



From left: A man rides a hydrogen-powered scooter in Shanxi's Xiaoyi city. ZHU XINGXIN / CHINA DAILY Photovoltaic cells are produced on the automated production line at Jinergy. PROVIDED TO CHINA DAILY An executive of Xinzhou-based China Crystal Technologies introduces products to journalists at a showroom. PROVIDED TO CHINA DAILY A solar farm built on the depleted coal mine of Jinyang New Energy Power in Yangquan's Yuxian county. PROVIDED TO CHINA DAILY



Energy transformation spurs economic growth

By YUAN SHENGGAO

China has set its goals for low-carbon development: to reach peak carbon before 2030 and carbon neutrality before 2060.

The North China province of Shanxi, with coal mining as its traditional pillar industry, is implementing its own measures to meet these goals through a large-scale industrial transformation initiative that is upgrading its coal industry and fostering new, green industries that can drive low-carbon development.

An active player in Shanxi's industrial transformation, the city of Yangquan, located in the east of the province, is using cutting-edge technologies to upgrade traditional industries and foster emerging sectors as new growth drivers.

Like the rest of Shanxi, coal mining had been the dominant industry in Yangquan for decades. But now the city has been given a new lease on life thanks to efforts to upgrade coal-mining facilities and boost economic diversification through developing new industries.

An affiliate to the local coal-mining giant of Huayang Group, Huayang No 2 Mine is an old coal-mining facility with a history of more than 70 years. It is seeing a rejuvenation thanks to digital empowerment and smart mining construction.

Huayang No 2 began smart mining construction in December 2021. Since then, it has developed nine intelligent operational subsystems for areas including infrastructure management, geological safety guarantee and coal cutting. The subsystems have been integrated through a comprehensive operational platform, substantially improving the coal mine's operations, safety and efficiency, according to executives.

The coal mining company now boasts nine intelligent mining shafts and 19 smart coal-cutting sites, featuring such technologies as 5G connection, remote monitoring and automation.

"The automation rate of our mining shafts and coal-cutting sites reached 90 percent," said Wu Ruiming, an executive of the company. "This has led to greater safety, as it is commonly recognized in the coal-mining industry that 'less manpower means better safety'."

Wu also noted that the daily work period of in-shaft workers has been reduced by about five hours, also leading to better safety and efficiency.

"In the next stage, we will use such technologies as artificial intelligence and robotics to further increase safety and efficiency," Wu said.

While Huayang No 2 is devoting much energy to the intelligent upgrade of traditional coal-mining operations, other companies in Yangquan have delved into various emerging sectors.

One such company is Huana Xinneng, which is also a branch company of Huayang Group and a developer of new types of batteries. Unlike the popular lithium-ion battery, what gives it an edge are sodium-ion batteries.

Nowadays, lithium-ion batteries have been applied to portable electronics and electric vehicles due to high energy density, long work life and environmental benefits. But limited lithium resources and high costs have impeded the application of lithium-ion batteries in large-scale energy storage systems.

Because of sodium's high abundance, low cost and suitable redox potential, some companies in China are developing applications of sodium-ion batteries as a substitute of lithium-ion ones, according to a report released by the University of Science and Technology of China. Huana Xinneng is one of such companies.

"Lithium-ion batteries are now increasingly popular in many application scenarios," said Luo Zhenhua, an executive of Huana Xinneng. "But there are still limits to the batteries. For instance, the mileage of lithium-ion battery vehicles can be drastically reduced in low temperatures and the batteries cannot be used in scenarios with strict requirements in safety."

He added that such shortcomings can be overcome by sodium-ion batteries. Compared with lithium-ion batteries, sodium-ion batteries feature better safety performance, better adaptivity to temperature change and a longer life cycle.

"In a temperature as low as -20 C, the capacity of some sodium-ion batteries can be kept at 80 to 90 percent," Luo said.

Huana Xinneng began to develop sodium-ion batteries in 2021. It realized volume production of cylindrical cells and battery packs in 2023 and began mass production of square cells in April this year.

According to Luo, square cells are the upgraded version from cylindrical cells, featuring a larger capacity in energy storage.

