China's "Nuclear Dragon" Goes Abroad: Exporting Nuclear Power Infrastructure through the Belt and Road Initiative

ASIA’S PATH FORWARD

By Chen Bing-Ming | 18 May 2021
INTRODUCTION

In 2013, the Chinese government announced a grand strategy to export nuclear power infrastructure, with plans to build nuclear plants in dozens of countries as part of the Belt and Road Initiative (BRI).

This is a big gamble. China has chosen to compete in a high-stakes field against the US and Russia in the hopes that it can exploit its systemic advantages to outcompete the few companies remaining in the business and become the world’s undefeated nuclear champion.

China’s primary objective is not to reap huge economic benefits. When a bilateral partnership forms around nuclear plant construction, the exporting country takes the lead. This implies that China hopes to gain regional political dominance through these projects, similar to Russia’s “pipeline politics.” Such influence would extend for decades, perhaps even a century or more.

In the past year or so, China’s state-owned nuclear industry giants, the China National Nuclear Corporation (CNNC) and the China General Nuclear Power Group (CGN), have moved away from their typical low-profile style, flaunting their industrial might to the world. This indicates that the first phase of China’s “Go Out” nuclear export strategy is already in place. The government is done with the diplomatic strategy of biding its time. Instead, it has launched an all-out attack, wagering to win a greater payoff.

1. THE BELT AND ROAD INITIATIVE AND THE "GO OUT" NUCLEAR POWER STRATEGY GO HAND-IN-HAND

In 2013, not long after the BRI was formulated, the “Go Out” nuclear power concept was elevated to the level of national strategy. CNNC and CGN jointly developed “Hualong One,” dubbed China’s nuclear “calling card,” a third-generation nuclear power technology to which China has fully autonomous intellectual property rights.

The first Hualong One nuclear reactor is located at the starting point of the Silk Road, in the city of Fuqing in Fujian Province. In August 2015, construction began on the first overseas Hualong One reactor, the K-2/K-3 units in Karachi, Pakistan. This was a breakthrough in China’s export of million-kilowatt-class nuclear power units. This made China the fourth country after the US, Russia and France
to develop a complete nuclear power industry chain with the capacity for "one-stop" solutions. As such, China will be able to independently realize the Going Out project without relying on any third party for assistance.

2. CHINA'S A NUCLEAR "DOUBLE DRAGON DEPLOYMENT" MODEL

Outside of Pakistan, CNNC has exported ten reactors and nuclear facility units to BRI countries. As of 2019, CNNC had formal holdings in the Rössing Uranium Mine, ranked among the world's top five natural uranium suppliers, in the BRI country of Namibia. Meanwhile, CGN is riding the "eastern wind" of the BRI, having secured strategic positions in over 20 countries.

In addition to Hualong One, CNNC is engaged in research and development on the "Linglong One," a much safer, more economical, smaller modular reactor that requires less time to construct. Two Linglong Ones can replace one 200-megawatt thermoelectric plant and can be used in small- to mid-sized power grids or regional power grids. There is not much demand for this setup in China. It is best suited to smaller, less populous countries, or countries with lower population density. China's nuclear "double dragon deployment" is thus taking shape in the form of Hualong One and Linglong One.

---

1 Zhu Xiaolei, "Zhonghe jituan buju 'Yi dai yi lu' zhuli Zhongguo hedian qiang guo meng" [CNNC deploys “Belt and Road” to help along Chinese dream of being a strong nuclear power], Global Times, January 30, 2016 https://world.huanqiu.com/article/9CaKrnJTz0R

2 "Zhonghe jituan konggu shijie di si da channeng youkuang" [CNNC controls world’s fourth-largest capacity uranium mine], Science and Technology Daily, July 30, 2019 http://www.nea.gov.cn/2019-07/30/c_138269743.html


4 Hualong yi hao Linglong yi hao jiebao pinchuan, Zhongguo hedian ‘shuang long chuhai’" [Hualong One and Linglong One make headlines, China’s nuclear “double dragons” go abroad], Central Commission for Discipline Inspection-National Supervisory Commission, September 14, 2020 http://www.ccdi.gov.cn/yawen/202009/120200914_225455.html
3. ECONOMIC AND POLITICAL CONSIDERATIONS OF THE NUCLEAR "GOING OUT" STRATEGY

A. Wild Ambition: China Hopes to Lead the World in Nuclear Energy by Mid-Century

During the Two Sessions in May 2020, CNNC President Gu Jun told China Central Television that "our goal is for China to lead the global nuclear energy industry by the middle of this century."5

Also during the Two Sessions, Wan Gang, Communist Party Secretary of CNNC's National Nuclear Power Institute of China, said that "Going Out" is guaranteed to have a positive effect on politics, the economy, and society. One, it will demonstrate China's role as a great nation, promoting political, diplomatic, and economic relations. Hualong One has become an exemplary calling card; two, it will fulfill the promises of BRI, moving it towards a high-quality stage of development; three, it will aid in "great nation diplomacy," elevating the welfare of the local population and improving the national economy and livelihood; four, it will mitigate domestic supply-side over-capacity, boost economic "transformational upgrading" (转型升级), push high-value-added exports, and spur continuous growth in high-end manufacturing; and five, it will transform the competitive pattern of global nuclear power, establishing the image of China's intelligent high-tech manufacturing industry.6

The nuclear industry and nuclear power exports have always been sensitive topics for two reasons: one, in many countries people fiercely oppose nuclear facilities. Even if they want renewable energy, they tend to gravitate more towards solar and wind power; and two, because nuclear technology and fuel can also be used for military purposes.

