

# White Paper Underscores China's Energy Transition

## Policy

By ZHONG Jianli

China's State Council Information Office has released a white paper titled "China's Energy Transition," detailing the achievements made over the past decade in this area.

The document highlights China's commitment to building a clean, low-carbon, safe, and efficient energy system that supports high-quality economic and social development while catering to people's growing desire for a better life.

"China insists on green and low-carbon development, accelerating the creation of an energy supply system primarily based on non-fossil fuels, thereby promoting harmony between humanity and nature," said Zhang Jianhua, administrator of China's National Energy Administration (NEA), during a briefing on the white paper.

According to data from the NEA, by the end of 2023, China's installed wind and solar power capacity increased tenfold compared to a decade ago, with clean energy accounting for 58.2 percent of the total installed capacity.

The white paper said, "China is committed to striking a balance between traditional and new energy sources in order to facilitate its energy transition while ensuring a stable energy supply tailored to the country's national conditions and development stage."

In the last decade, China has



A floating distributed photovoltaic power generation project in Lingwu city, Ningxia Hui autonomous region. (PHOTO: XINHUA)

eliminated more than 100 million kilowatts of outdated coal-fired power capacity, leading to a more than 90 percent reduction in pollutant emissions from the power sector. Additionally, since 2012, energy consumption per unit of GDP has decreased by more than 26 percent.

As a key area for achieving carbon peaking and carbon neutrality goals, the energy sector has been making efforts to advance carbon reduction, pollution control, and green growth.

In the past decade, over 40 percent of annual additions to global renewable energy capacity have come from China,

with China's annual power generation from non-fossil sources increasing by 2.2 trillion kilowatt-hours, equating to a reduction of approximately two billion tonnes of CO<sub>2</sub> emissions.

The white paper said innovation is the key to energy transition. By applying an innovation-driven development strategy within its energy sector, China has achieved breakthroughs in core technologies and created new technologies, industries, and business models.

China's energy transition also contributes to building a global community of shared future. The country is dedicated to deepening international

cooperation in green energy and promoting global energy transition efforts.

According to the International Energy Agency, in 2023, China accounted for more new renewable energy capacity installations than all other regions combined, making it the largest contributor to the global renewable energy industry.

Zhang said in the context of a global green transition, while accelerating its own new energy development, China is also committed to sharing cost-effective clean energy products with other countries, and serving as an impetus for global energy transformation.

# Developing New Information Infrastructure in Coordination

By WANG Jing

The Ministry of Industry and Information Technology, along with 10 other government bodies, have issued a notice to promote the coordinated development of new information infrastructure on September 4.

New information infrastructure is the information "artery" of socioeconomic development, which mainly includes network infrastructure such as 5G network, computing infrastructure, represented by data centers, AI infrastructure and other new technology facilities.

Combined with the growing technological trend of new information infrastructure and the needs of socioeconomic development, the notice clearly strengthens development in seven as-

pects, including national overall layout, cross-regional coordination, and cross-network coordination.

Telecommunications enterprises are encouraged to strengthen the overall layout of the national optical cable network, formulate long-term plans for international communications facilities, and cooperate with transportation, energy and other related enterprises to build cross-border infrastructure such as international railways, and international oil and gas pipelines, said the notice.

Differentiated measures should be implemented to optimize the layout of computing infrastructure. In addition, enterprises are encouraged to develop computing cloud services and explore the construction of national or regional service platforms.

To strengthen cross-regional balanced and inclusive development, the notice emphasized that all localities should deepen cross-provincial planning and construction cooperation, and that the central city and surrounding areas will coordinate the layout of computing facilities.

To deepen balanced and coordinated development among regions, the east regions are expected to explore new application models such as 5G-A, the western regions are encouraged to explore the construction of ultra-large AI training computing power facilities in areas with obvious comprehensive cost advantages, and the border provinces will make use of foreign cooperation mechanisms to build international information hubs with regional advantages.

The construction of 5G and optical

fiber networks in rural areas will be promoted, and the quality of network coverage in rural governance will also be improved.

In addition, all localities should carry out the "signal upgrade" special action, improve basic platforms such as urban information models, and promote the integration of platform functions.

