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Nuclear energy points way to greener, cleaner future



Shandong Nuclear Power Co's plant in Haiyang, Shandong province, provided heating produced by clean energy to all urban districts of the city during the winter. ZHANG XIAOHUI / FOR CHINA DAILY

By ZHAO RUIXUE in Jinan and ZHANG XIAOMIN in Dalian, Liaoning

In addition to supplying power, nuclear energy has been used for decades for heating and seawater desalination around the world.

Nuclear energy developers are now using new models of this form of clean energy to increase efficiency and reduce costs.

In Haiyang, Shandong province, a nuclear power plant on the Yellow Sea shore completed a mission this year to provide clean heating to all urban districts of the city throughout the winter.

Shandong Nuclear Power Co, a subsidiary of State Power Investment Corp and also the plant's operator, said the facility provided carbon-free heating for 143 consecutive days, serving an area of 5 million square meters and benefiting 200,000 residents in Haiyang, a county-level city under the jurisdiction of Yantai.

The plant's heating system is connected to the nuclear unit, making it the first commercial attempt in China to supply heat from traditional nuclear power.

Xiu Yaping, a Haiyang resident who lives about 20 kilometers from the plant, said clean heating keeps her family warm and contributes to a healthier environment.

"The temperature in our home remained at about 24 C during the winter," Xiu said, adding that when she turned all the heating appliances in the property on, the temperature rose to around 28 C, so she had to turn one or two of them off.

"The heating came on several days before the scheduled start of the winter heating season, and due to cold weather it was turned off days after the scheduled end of this period," she said.

Living near a thermal power plant, Xiu used to be worried by

smoke pouring from its chimneys in winter when the plant started to burn coal to provide heating. She needed to clean her window sills every day to prevent soot forming.

"Now, I feel that our living environment is much cleaner," she said.

Safety a priority

Zhou Dadi, a senior researcher at the National Development and Reform Commission's Energy Research Institute, said that for more than three decades China has conducted research on using nuclear energy to provide heating, and has developed mature technologies.

Wu Fang, chairman of Shandong Nuclear Power Co, said, "Safety is the first prerequisite we need to consider when we develop nuclear power."

In 2019, trials to use steam from nuclear power for winter heating began in Haiyang, when more than 7,000 households started to use this new system, followed by a second phase last year that covered the entire urban area of the city.

The heating system extracts non-radioactive steam from the secondary circuit of the nuclear unit. The steam is then fed through a multistage heat exchanger at the plant.

Heat is subsequently channeled to a thermal power supply company to heat water flowing to consumers through municipal pipelines.

Wu said, "During this process, only heat is transferred, with no hot water being exchanged, ensuring the safety and reliability of nuclear energy heating."

Smart devices are used in the heating system to guarantee safety and efficiency.

Li Changke, assistant to the general manager of Fengyuan Thermal Power Co, which is cooperating with Shandong Nuclear Power Co, said, "Devices have been installed on the pipeline network to monitor any



Engineers check the heating system at Shandong Nuclear Power Co in Haiyang. JIANG TAO / FOR CHINA DAILY

water leakage or damage to insulation layers."

The heating system at the nuclear plant is included in the city's smart heating platform.

"We use smart equipment to adjust the heating supply according to the weather," Li added.

Important source

Nuclear power is an important source of energy with many environmental benefits, according to experts.

Wu said, "It contributes to solving environmental problems such as those linked to emissions of carbon dioxide and other gases from the burning of fossil fuels."

The use of nuclear energy in Haiyang has replaced 12 boilers that burned coal for central heating. To date, the clean energy has reduced carbon dioxide emissions by 330,000 metric tons, nitrogen oxide emissions by 2,021 tons, sulfur dioxide by 2,138 tons and soot by 1,243 tons, according to Shandong Nuclear Power Co.

the 14th Five-Year Plan period (2021-25) to reach its goals of peaking carbon emissions by 2030 and achieving carbon neutrality by 2060.

Last month, the government released its modern energy system plan as part of the 14th Five-Year Plan, emphasizing that China's share of non-fossil energy consumption will increase to about 20 percent.

Jiang Yi, an academican at the China Academy of Engineering and director of the Research Center of Architecture Energy Saving Affiliated to Tsinghua University, said that as a clean form of energy, nuclear power has the potential to develop the heating sector.

