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Annual Review: China's Strategy of Innovation-driven Development and the Reform of the Science and Technology Management System

- **Top leadership highlights innovation-driven development**
- **A new round of reform of the S&T management system has been kicked off**
- **Scientific and Technological achievements proved a remarkable progress in national research and innovation capacities**

The Third Plenary Session of the 18th CPC Central Committee was rounded up on November 12, 2013. In the communique issued upon the completion of the session, the reform of the science and technology (S&T) management system and development of an innovative country were high on the agenda. Since the 18th National Congress of CPC was held in 2012, innovation-driven development has become the guiding principle of S&T policies and the consensus of the science and technology community.

As a major focal point of S&T policy, innovation is both a choice of the times and an inheritance of the history. Over the past six decades, science, technology, education and innovation has been chosen as policy focus respectively by the Chinese leadership in different period of time, from "Marching forward to Science" by the central government in the 1950s to "Science and Technology as a Primary Productive Force" by former leader Deng Xiaoping in the 1970s, from the "Strategy of Revitalizing China through Science and Education" in the 1990s to "Building China as an Innovative Country" in the 21st century.

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Ⅰ. Top leadership highlights innovation-driven development

Since November 2012, the new leadership has put S&T innovation high on its agenda, emphasizing its role as the cornerstone of productivity and national strength.

During the first session of the 12th Chinese People's Political Consultative Conference (CPPCC) held in March, 2013, President Xi participated in discussion with representatives of the science community. At the meeting, 11 CPPCC representatives made presentations on science and technology advancement.

According to President Xi, increasing innovation capacity is the most critical task to follow up with the Strategy of Innovation–driven Development. A full round of reform should be adopted for science and technology management system to ensure the development of innovation capacity and enable China to grow into a strong economy from a large economy. President Xi encouraged researchers to strive for innovation.

China's new leadership stressed innovation-driven development on many occasions.

President Xi inspected China's first large-scale scientific facility, the Beijing Electron-Positron Collider, based in the Institute of High Energy Physics, Chinese Academy of Sciences (CAS) on July 17. After the presentations of CAS President and members, President Xi made remarks, highlighting the role of science and technology in developing national strength. He called for deepening reform, pooling resources and removing barriers to put in place the Strategy of Innovation-driven Development.

Soon afterwards, President Xi made a field visit in Wuhan to East Lake National Innovation Demonstration Zone, also known as "Optics Valley of China". After his discussion with several local entrepreneurs, Xi said that economic aggregate is not the only indicator of national strength and a country's strength relies on innovation, technology and human capital. Science and technology are the cornerstones of a country's prosperity.

On his inspection tour to Liaoning in August, President Xi talked about enhancing the core competitiveness of industries through innovation, forming an industrial layout with the synergy of emerging industries and traditional industries, modern service and traditional service, ICT and industrialization, and revitalizing the old industrial bases. He also visited Dalian Hi-tech Development Zone, getting the first-hand information on the activities in local innovation and R&D for new product. He commented that hi-tech development zones is a place pooling science, technology and industries, and serving as incubators for innovation.

In late August, Premier Li Keqiang chaired the first plenary meeting of the National Leading Group of Science, Technology and Education. He said science and technology should play the role as primary productive force, serve economic growth and social progress and aim for innovation and entrepreneurship. He regarded reform as "biggest dividend" for China.

On September 30, the Political Bureau of the CPC Central Committee had a group study on implementing the Strategy of Innovation-driven Development with a site visit in Zhongguancun, "China's Silicon Valley".

Zhongguancun was China's first national hi-tech industrial development zone in late 1980s and entitled "national innovation demonstration zone" in 2009. After twenty years, Zhongguancun has become home to nearly 20, 000 hi-tech companies, with a total revenue of 2.5 trillion yuan last year and 1.56 million employees.

At the group study, President Xi said, "the Strategy of Innovation-driven Development will determine China's future", stressing that people from all walks of life should give full play to the role of scientific and technological innovation, keep abreast with S&T advancement in the world, and make the most of the new round of scientific revolution and industrial changes to implement the strategy.

