RUSSIA

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CHINA'S NUCLEAR "BIG LEAP" AND RUSSIA'S ROLE

Before the earthquake in Japan, Chinese nuclear power generation was expected to reach 86 GW by 2020.

Such a giant nuclear leap (25 reactors are already being built, and even more are planned) requires meticulous planning and preparation. Let us then consider the prospects for China's "big nuclear leap", and the role Russia can play in it.

CHINA'S NUCLEAR ENERGY SECTOR AFTER FUKUSHIMA

China reacted very quickly to the Fukushima crisis. On March 16, 2011, four key decisions were made at a sitting of the State Council:

- **Immediately launch comprehensive checks at all the nuclear power plants in operation to ascertain their safety and reliability;**
- **Step up safety controls, adopt a new approach to safety at nuclear power plants, and carefully monitor compliance;**
- **Assess the state of the NPP construction sites, make sure they comply with the highest international standards, and suspend construction if any problems are identified;**
- **Suspend the approval process for new NPP sites until the inspections are completed.**

The inspection teams were set up on the same day, March 16. The following day they began their work at the *Qinshan-1* NPP (China's first indigenously built nuclear power plant in Zhejiang Province), which currently has a single *CNP-300* type reactor in operation.

Chinese officials and regulatory authorities made a number of proposals to review the country's nuclear policy. One of these proposals was to abandon plans to build several second-generation *CPR-1000* reactors and focus on the development of the third generation (*AP-1000* reactor design and all its Chinese derivatives). The government also said it would review the list of future construction sites and try to avoid building new power plants right next to the coast - which is not easy in many parts of China, since its coastal areas have the largest concentration of power-hungry industries. There has also been a debate in the media about whether China can abandon nuclear energy altogether.

But what choice does the country have? Its strategic objective is just to slow the growth of its dependence on energy imports – ending it altogether is not even on the agenda. China is trying to make the full use of its hydroelectric resources - but even though it has several big rivers, their geography makes them unsuitable for the purpose of providing electricity to the south of the country. China is also investing heavily in renewable energy – but it will not be enough to keep up with its booming economy's energy demand.

The only other alternative is coal-fired power plants, but China is well aware of the painful consequences. A case in point is the city of Chongqing, which is situated in the Sichuan hollow and seldom has any winds. The city is always covered with a thick smog; acid rains destroy the crops, and many people never leave their homes without a face mask. The situation is nothing short of an environmental catastrophe. Besides, half of the Chinese railway system's capacity is already taken by the coal being carried from the mines in the north to the power plants in the south.

Another thing to consider is that coal mines are much more dangerous in terms of industrial safety than nuclear power plants. Some 3 000 people are killed in the Chinese coal pits every year. Fatalities have become so commonplace that the incidents which have claimed less than 10 lives are not even covered in the local papers.

The bottom line is, there is little point discussing any proposals to abandon nuclear energy in China. The country simply has *no alternative to nuclear energy*.

But although the general line remains firm, China's State Council has suspended the approval of new NPP projects and ordered additional checks at the plants already being built. Chinese officials say nuclear safety will now be regarded as a higher priority. As a result, the expectation is that Chinese nuclear energy projects will not be cancelled, but they will become more expensive due to additional safety measures. These measures may include:

- **A rethinking of the choice of technology for the future NPPs; some of the sites currently earmarked for second-generation reactors will probably be used to build third-generation plants instead;**
- **A more careful and comprehensive approval process for new NPP sites, in view of the reassessment of the dangers posed by the earthquakes and tsunami;**

- **More stringent safety requirements to nuclear power plants: additional safety checks and inspections during their construction and operation;**
- **Slower rate at which new NPPs are being built and launched;**
- **Lowering of the target for the share of nuclear energy in national power generation by 2020 (at the very least, that target will no longer be revised upwards every so often);**
- **Reform of the Chinese nuclear bureaucracy and new nuclear legislation and regulation;**
- **A PR campaign and efforts to bolster the nuclear energy industry's public image.**

Overall, there is sufficient political will in China to develop nuclear energy, but on the practical level, the existing plans to launch almost 50 new reactors over the next 15 years are way too ambitions. Analysis of the country's nuclear energy fundamentals suggests that several major issues cannot be resolved in such a short time frame. If the country is to have 86 GW of nuclear generation capacity by 2020, it will need an additional 7 000 trained nuclear energy specialists. Given that in the previous years there was very little demand for such training in China, there is simply no way to train so many in such a short period. The same applies to fuel supply - more specifically, to uranium production and the fabrication of fuel rods.