In this respect, China has been acting out of character throughout 2020, touting the strength of its nuclear industry and its nuclear power export strategy. Unhindered by taboo, China readily refers to this as "great nation diplomacy," emphasizing its political and diplomatic ties with importing countries. In the author's analysis, this shift in attitude may point to three judgments that have been made by

---


Chinese policymakers:

1. After 30 years of technological development, China is now strong enough to export the fruits of its nuclear labor to the world in bulk.

2. There is now no going back on nuclear projects in the aforementioned BRI countries. For example, if construction has started or is already underway, the huge upfront investment is such that the importing country cannot afford the loss that would come from project interruptions. Even if an opposing view is held by the importing country or a third country, China is confident that it can surmount any obstacles by political or economic sleight of hand and push ahead with the project.

3. The nuclear “Going Out” strategy has reached a new level at which China must make the world see its true strength, its superiority in nuclear energy output, for example that the entire national system can deliver on schedule with lower prices. If successful, this will earn China even more market share.

B. Economic Considerations: A Market for 24 Trillion Units

On March 11, 2018, CNNC China Nuclear Power Engineering Co., Ltd. President Liu Wei revealed, “According to the demands of the global nuclear market, there are 72 countries developing or planning to develop nuclear power. Forty-one of these are BRI countries, and an additional 11 countries which border the Belt and Road are currently developing nuclear power. Data from the International Atomic Energy Agency indicates that the world will have 300 new units before 2030. Eighty percent of those new units will be in countries along the Belt and Road.”

China is doing all that it can to build 30 units in countries along the Belt and Road by 2030. Nuclear partnerships with countries along the Belt and Road will directly leverage a three trillion output value market.

The three trillion figure is based on the standard of “100 billion for one Hualong One unit.” On this basis,

---


8 “Duo tai hedian jizu jihua niannai kaigong, hedian yinglai jianshe gaofeng” [Construction of multiple nuclear power units to start this year; nuclear brings construction to peak], Yicai, March 8, 2018 [link](https://www.yicai.com/news/5404830.html)
BRI and bordering countries are a 24 trillion market. The huge economic benefits are an important factor for the Chinese government to pursue this strategy, but it could also ignite a neck-in-neck battle between the nuclear industries in China and the US. in BRI and bordering countries, while also upsetting the equilibrium that has taken shape in these regions.

C. Politics: A "Hundred Year Marriage" with Importing Countries

The economic reward is an important consideration, but it is superseded by political considerations.

In the report mentioned above, Sun Qin points out that nuclear power is a project of strategic cooperation between countries. From initial discussions to signing an agreement and on to construction, the whole process takes about ten years; once construction is complete, the unit is in operation for about 60 years. When it is decommissioned, demolishing the unit and dealing with the used fuel take time as well. Thus the saying that two countries partnering on a nuclear project is akin to a "hundred-year marriage." This marriage is not easily dissolved.

If the importing country wants to suspend work in those first ten years, it must first pay enormous damages to the Chinese company for breach of contract. Then there are the losses for early investments at home, such as land purchases, relocation of residents, supporting infrastructure, etc. Yet this is still the easiest time to back out. It is a "reversible" stage, when the importing country needs only its own strength to tear down anything that has already been built. (For China, this is the riskiest period.)

Once construction is complete, the "marriage" is truly ironclad, since the supply of fuel, maintenance of daily operations, and disposal of spent fuel all depend on the Chinese company. In the early stages, maintenance is especially dependent on the Chinese technical team, as their training is not only costly, but also takes a long time. For example, once Karachi's K2/K3 units are up and running, they will require about 1000 staff, including 200 operators for the nuclear reactors. It takes three to four years to recruit a graduate from the field and train them such that they can start to work, and the training costs about one million yuan per person. The cost goes up if they are brought to China for training. Even when the candidate is trained enough to start work, these core operators must continue training on a rotating

---

9 "Sun Qin: Cong da dao qiang--kaiqi hegongye de huihuang" [Sun Qin: From big to great--unlocking the brilliance of the nuclear industry], DSTI, February 12, 2015 http://www.dsti.net/Information/ViewPoint/67373
basis, including about one month of in-house training and two intensive training sessions every year—and this training is lifelong.\(^9\) Suspending the partnership with the Chinese company thus means losing technical support, endangering normal operations at the plants.

At this point in the process, it is quite difficult to shut down a power station. Even if the technical team in the importing country is capable of shutting down and dismantling the equipment themselves, the disposal of spent fuel would still be a technical threshold they could not cross.