President Xi laid out current tasks from five aspects: integrating scientific and technological innovation with socio-economic progress, enhancing innovation capacity, improving mechanism for human capital development, creating sound policy environment and expanding international S&T cooperation.

China's new leadership has set the direction and policy framework for S&T advancement, social-economic progress and innovation-driven development.

Ⅱ. A new round of reform of the S&T management system has been kicked off

Reform is the cornerstone for carrying out innovation-driven development. To follow up with the strategy, the reform of the science and technology management system shall be adopted as a key task under new circumstances.

In July, 2012, the *Guidelines on Deepening the Reform of the Scientific and Technological Management System and Accelerating the Development of a National Innovation System* (the *Guidelines*) was issued during the National Conference on Science, Technology and Innovation. Following the *Guidelines*, the State Council set up a leading group to direct relevant activities, including approval of major policies, coordination of major cross-departmental issues and promotion of related experience. The leading group met in July and December of 2012 and April of 2013, discussing such related issues as closer integration between science and economy, reform of the management system for science and technology, implementation of the *Guidelines*, enhancing the major

role of enterprises in innovation and capacity building, and the priority reform tasks, etc.

Minister of Science and Technology Wan Gang pointed out that, based on clear understanding of the bottlenecks and key issues in scientific and technological reform and innovation, it is important to intensify the reform in a range of aspects, including closer integration of scientific advancement and economic growth, upgrading innovation capacity, utilizing innovation resources in a more concentrated and efficient manner, and improving research funding management, an ecosystem for innovation as well as relevant policies, and strive to achieve breakthroughs in these regards.

The government has adopted a group of new measures for reform of the management of science and technology, including information disclosure, resources sharing, innovation in enterprises and regional innovation.

1. Improving Management of Scientific & Technological Programs and Research Projects

In order to improve the management system for science and technology, the Ministry of Science and Technology (MOST) and relevant governmental authorities are working on the building of a new science and technology reporting system, innovation survey system and integrated management information system for science and technology at the national level. The ministry is also trying to better a resources sharing mechanism for science and technology by giving researchers public access to major research information and use of major equipment and instruments.

In April, 2013, MOST took the lead in a pilot project for scientific and technological reporting system on the national programs, including the 973 Program (for basic research), 863 Program (for high-tech R&D), Key Technologies R&D Program, Major Science and Technology Projects, International Science and Technology Cooperation Program, and the special project for the development of large equipment and instruments. Later in November, a beta version of the National Science and Technology Reporting System was launched, with 1,000 reports online for public access, and the number increased to 3,000 by the end of December, 2013. The reporting system will not only strengthen scientific and technological management effectively, but also facilitate academic communication and sharing of research findings among researchers.

MOST has also adopted a number of reform measures targeting project management and use of funding, which are major concerns of the scientific community. The first measure is to take the requirements of industrial and technological development as a basis in calling for proposals, and to rely on industrial authorities to lead the implementation of major special projects. Over the past year, the management of major projects has been improved to highlight priorities and better apply dynamic adjustment, evaluation and accountability measures. The second measure is to use an online submission of proposal and a video recording of oral defense for project application, which makes appealing, inquiries and tracing of the review process possible, as well as optimizes project review by saving time and expenses. The third one is to collect requirements for local development and innovation through regular meetings between MOST and provincial governments, and to satisfy the requirements by directing the capital to regions and relying on local governments to facilitate science and technology projects. In addition, new methods are being developed for the major projects and Key Technologies R&D Program to allow decisions and investment by the contractors and subsequent national subsidies, in a bid to support cooperation between research institutes and the enterprises.

2. Resource Sharing and Information Disclosure

In recent years, MOST has been improving an open system for sharing of scientific and technological resources by offering access to major research information, equipment and instruments, so that the research infrastructure and laboratory facilities build by public funding as well as the information accumulated in scientific and technological programs, can be shared by the public. Currently, MOST is making further efforts for an integrated national information system for S&T management, which connects information on feasibility studies and research management, thus supporting cross-program and cross-departmental decision-making, inspection and statistical analysis. The government is also soliciting public opinions on its work plan for the national innovation survey system recently.