Central heating coverage in urban districts of China increased on average by 10 percent annually from 2000 to 2020, according to the National Bureau of Statistics.

Jiang said, "In places with nuclear power plants, urban heating problems can be solved by using the heat from this form of energy, without increasing emissions."

Shandong Nuclear Power Co said it plans to expand the heating area to all of the Jiaodong Peninsula in the east of the province.

The company has started the third phase of a 900-megawatt district heating project based on nuclear power. When put into service, this phase will cover 30 million sq m and is expected to meet demand from 1 million residents. Carbon reduction is likely to increase several times over, according to the company.

Wu said, "The third-phase project will also involve new energy and energy storage solutions to better manage the consumption of clean energy and cross-regional clean energy heating."

In eastern China, the first phase of a nuclear heating project at Qinshan Nuclear Power Station in Haiyang county, Zhejiang province, successfully completed a trial operation by providing heating for an

area of 460,000 sq m for 100 consecutive days during the winter, benefiting 4,000 households.

China National Nuclear Corp, which operates the Qinshan plant, said that when it is fully operational the project is expected to provide heating to a total of some 4 million sq m of public facilities, residential communities and industrial parks in Haiyan.

Project launched

In the northeast, a major industrial area, an agreement on a heating project powered by nuclear energy was signed last month by Hongyanhe Nuclear Power Co and the northeastern branch of State Power Investment Corp.

The initial phase of the project, which is located in Hongyanhe town, Dalian, Liaoning province, is scheduled to be put into operation in the coming winter, providing heating to an area of 242,400 sq m.

The project is expected to make an important contribution to environmental protection in the northeast, especially Wafangdian, a county-level city of Dalian, where Hongyanhe is located.

Wang Bairun, a Hongyanhe official, said, "We usually use electricity and coal-fired furnaces to provide heating in the town, which is lagging behind when it comes to central heating systems in the urban area."

Coal-fired boilers in different areas of the town pose big challenges to environmental protection, especially during the heating season, Wang added.

Wang Jianguo, an engineer at the Hongyanhe nuclear plant, said, "The nuclear energy-powered project will substantially reduce pressure on the local government to protect the environment."

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Hongyanhe Nuclear Power Co in Dalian, Liaoning province, is scheduled to put the initial phase of a heating project into operation next winter. PROVIDED TO CHINA DAILY

Power demonstration project benefits thousands of residents in Shandong

By ZHAO RUIXUE in Jinan

A demonstration project on the comprehensive use of nuclear energy in Haiyang, Shandong province, is being used as an example in China's 14th Five-Year Plan (2021-25) to better develop nuclear energy.

In addition to its main business of power generation, in 2019, Haiyang Nuclear Power Plant started com-

mercial heating services.

This year, the plant provided heating from clean energy to all urban districts of Haiyang during the winter, marking the first commercial attempt in China to supply heat from traditional nuclear power.

Shandong Nuclear Power Co, which operates the plant, said more than 200,000 residents benefited from the nuclear power project,

which provided carbon-free heating for 143 consecutive days to an area of 5 million square meters.

The company is updating the project, integrating it with a seawater desalination system to produce freshwater for the Jiaodong Peninsula in eastern Shandong, where water supplies are short.

A demonstration project for the simultaneous production and channeling of freshwater and

heat was completed in May last year. The project now provides freshwater and heat to nearly 2,000 people in the plant's dormitory area.

This process involves a multistage reverse osmosis and evaporation system that uses heat generated by the plant. Desalinated water is treated until it reaches the drinking water standard and is then heated to 95 C. The water and heat are then chan-

neled to consumers via a pipeline.

A device is used to separate the heat and water, with the former entering the thermal system, and the latter entering the water supply system for use.

The company said that compared with the traditional method of producing and transporting water and heat via separate channels, the simultaneous project will halve the total cost.

Wu Fang, chairman of the company, said that in addition to its key business of power generation, a 1-million-kilowatt nuclear unit is expected to supply heating to an area of 30 million sq m.

The unit will produce 30 million metric tons of freshwater during a single heating season by using the technologies to simultaneously produce and channel water and heat, Wu added.