In the scenario described above, the importing country has few options to substitute for the Chinese companies—Westinghouse Electric and General Electric in the US, Russia's Rosatom State Nuclear Energy Corporation (ASE), France's Areva, Framatome, and Électricité de France (EDF); the Korea Electric Power Corporation (KEPCO) in South Korea, or Mitsubishi Heavy Industries in Japan—not all of which can provide "one-stop" solutions like CNNC and CGN.

The sky-high technical barriers to the nuclear power industry dictate that very few countries will gain entrance and compete with China in the foreseeable future. (Germany has already declared that it will end all nuclear power operations, and British plants are now being built jointly by Chinese and French contractors) It is also important to keep in mind that France has no plans to compete with China and is keen to become a partner. Areva has even hinted that it would “sell off” the entirety of its own exceptional spent fuel management services to CNNC.\(^11\)

These factors aside, I am afraid that American, Russian, and French companies will be hard-pressed to offer better terms than the Chinese companies. After all, China's nuclear energy output has two advantages: low prices, and the support of the entire national system. When Chinese nuclear power groups "go abroad," they can call on any support they need from the "national team," be it financial, logistical, or medical. It is because of this national support system that the Hualong One project in Karachi was not stymied by the pandemic. It is difficult for other countries to reproduce these advantages.

---

https://news.qq.com/a/20130129/000975.htm

\(^11\) Xie Wei and Zhang Yan, "Zhonghe jituan zhengshi jieru Faguo hedian, cangu chongzu quanqiu hedian jutou" [CNNC officially in on French nuclear, restructuring of global nuclear power giants], China Economic Weekly, November 17, 2015
https://news.qq.com/a/20151117/002687.htm?qqcom_pqv_from=aio?pc
CONCLUSION

Once China's nuclear power plants are up and running in Belt and Road countries, China will have established firm, long-term bilateral partnerships with importing countries—in which China will have the upper hand.

For importing countries, letting China build plants within their borders is a delicate decision: On the plus side, energy costs would be greatly reduced, averting the pollution created by thermal power and ending their reliance on fossil fuels. They would also gain technology transfers and training for their own tech teams. At the same time, the public's conflicting feelings about nuclear facilities are long-standing; natural or man-made disasters could cause nuclear leaks; their reliance on China would be too great, and the infrastructure could be completely controlled by China; and in extreme situations, nuclear plants are easy targets to attack.

For these reasons, we can expect China to have some trouble selling its nuclear power plants to several dozen countries. Under these practical conditions, China persists in its "Go Out" nuclear strategy because previous efforts to export its values and culture have essentially failed. China has had to change tack in today's Great Game. Forging a nuclear empire plays to China's political advantages. It is where China is most likely to surpass the US. Then, on its "exporting country influence," China can change the balance of power among the great nations.
TIMELINE

2014
- Following diplomatic negotiations, China's nuclear enterprises sign documents of cooperation with France, Argentina, Italy, Spain, Canada, the Czech Republic, and Kazakhstan.  
- **November**: China and South Africa sign a related agreement providing the conditions for Chinese enterprises to invest in and build nuclear projects in South Africa.
- **October**: CGN invests in units 3 and 4 of the Cernavoda plant in Romania, developing the plant in cooperation with the Romanian National Nuclear Power Company.

2016
- CNNC announces on its website that it will spend 80 billion to build two international nuclear supply centers, one in Cangzhou, Hebei Province, the other in Jiangmen, Guangdong Province.

2017
- CNNC and the Saudi Geological Survey jointly launched an evaluation project of Saudi Arabia’s uranium-thorium resources. The project has progressed smoothly. Drilling began at Area 1.7 on January 29, 2018. CNNC hopes to continue working with Saudi Arabia on the second phase of the project, strengthening nuclear partnerships.
- **September**: China's National Development and Reform Commission officially defined the Sino-Arab (UAE) Production Capacity Cooperation Demonstration Park as China's first such venture through the BRI. The park will be located near Khalifa Port in Abu Dhabi, and will include a nuclear fuel processing plant.

2018
- **November 26**: CNNC's China Uranium Industry Co. Ltd. acquired Rio Tinto's 68.62% stake in Namibia’s Rössing Uranium Mine Co. Ltd. for USD $106.5 million. On June 21, 2019, the Namibian government approved the share transfer and CNNC officially took control of Rössing Uranium Mine, making it one of the top five natural uranium suppliers in the world.

2020
- **June 18**: CNNC Nuclear Power Institute of China [launched] its autonomously controllable plant-wide DCS shipment site, with its own “Dragon Scale” platform at the core of the operation, giving complete localization capacity to the “nerve center” of China's nuclear power plants.
This Asia’s Path Forward paper addresses **Authoritarianism and Challenges to Democracy**. Visit [CIPE.org](http://CIPE.org) for further Asia’s Path Forward papers on the six essential themes for an economic recovery roadmap:

- Restarting Economies
- Diversifying Supply Chains
- Combating Corruption
- Authoritarianism and Challenges to Democracies
- Economic Challenges for Women and Marginalized Groups
- Chamber and Association Responses and Strategies

---