Jin Shenglong, board chairman of Huana Xinneng, said the company will continue to boost the growth of the sodium-ion battery industry, contributing to Shanxi's and China's low-carbon development.

Jinyang New Energy Power, based in Yangquan's Yuxian county, is another example of Shanxi's industrial transformation in diverting its operations from coal-fired generation to solar power business.

The company has a coal-fired power plant near a coal mine. After decades of development, the mine had seen its reserves depleted in recent years. Land subsidence was the direct outcome of this.

To make better use of the coal mine's land, Jinyang New Energy Power developed a large solar farm on the surface of the mine after refilling it.

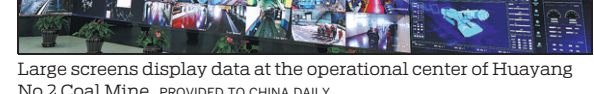
With a total investment of 727.97 million yuan (\$101.74 million), the solar farm can generate 128 million kWh of electricity annually. Compared with the former coal-fired facility, this translates into a reduction of 127,600 metric tons of carbon dioxide emission every year, according to Lu Haijun, head of the company.

"We have seen great environmental benefits from this new (solar power) business," Lu said. "We are developing the solar farm while repairing the local environment and restoring the ecosystem."

More importantly, Lu said the new facility has brought new jobs to workers who were on the verge of unemployment because of the depleted mine reserves. With the expansion of the solar farm, rural residents in the vicinity were also offered jobs.

"As a solar power enterprise, we are benefiting from the fast-developing photovoltaic technologies," Lu said. "In the years to come, along with our business expansion, we will promote our operational experience to the rest of the country and even the province, bringing more benefits to the people and the environment."

Feng Siqun contributed to this story.



Large screens display data at the operational center of Huayang No 2 Coal Mine. PROVIDED TO CHINA DAILY

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Liu Hanru, chief scientist at Farizon New Energy Commercial Vehicle Group

“The energy industry is at the forefront for realizing the nation's peak carbon and carbon neutrality goals.”

Liao Jicheng, deputy general manager of Jinergy

ago. It is now one of the leaders in the sector worldwide.

Geely's Jinzhong facility began the world's first mass production of methanol-powered heavy-duty trucks and methanol-electric hybrid passenger cars in June 2022.

Liu Hanru, chief scientist at Farizon New Energy Commercial Vehicle Group, said the mass-produced truck is its second generation of heavy trucks powered by methanol.

"Compared with its previous version, which was a model for trial operation, the new truck features stronger performance and lower energy consumption. Thus, it can help owners substantially cut operational costs," said Liu.

The executive added that the hybrid car belongs to the fourth generation of the company's methanol passenger vehicles.

Liu said the maturity in vehicle-making technologies and the availability of methanol are two decisive factors in the sector.

He said Geely began to develop technologies for methanol vehicles in 2005 and has since made breakthroughs in the production of engines and components.

"With our self-developed core technologies, Geely is the world's first volume producer of methanol-fueled vehicles and the first in China to get a license for methanol vehicle production," Liu said.

Geely established Shanxi New Energy Automobiles Corp — the predecessor of Farizon New Energy Commercial Vehicle Group — in the city of Jinzhong in 2011. Its facility began producing methanol and pure electric vehicles in 2017.

When talking about the availability of methanol, Liu said Jinzhong, as well as Shanxi, has unique advantages in developing such fuel.

He explained that carbon dioxide, as a raw material for methanol production, can be captured from the emissions of Shanxi's coal-fired power plants, coking plants and other industrial facilities that consume coal.

Jinzhong is one of the cities piloting the development of methanol fuel and methanol vehicle production. It now boasts a complete methanol industry chain, ranging from R&D, equipment manufacturing, methanol production and transportation to filling stations.

Local officials said Jinzhong initiated a plan in 2022 to establish itself as a national-level demonstration zone for the methanol economy.

Over a three-year period, the city aims to produce 1 million metric tons of methanol, 100,000 methanol-

powered passenger vehicles and 50,000 methanol-fueled heavy-duty trucks annually. In addition, about 100 methanol filling stations will be added each year in the city. In total, the methanol industry chain is expected to generate more than 100 billion yuan (\$14.01 billion) in annual revenue, according to the officials.