To improve management over research projects, the project approval and budget information will also be open to the public. Moreover, the management of research funding will be adjusted to enhance review of project budget. MOST and the Ministry of Finance started the inspection of research funding in June, 2012, and 12 inspection groups were sent to carry out inspections over funding management and utilization by research contractors in 31 provinces across the country.

3. Guiding and Encouraging Innovation in the Enterprises

One of the core tasks of this round of reform is to stimulate enterprises as the major player in technological innovation, and promote close integration of science, technology and economy. In 2013, the State Council promulgated a guideline to strengthen the major role of enterprises in innovation and upgrade their innovation capabilities, which focuses on the implementation of national technological innovation program and lists 12 key tasks and relevant policy measures for boosting innovation in enterprises.

In June, MOST and other 14 governmental bodies, including the National Development and Reform Commission and the Ministry of Finance, teamed up to carry out the following five tasks: improving innovation capacity of enterprises so to expand their innovative activities; fostering synergy among enterprises, universities and research institutes by establishing industrial innovation consortia; facilitating the sharing of scientific and technological resources, and guiding innovation resources to enterprises; creating a sound environment for technological innovation in enterprises; and strengthening government guidance for increasing R&D input in enterprises.

In order to mobilize the internal impetus of the enterprises and create a sound ecosystem for innovation, the relevant authorities also provide a range of incentives for enterprises to innovate, such as accelerated depreciation of R&D facilities and equipment, and tax cut for hi-tech enterprises, etc.

4. Facilitating regional innovation

The innovation-driven development strategy should also be embraced at the regional level. In light of regional economic and social progress and industrial strengths, the local government should make the task of building an innovative province as a major strategy, and accelerate the building of regional innovation systems by focusing on key industries, innovation-based enterprises and innovative cities and parks as well as improving the innovation environment.

At present, 27 provinces and municipalities have already mapped out their plans for developing innovative provinces and cities, and promulgated a number of comprehensive reforms and policy measures. Greater efforts have been made to the building of national innovation demonstration zones in Zhongguancun of Beijing, Zhangjiang of Shanghai and East Lake region of Wuhan, and some pilot innovation

policies have been carried out at regional level. For example, by drawing upon the experience of the Silicon Valley in the US, Wuhan promulgated a guideline on accelerating the commercialization of research achievements in the East Lake zone, which mobilized researchers in innovation and entrepreneurship and fostered leading industries with regional strengths. Jiangsu province has been promoting industrial restructuring which aims at creating one strategic industry in every district, calling for "one pillar industry in each county" and "one distinct product in each town", with the focus on energy, material, bio-medicine and communication. Guangdong province has been developing new forms of organization for research institutes through the Innovative Research Team Program, which has helped introduce 57 such teams and foster a number of new types of research institutes. In addition, the regular meetings between the provincial government of Guangdong and MOST have strengthened central and local coordination in science and technology planning, thus facilitating regional industrial restructuring and technological innovation.

Ⅲ. Scientific and Technological achievements proved a remarkable progress in national research and innovation capacities

Thanks to the continuous efforts from China's scientific and industrial communities over the years, a great number of technological breakthroughs and achievements have been generated, showcasing significant improvement in the nation's R&D and innovation capacities.

In aeronautics and aerospace development, the orbiting space lab Tiangong-1 has accomplished its tasks, and a lecture given from the space station to students all over the country has inspired their interests for science. The spacecraft Shenzhou-10's 15-day flight in orbit has verified the space docking technology, and ushered in China's reusable launching system. The lunar probe Chang'e-3's soft landing on the moon and the lunar rover Yutu (Jade Rabbit)'s exploration on the lunar surface have validated China's home-grown space technologies.

