China Reveals Plan to Build New National Labs

By XIN LING (Staff Reporter)

China is planning to build several large, multi-purpose national laboratories in the years to come. A suburban 10 billion yuan ($1.53 billion) Beijing-based facility will start construction early next year, while a Shanghai-based facility recently received approval from government funding agencies. The initiative was announced by CAS President BAI Chunli in February as another major effort to reform China's research structure.

Over an area of 3,300 acres in the northern suburbs of Beijing, the new national lab will comprise three major research infrastructures, namely the Synergetic Extreme Condition User Facility (SECUF), the Beijing Advanced Photon Source (BAPS), and the Earth System Simulator, as well as five research platforms focusing on accelerator technology, clean energy, materials genome, environment science and brain science. Different from all existing national labs in the country, it features cross-disciplinary research and aims at boosting China's overall research innovation capacity.

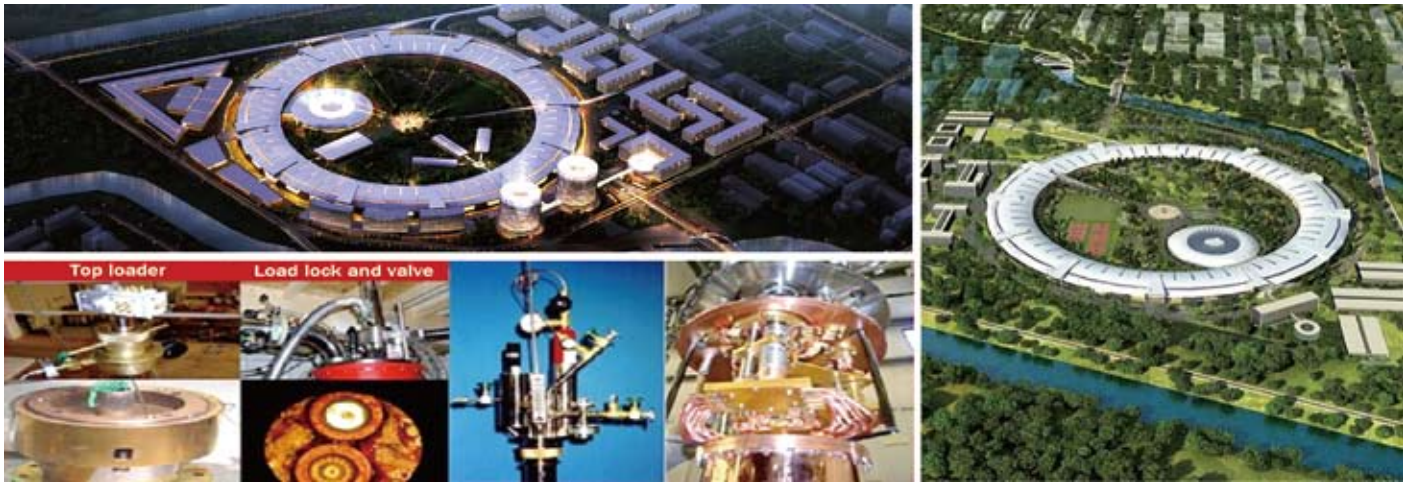
"After seven to eight years of construction, the lab will be housing some 3,000 employees, a scale similar to Argonne or Oak Ridge national laboratories under the U.S. Department of Energy," said DING Hong, chief scientist at the CAS's Beijing National Laboratory of Condensed Matter Physics, who is an early planner of the lab.

According to DING, many of the large science facilities being built in China call for combined efforts from different fields, which is now constrained by the Principal Investigator system. National labs usually concentrate on more complicated, cutting-edge and long-term research to address national strategic needs, while nurturing innovation and scientific excellence.

The SECUF, for instance, of which DING is the project manager, will develop a dozen instruments that can operate at extremely low temperatures (below 1 mK), high pressures (approaching 300 gigabar), extra high magnetic fields (32 tesla), and ultra short laser pulses (200 attoseconds), such as the systems for large-volume high-pressure materials synthesis, the time-resolved transmission electron microscopy, etc. The BAPS, once completed, will become one of the largest and most powerful X-ray synchrotron radiation sources in the world. According to DING, almost half of the 1.53 billion dollars will go to BAPS.

"Actually, we started planning on such a lab around 2008," he noted. "It is time China had its own national labs to this scale."

The initiative, seen as a strong government resolution to reform China's research structure out of an earnest quest for true innovation, was announced by CAS President BAI Chunli at a seminar on national lab management held in Beijing on February 2, 2016, with the participation of around 20 directors of national labs



(Up left) The 4-5 billion RMB Beijing Advanced Photon Source (BAPS), or previously called High Energy Photon Source (HEPS). With a beam energy of 6 GeV, it will rival existing top-level devices such as Japan's Super Photon Ring, the European Synchrotron Radiation Facility in France and the Advanced Photon Source based at Argonne National Laboratory, US. **(Down left)** The Synergetic Extreme Condition User Facility (SECUF). **(Right)** A schematic bird's view of the future national lab to be built in Huairou, northern suburbs of Beijing.

from in and outside China.

"It seems to be a natural consequence of the ongoing shift in the Chinese economy, from one where growth has been driven by low cost labor manufacturing foreign designed goods for international markets to one where continued growth and improvement in standards of living will have to come from higher value products and services," said Thomas Mason, director general of the Oak Ridge National Laboratory and a participant of the management seminar in Beijing.

"This will demand more innovation and a free flow of ideas from fundamental science into new technologies and products. Along with universities and industry, national labs can play a role in this innovation ecosystem as they have in other places. Many of the elements already exist in China. There is a large manufacturing base, research universities of growing prominence, and research institutes and facilities such as supercomputers, x-ray and neutron sources, etc. The thing that a national laboratory structure could do is integrate some of those activities and drive R&D in a more mission focused way," he noted.

However, one of the major challenges to set up and run such national labs in China is to determine how to integrate the old research system into these new labs.

"While many of the pieces of national labs already exist, from example within the institutes of the Chinese Academy of Sciences, integrating construction and operation of major facilities with the research programs that use them is hard to do if there are too many management or budgetary boundaries," Mason pointed out.

According to him, co-location could be another challenge, because even though much can be done remotely with video conferencing, building connections between fundamental and applied research and cutting across disciplines is best done when people can work in close proximity on common problems.

Besides Beijing and Shanghai, such national labs are set to be established in other parts of China, too, including Hefei where China's first synchrotron radiation facility and the Experimental Advanced Superconducting Tokamak are located, and Guangdong Province which harbors the Daya Bay Neutrino Experiment and the upcoming China Spallation Neutron Source.

The Zhangjiang Comprehensive National Science Center, located in suburban Shanghai and designed within the national lab framework, has just received the green light for construction from China's National Development and Reform Commission and the Ministry of Science and Technology on Feb. 16, 2016.