While Geely's Jinzhong facility is delving into the methanol energy industry, Jinneng Clean Energy Technology, or Jinergy, demonstrated to the media group another aspect of new energy technology development: the R&D and production of the advanced TOPCon photovoltaic cells.

At the production base of Jinergy — a world-leading PV manufacturer and clean energy provider incorporated under Jinneng Holding Group in Jinzhong city — more than 100 5G-connected smart carts were busy transporting silicon wafers to the automated production lines with an annual output of 4 gigawatts of high-efficiency photovoltaic cells.

Jinergy recently announced that its TOPCon high-efficiency heterojunction solar cells were produced with a photoelectric conversion efficiency of more than 25.5 percent, one of the highest rates for the industry worldwide.

Jinergy began R&D on heterojunction cells in 2016 and realized mass production of the products in 2017. It started to develop the more advanced TOPCon cell technology in 2019.

As the first domestic mass production facility of heterojunction cells, Jinergy has now sold products to more than 50 countries and regions across the world.

"The energy industry is at the forefront for realizing the nation's peak carbon and carbon neutrality goals," said Liao Jicheng, deputy general manager of Jinergy. "We will continue to develop more products with higher quality and efficiency to support China's low-carbon development."

For an energy company, efficiency always means better economic and environmental benefits, the media group learned at a power plant in Jinzhong.

Inside Ruiguang Thermal Power, journalists were led to the central control room, where large displays showed figures relating to the output and efficiency of its two power generation sets.

The two generation sets, each with a capacity of 300,000 kilowatts, can generate 3.3 billion kilowatt-hours of power annually, supplying electricity to the whole province.

The company is creating benefits other than power generation through its recycling practices, according to Dong Xin, deputy general manager of Ruiguang.

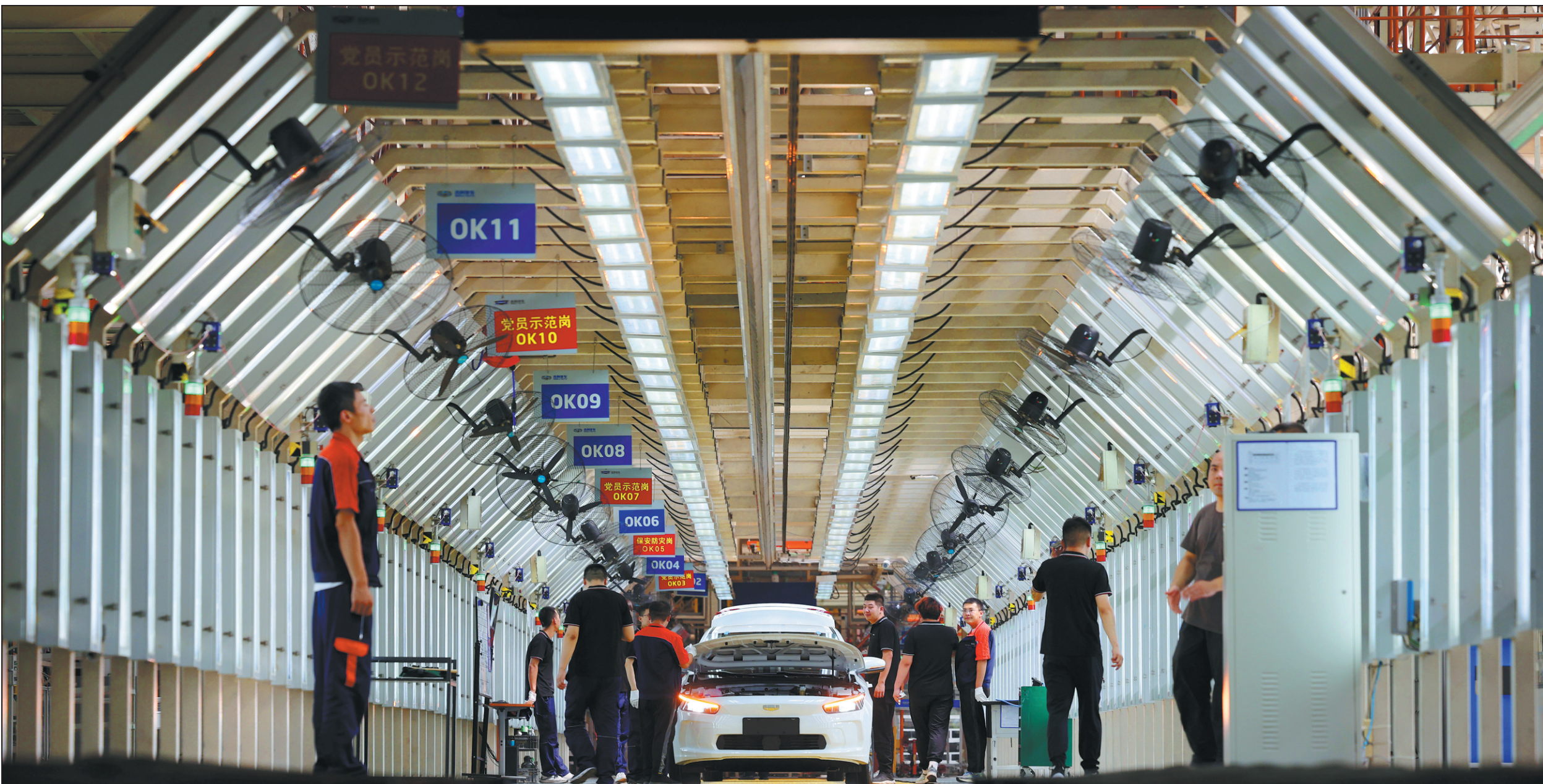
"We have realized 100 percent utilization of solid waste," Dong said. "The coal ash and cinder are used to produce construction materials like cement and gypsum."

