...

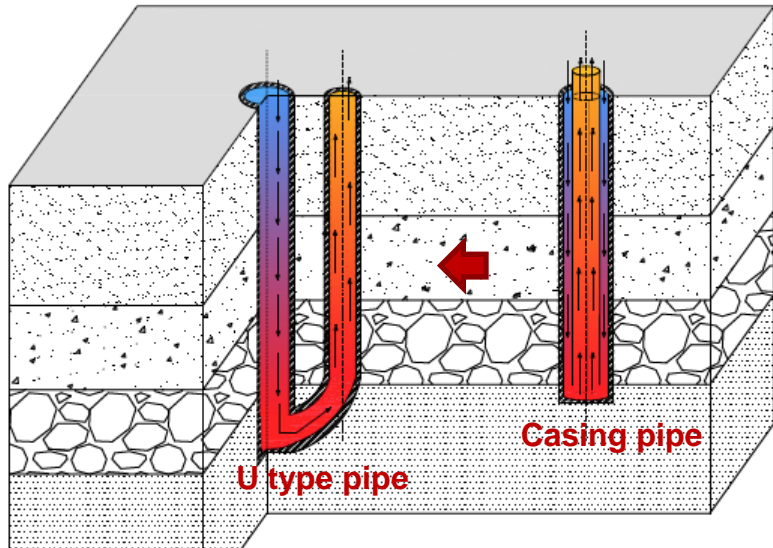


Air source heat pump boiler

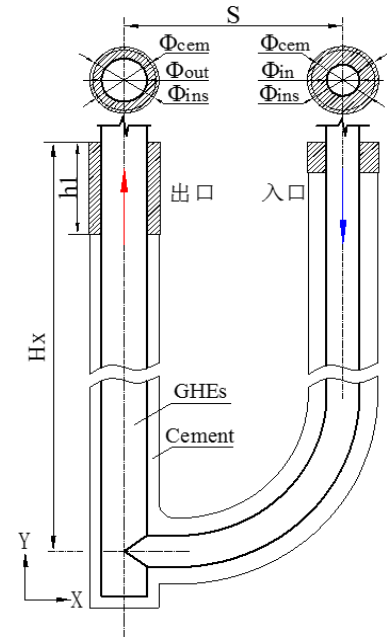
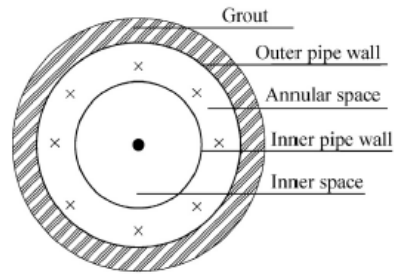


Hongzhi Yan, Bin Hu, and Ruzhu Wang*. Air-Source Heat Pump for Distributed Steam Generation: A New and Sustainable Solution to Replace Coal-Fired Boilers in China, *Adv. Sustainable Syst.* 2020, 2000118

High efficiency heat pump system



Different forms of medium-deep heat exchangers



- ◆ Casing pipe-Low construction costs than U type, low cycle resistance
- ◆ U type pipe-High heat transfer efficiency, allowing for more heat extraction



Medium-deep geothermal HP

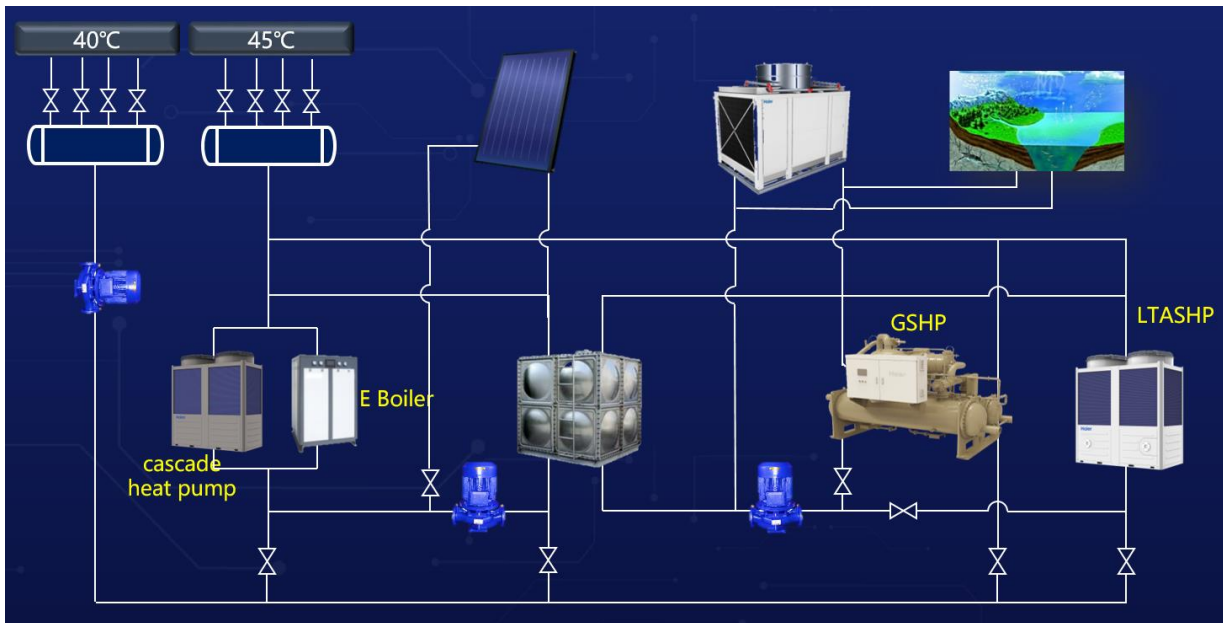


The medium-deep geothermal heat pump has high heat transfer efficiency and large heat supply energy density. It is one of the alternative ways to traditional heat supply in severe cold and cold regions. The demonstration project in Qingdao city can reach 6.2, and the system energy efficiency is 4.5

www.heatpumpingtechnologies.org



High efficiency heat pump system



- ◆ Heat pump + solar energy + electric boiler + water heat storage
- ◆ Heating/cooling
- ◆ Optimal investment, cost-effective, tailored to local conditions

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Summary

- (1) The application of heat pump technology represents the future direction of advanced heating development, is the only way for the re-electrification of building heating and cooling, is an important means for building a new energy system, and is also a key path for building a zero-carbon transformation.
- (2) China's carbon neutrality goal has promoted the iteration and advancement of heat pump technology, and the heat pump industry will develop rapidly under the global energy structure and China's energy policy.
- (3) Technologies such as hybrid heat pumps and new heat pump systems are important trends in the future development of heat pumps, and the growth of China's heat pump market will accelerate.



Thanks for your attention

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