According to the notice, to deepen the cross-industry co-construction and sharing of infrastructure, the local communication administration will work with the relevant industry authorities to establish a cross-industry co-construction and sharing demand list, promoting the opening up of towers, optical cables and other resources in the fields of communications, transportation, and municipal administration.

# Shandong, Ningxia's Agricultural Sci-tech Union

## Case Study

By WANG Jing

"It's so cool that sci-tech is helping agriculture!" This was one of the frequent comments heard from visitors watching the precision agriculture aviation team of Shandong University of Technology (SDUT) give a demonstration on an agricultural sci-tech cooperation demonstration day.

The event, held in Ningxia, was a collaboration between Shandong province and Ningxia Hui autonomous region.

Intelligent agricultural machinery was the theme of this year's event between the two regions. Through sci-tech cooperation, they have improved the rate of agricultural mechanization and reduced production costs. A total of 48 agricultural sci-tech innovations from Shandong were displayed at the demonstration.

### Self-developed intelligent system

When the command button is switched on, a coaxial double-paddle

drone takes to the air. It is powered by eight rotor blades, and can support an 80 kg payload. This is the latest sci-tech innovation, called a large load electric powered plant protection drone, created by the precision agriculture aviation team led by Lan Yubin. Lan is a special assistant to the president of SDUT and dean of the university's College of Agricultural Engineering and Food Science. The drone is designed as a crop spraying vehicle.

"We independently developed the drone software operating system and visual recognition system, which deeply integrates the professional-grade flight control system and the autonomous spray control system. In particular, the drone can adapt to different planting patterns thanks to the design in agronomic integration of the spray rod," said Lan.

Focusing on the two major directions of precision agriculture aviation and ecological unmanned farms, Lan's team has carried out scientific research in Shandong, and the results have been a great success.

### Agricultural machinery with broad applications

According to statistics, there are

more than 80,000 agricultural machinery manufacturing enterprises in China. However, there are only 1,700 up-scale agricultural machinery enterprises, and small and medium-sized enterprises account for more than 80 percent.

"Although the intelligent agricultural machinery market is in its infancy, the market potential is huge, and agricultural machinery industrial parks are concentrated in Shandong, Henan, Hunan and other provinces," said Shang Shuqi, director of the Academic Committee of Qingdao Agricultural University, and academic dean of the School of Mechanical and Electrical Engineering.

According to the data of the China Business Industry Research Institute, China's smart agriculture market size reached 86.863 billion RMB in 2022, an increase of about 26.81 percent, and it is expected to exceed 100 billion RMB in 2024.

### Win-win cooperation

Ningxia Science and Technology Department, Ningxia Agriculture and Rural Affairs Department, together with the SDUT, Shandong Oaks Animal Husbandry and Seed Industry Co., Ltd. and other universities as well as research

institutions, have jointly implemented sci-tech cooperation projects, such as intelligent agricultural machinery development, and efficient planting of vegetables in protected agriculture.

Liu Changqing, president of Ningxia Academy of Agriculture and Forestry Sciences, said with the support of Shandong Agricultural University and Shandong Academy of Agricultural Sciences, the college has established an agricultural sci-tech innovation system with obvious regional characteristics, forming 11 major disciplines and 43 research fields.

Since the science and technology departments of the two regions signed the framework agreement of cooperation in 2017, Shandong and Ningxia have worked hand in hand in industrial cooperation and talent exchange, building a solid partnership.

"We will strive to provide a new stage for talent exchanges, and try to provide more opportunities for Shandong's innovation subjects and experts to cooperate in Ningxia," said Sang Changqing, deputy director of Ningxia Science and Technology Department.

## Tech+Culture

# Terahertz Waves Reveal Secret of Sanxingdui Artifacts

By YU Haoyuan

A robotic arm rotated effortlessly, sending out electromagnetic waves towards a priceless bronze relic. The terahertz scanned the historical legacy unearthed from Sanxingdui, a major Bronze Age archaeological site in Sichuan province, southwest China. The scan results appeared on computer screens, giving researchers detailed information about the rust on the bronze.

This high-tech examination took place recently, at the Terahertz Science and Technology Key Laboratory of Sichuan, affiliated with the University of Electronic Science and Technology of China.

It was the world's first instance of using terahertz waves for tomographic imaging analysis of bronze artifacts. The analysis used the world's first terahertz near-field imaging system based on vacuum electronic devices, independently developed by Chinese scientists.