The launch and activation of the Gaofen-1 satellite represents the start of China's high-definition earth observation system, which will be operating with all-weather, round-the-clock and global coverage by 2020. Yun-20, the large transport aircraft, made its first flight in early 2013, setting a new milestone for China's aviation industry.

In terms of advanced equipment manufacturing, Tianhe-2 topped the TOP500 List among the world's fastest supercomputers in 2013, following Tianhe-1's similar achievement three years ago. This is

another proof that China possesses outstanding R&D and manufacturing capacity in supercomputer technology.

China's deep-sea submersible Jiaolong completed a record dive in 2012, and started its five-year trial period in 2013. So far, Jiaolong has finished a number of dives in South China Sea and the Pacific Ocean, with a great deal of rare deep-sea creatures, rocks and sediments brought back onshore, which proved its deep-sea performance.

The 80,000-ton press forge manufactured by Chinese enterprises has unblocked the bottlenecks of the large machinery industry. Chinese research teams have developed magneto-rheology and ion beam ultra-precision polishing equipment, making China the third country mastering processing technologies of high-precision optical parts after the US and Germany.

With regard to nuclear power plant and mega engineering projects, the world's first power plant with high-temperature gas-cooled reactor is now under construction in China, and the first AP1000 nuclear power plant is expected to begin operations in 2014. The world's largest thin-film solar power plant has been established in Hainan prefecture, Qinghai province, and the Asia's first 10MW tower-type solar power plant started to generate electricity in Delingha, Qinghai province. China's high-power supercritical power generation facilities with circulating fluidized bed (CFB) technology has passed a 168-hour test running under full load, meeting its design requirements. China's first long-distance coal pipeline and the world's largest oil and gas platform are also under construction.....

In the field of ICT, China has accelerated the R&D of new-generation mobile broadband technology, and has been leading the world in implementing 4G standards. Since the industrial chain for TD-LTE technology standard already has been in shape, a network with over 200,000 base stations covering 300 cities will be established. Integrated circuit (IC) equipment industry has also boomed: etchers, ion implanter, lithography machine and exposure machine have been developed rapidly towards the high-end market and will be sold all over the world. Large scale production of 40-nanometer linewidth integrated circuit has also been realized.

In terms of medical science and new medicine, effective diagnosis technologies and vaccines have been developed to prevent and control H7N9 avian flu. Based on years of research and development, China's pharmaceutical industry has obtained 62 certificates for new drugs against cancer, hypertension, inflammation and hepatitis B, etc. In addition, China has made breakthroughs in developing maglev centrifugal artificial heart as well as CT and MRI diagnosis equipment, and its implantable cranial nerve stimulation products have obtained the market authorization for the first time……

In agriculture, a new type of hybrid rice has realized a test result of about 14.3 metric tons per hectare, and new breakthroughs have been made in new variety development and genetic mapping analysis of hybrid wheat. In addition, the high-yield and insect-resistant cotton are now planted in over 13.3 million hectares of farmland.

As for basic research, Chinese scientists have observed the quantum anomalous Hall Effect for the first time. The scientists from Peking University have made trailblazing achievements in somatic cell reprogramming. Zhejiang University has developed an ultra-light material, namely all-carbon aerosol. New progress has also been made in theories of monomer Raman Imaging, high-precision quantum measurement and anomalous mantle. All these achievements indicate the improvement of overall research capacity of Chinese scientists.

The aforementioned accomplishment has

presented us a vision that, the new leadership, with their commitment to the innovation-driven development strategy, will push through a new round of reform on science and technology management to remove the impediments for the innovation strategy and stimulate innovation in the scientific and industrial community, and the new scientific and industrial results coming up in recent years have demonstrated a great boost in innovation capabilities of scientific research, industrial technology and mega engineering project. The strategy and the reform will surely bring about new breakthroughs and achievements in 2014.

(Source: Science & Technology Daily, November 15, 2013)

(Editor's Note: All news in the issue are translated from Chinese texts for your reference. They are subject to checks and changes against official release of original Chinese or English texts.)