These difficulties are not insurmountable, and China's nuclear energy industry will certainly keep growing at a rapid pace. But the predicted *giant nuclear leap* will probably have to wait until the 14th Five-Year Economic Plan, not the 12th. That realization is beginning to dawn on the Chinese themselves. In a country where all decisions have always been made unanimously, there is now dissension at the very top over the approaches to nuclear energy development. The science and research department of the State Council argues that the big nuclear leap policy should be reviewed, and that China should not have to choose between growth and safety. It is quality, not quantity that should be viewed as the higher priority. A U-turn on such grandiose plans had previously been unthinkable in China - but Fukushima seems to have played a positive role here.

RUSSIAN CONTRIBUTION TO CHINA'S BIG NUCLEAR LEAP

To begin with, let us state the fact that the Russian slow neutron reactor technology is of less interest to China than similar technologies from France or the United States. Russia has built the No 1 and 2 reactors of the Tianwan NPP. In 2010 the two governments signed an agreement under which Russia's *Atomstroyeksport* will build another two reactors at the same NPP. But that will probably be the end of Russia's participation in Tianwan, even though the plan for the site includes eight reactors.

Several reputable sources have claimed that Russia will supply two *VVER-1200* type reactors to China, which will become the No 5 and 6 reactors at Tianwan. But *Atomstroyeksport* itself has denied these reports, and said it has no expectations for cooperation with China in slow neutron reactors beyond the No 3 and 4 Tianwan units. What is more, in February

2011 there came a report that work on the No 5 and 6 units had already begun at the Tianwan site, and that its schedule was already about one year ahead of the No 3 and 4 units to be built by Russia. In other words, at some point in the future there will be four new reactor units being built at Tianwan by two different contractors and using two different designs.

It is also worth noting that the contract to build the first two reactors at Tianwan was part of a package deal, which also included the construction of a uranium enrichment plant in China, and a commitment by Beijing to buy a certain guaranteed amount of uranium enrichment services from Russia every year. Officially, Moscow and Beijing do not recognize that these contracts are linked. Meanwhile, the contract for the No 3 and 4 units in Tianwan is part of a package deal under which Russia will also build fast-neutron reactors in China. That link is recognized in official documents. All these contracts reflect China's unswerving determination to acquire the necessary technologies. All the reactor components that can be built in China itself will be supplied by Chinese companies. The share of indigenous subcontractors in the No 1 and 2 reactors was relatively small. But the No 3 and 4 units will be about 60% Chinese-made. Essentially, Russia will supply only the core nuclear machinery.

Even though prospects for cooperation between Russia and China in slow-neutron reactor technology are bleak, there are other areas were the future looks a lot more promising. One such area is the Russian fast-neutron reactors. China is developing its nuclear industry in accordance with a three-stage plan under which the second stage will see the transition to fast-neutron reactors as the main technology used in the national nuclear energy industry. It has to be said, however, that such transition is not expected to happen before 2050. But the time to start getting acquainted with the new technology and lay the foundations for an indigenous industry is now. China's interest in the fast neutron technology is explained by fuel supply considerations. Chinese reserves of uranium are not large, and the country would much prefer not to depend on foreign suppliers for its nuclear fuel cycle.

The *CEFR* reactor has been the first step. Initially the project was viewed as an import of Russian technology for a fast-neutron research reactor. But eventually Russia's role was reduced to merely helping the Chinese to build the reactor on their own. The bulk of the project was done by Chinese specialists and Chinese companies. Nevertheless, after receiving valuable help from Russia during the fast neutron research reactor project, Beijing has shown interest in commercial *BN* reactor technology. The two sides are now negotiating a contract for the engineering design of two units of the Sanming NPP using *BN-800* reactors. The Sanming site in Fujian Province can host four reactors. It is expected that all four will be *BN-800* reactors built by Russia's *OKBM Afrikantova* company.

At this point the two sides have yet to resolve a number of differences regarding the terms of the contract. The intergovernmental agreement and the contract itself were expected to be signed during a meeting between the Russian and Chinese prime ministers in November 2010, but that date has been postponed. Much to Russia’s surprise, China now insists that

the contract for the engineering design should be signed without an intergovernmental agreement, which is absolutely against Russia's interests and in contravention to the accepted norms and standards for such contracts. In the absence of an intergovernmental agreement this will be a purely commercial venture, not subject to any government controls.

China is also quite interested in other new Russian technologies, including the floating NPP. Initially China was expected to be closely involved in the project to build the first such plant in the world. Apart from financial investment, China had hoped to build the floating platform for the NPP at its shipyards; the contract was worth about 85 million roubles. But in the end, Russia pulled out of the joint project, and the first Russian floating NPP was built without the Chinese. Selling this technology to China just for the sake of keeping the market share may not be the best idea. It is therefore safe to say that in nuclear energy industry, just as in the defense industry, our cooperation with China is on the decline, and that the Russian priorities are shifting towards India.

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