Terahertz waves are electromagnetic waves with frequencies ranging from 0.1 to 10 terahertz and wavelengths between 0.03 to 3 millimeters. Hu Min, leader of the research team, explained why they chose to use terahertz waves. Compared to ionizing technologies such as X-rays, terahertz waves have extremely low photon energy, thereby preventing harmful ionization reactions. This enables researchers to see the internal structure and material composition of the artifacts without causing any damage. Besides, it's safe for researchers as well.

"Terahertz waves can penetrate most non-metallic materials, and through multi-layer reflections within the object using time-domain pulses, they provide layered structural information so that we don't have to section the artifacts," Hu said.

Zhang Xiaoqi, another researcher from the laboratory, had more details. To identify the rust layers on the artifact, researchers first constructed a 3D profile of it, using structured light technology to generate a "digital map." With this map, they then employed intelligent algorithms to plan the terahertz wave scanning path, ensuring vertical incidence for precise assessment of the rust layer's thickness.

"The robotic arm manipulates the detection probe to emit terahertz waves, penetrating the rust layer and uncovering

the secrets of the relic's internal structure and material properties. Finally, the detection data is integrated with the 3D profile of the bronze, generating a 3D image of the rust layer, visually showcasing the distribution, morphology, and thickness variations of the rust," Zhang said.

The "terahertz fingerprint" enables cultural relic conservationists to gauge the difference between harmful and harmless rust, along with their distribution, thereby making the restoration of artifacts more precise and efficient.

Terahertz wave scanning employs femtosecond pulses for time-of-flight imaging. This obtains preliminary information about the artifact's surface layer in just 10 minutes post-excavation. This technique also facilitates high-resolution imaging, with thickness identification precision reaching 10 microns and horizontal precision extending 50 nanometers.

"Our laboratory will leverage its strengths in terahertz technology to offer non-destructive testing, disease diagnosis, and additional technological support for artifacts from the Sanxingdui site," Zhang said.

Hu said in the future, the laboratory plans to introduce AI and machine learning technologies to enhance the efficiency and accuracy of data processing and analysis in conjunction with terahertz technology, making the investigation results more detailed and reliable.

The team also intends to strengthen interdisciplinary collaboration with researchers from fields such as archaeology and materials science to promote innovative applications of terahertz technology in cultural relic preservation.



A bronze figure excavated from the Sanxingdui site. (PHOTO: XINHUA)

# China Pledges Open Environment for Sci-tech Innovation

From page 1

"Integrating culture and technology enhances the strengths of both. Take the protection and utilization of cultural heritage as an example. On the one hand, technology provides innovative methods to preserve and utilize historical treasures, offering more possibilities for their creative transformation and development. On the other hand, as sci-tech workers engage in preserving these heritages, they gain firsthand experience of history, which enables them to carry forward the essence of Chinese culture," Zhang said.

Hungarian expert Bulcsu Gödri emphasized the importance of interdisciplinary collaboration, noting that cultivating an innovation culture requires fostering cross-disciplinary strategists who can connect different fields to achieve integrated innovation. A cross-disciplinary approach enables us to leverage diverse perspectives, resulting in solutions that are technologically advanced, culturally resonant, and socially impactful.

Paul Burrows, secretary general of the World Association of Industrial and Technological Research Organizations, pointed out that over the next 50 years, no country can face challenges like pan-

demics, aging populations, and global warming alone. He stressed that these global challenges can be tackled only by working together across borders, sharing insights, and forging agreements.

### Fruitful technology transfer

The data on how researchers from universities and research institutes transform their findings into practical applications shows the level of integration between culture and sci-tech.

During the forum, the Annual Report on the Transformation of Scientific and Technological Achievements in China (for universities and research institutes) was released. The report highlights that the total contract value of technology transfers from universities and research institutes increased from approximately 109 billion RMB in 2019 to over 205 billion RMB in 2023. This encompasses transfers through licensing, equity investment, technical development, consulting, and services. The total number of contracts rose from 433,000 in 2019 to 640,000 in 2023.

These achievements were mainly in sectors like manufacturing, scientific research and technical services, showing the vital role of technology transfers in driving socioeconomic development.