Heat residue from coal-fired power generation is also collected and supplied to cities like Jinzhong and Taiyuan, according to Dong.

"Despite the growing use of new energy resources, coal-fired power generation still occupies a dominant position in today's electricity industry," Dong said. "Upgrading the facilities with intelligent technologies and improving efficiency through recycling are a practical and cost-effective method of carbon reduction."

One of the solutions to improve efficiency is the use of smart boilers, Dong said. He explained that the use of digital technologies can adjust the volume of coal combustion according to practical requirements, thus economizing the use of fuel and reducing emissions.

Feng Siqun contributed to this story.



Shanxi in fast lane of low-carbon development

Media group on tour discovers province is pulling out all the stops to meet the nation's ambitious green targets

Workers at Geely's Jinzhong plant inspect a methanol-electric hybrid car as it rolls through the final stages of the assembly line. ZHU XINGXIN / CHINA DAILY

By YUAN SHENGGAO

In a recent media tour to witness the progress of low-carbon development in China's energy-rich regions — including Shanxi, Shaanxi, Henan and Shandong provinces, as well as the Inner Mongolia autonomous region, reporters found Shanxi a worthy example.

The North China province, which used to rely on coal mining and other heavy industries, began an industrial transformation program in 2019, aiming to upgrade its traditional coal mining and cultivate emerging industries for economic diversification and low-carbon development.

The media group, which included journalists from across the country, toured the Shanxi city of Jinzhong on July 22.

To contribute to Shanxi's low-

carbon growth, Jinzhong has developed a complete methanol industry chain. Methanol is a clean, renewable energy resource featuring high combustion efficiency and low emissions. It can be produced from coal, coking gas, natural gas and biomass.

Jinzhong, as well as the rest of Shanxi, is rich in coal and coking gas which can be used to make methanol. The city began to develop the methanol industry some 40 years ago.

It was Farizon New Energy Commercial Vehicle Group, the Jinzhong arm of renowned domestic automaker Geely Auto, that pushed the industry into the fast lane of development.

At the production plant of methanol-fueled vehicles, an executive told reporters that Geely began research and development of methanol-fueled vehicles about two decades



From left: A new energy car is assembled at Geely's Jinzhong facility. A technician tests the product quality of photovoltaic cells at Jinergy's production plant in Jinzhong city. PHOTOS PROVIDED TO CHINA DAILY

