



The Rise Of China's Civil Nuclear Program and Its Impact on U.S. National Interests

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Introduction

Beijing's civil nuclear program has made considerable growth in recent years. As early as 2000, China was considered a nuclear technology backwater with only three commercial reactors, compared to over 100 in the United States. Today, China has 35 reactors with 20 under construction. By 2030, it is projected to have 150 gigawatts of nuclear on line—roughly equivalent to Germany's total capacity in electricity—while the U.S. nuclear fleet is expected to shrink by 20 percent or more. In little more than a decade, China could have twice the number of civilian reactors as the United States.¹

These advancements largely flow from Beijing's recognition that a vibrant civil nuclear program promotes core national interests, increases energy security, and reduces air pollution. While the success of the Chinese commercial program has depended mostly on the transfer of nuclear technologies, from Russia, France, Canada and the U.S., Beijing is quickly becoming self-sufficient across the supply chain and fuel cycle. Given its current trajectory, China will replace the United States as the world leader in civil nuclear energy – most likely in the next five to ten years. This change will have major implications for the global system, some of which may be negative.

While Beijing has joined international treaties and agreements on nuclear technology transfer, Chinese enterprises and individuals do not always adhere to the rules, reflecting problems with compliance and enforcement and possibly providing insight on the country's covert operations to subvert civilian nuclear technology for non-civilian application. As China's nuclear market increasingly globalizes, insider business transfers are likely to gain greater attention, particularly as they pertain to countries of concern such as Iran, North Korea, and Pakistan.

Given the need to promote energy security and address pollution and carbon emissions, China's commercial nuclear advances are welcomed. However, the United States and its allies should be cautious of the increasing likelihood of Chinese monopolization of the international market for nuclear technologies and services.

Such a development would give China the opportunity to reshape the global nuclear nonproliferation regime, including the Non-Proliferation Treaty (NPT), and in the process, marginalize the United States.

Beijing's history of supporting proliferation to gain short-term geopolitical benefit at the expense of rivals – as in the case of the Pakistan and India – is cause for concern. While

a return to Mao's belief that proliferation enhances global security seems remote, vestiges of the Chairman's world view unquestionably remain in Beijing's national security circles. Significant shifts in U.S. foreign policy, such as a rapprochement with Russia or support for a nuclear weapons program in Japan, would increase the likelihood of a more aggressive Chinese posture on proliferation.

China's Evolving Power Sector

Market system reforms in 1978 marked a pivotal moment in modern China as the country began to “open up,” ending its five centuries of isolation. Since transitioning in the 1980s from a centrally-planned economy to more of a market-based system,² China's GDP growth has averaged nearly ten percent a year – making it the fastest expansion by a major economy in modern history. China – the Middle Kingdom³ – is likely to achieve true superpower status in the next decade as its vast manufacturing base and wealth produce corresponding political and military influence.⁴

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Despite this impressive achievement, China is still considered an emerging economy in several ways. Rapid transformation and economic growth has resulted in high inequality, environmental sustainability challenges, rapid urbanization, and demographic crises. With incomplete market reforms and a population of about 1.4 billion people (about 20 percent of the world's population), China's per capita income at roughly \$14,000 is considerably smaller than the nearly \$56,000 enjoyed by the United States.⁵ In addition, about 70 million people – roughly the population of France or Thailand – in rural areas remain in poverty as of 2014.

Providing and expanding access to electricity has been a cornerstone of Chinese economic development. Since its “opening,” China has witnessed an extraordinary surge in energy use – from being energy poor to consuming more than any other country. While its current electric power consumption of about 4,000 kilowatt hours (kWh) per

capita ranks 69th in the world, China lands in the top 10 when only countries with more than 50 million people are considered.⁶ This is a notable accomplishment. In 1975, Chinese electric power consumption stood at only 119 kWh – levels that currently exist in poor, Sub-Saharan Africa.⁷

Beijing has addressed the growth in energy demand by investing trillions of dollars in energy infrastructure with a heavy reliance on coal-fired power plants. In 2012, China consumed one-half of the world’s coal and more than four times as much as the United States.⁸ While Chinese coal use has slowed with structural changes to the economy, Beijing remains the largest investor in fossil-fuel generation with 70 gigawatts of new coal projects in 2015 and 200 gigawatts under construction at the end of April 2016.⁹

The buildout of China’s power infrastructure and dependence on coal has resulted in a momentous increase in air pollution, which kills an estimated 4,000 of its citizens every day. In 2015, China issued its first “Red Alert” public health warning due to a California-sized noxious smog cloud hanging over Beijing.¹⁰ With face masks becoming normal wear for urban dwellers, Beijing is under increased pressure to address a growing health crisis. In the city of Taiyuan—China’s “coal capital,” for example, the local government has made efforts to meet emissions standards by requiring the installation of scrubbers in coal-fired plants, banning farmers from burning straw, regulating heavy polluting vehicles, and most recently, replacing its entire taxi fleet (8,000 cars) with electric vehicles.¹¹

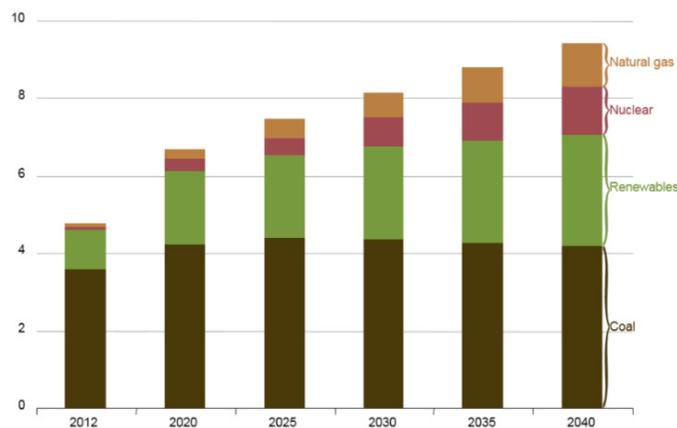
To further improve air quality, China is increasing the share of non-fossil in primary energy consumption. Beijing spent about \$111 billion on clean energy systems in 2015.¹² An examination of current and expected investments indicates an increasing trend, particularly for natural gas and nuclear energy from now until 2040.¹³ Coupled with renewables and gas, the combination of these clean power sources is expected to move the nation away from coal, helping address dangerous pollution while meeting international climate change goals.

Today, the Middle Kingdom accounts for 30 percent of global greenhouse gas (GHG) emissions – 90 percent of which is caused by fossil fuel combustion.¹⁴ Coal’s contribution to the 90-percent share is almost 70 percent.¹⁵ Structural changes to the country’s economy will reduce energy demand and thus slow down the growth in carbon emissions – an expectation reflected in China’s pledge under the Paris climate agreement.¹⁶ Under the Paris deal, Beijing has promised (1) to peak emissions of carbon dioxide (at a undefined amount) “around” 2030 and to

make best efforts to peak earlier, and (2) to increase its share of non-fossil fuels in primary energy consumption to “around” 20 percent of total demand in 2030. China is also expected to cut carbon emissions by 60 to 65 percent per unit of GDP by 2030, compared to 2005 levels.¹⁷

China electricity generation by fuel source, 2012-40

trillion kilowatthours



Source: U.S. Energy Information Administration (EIA), 2016¹⁸

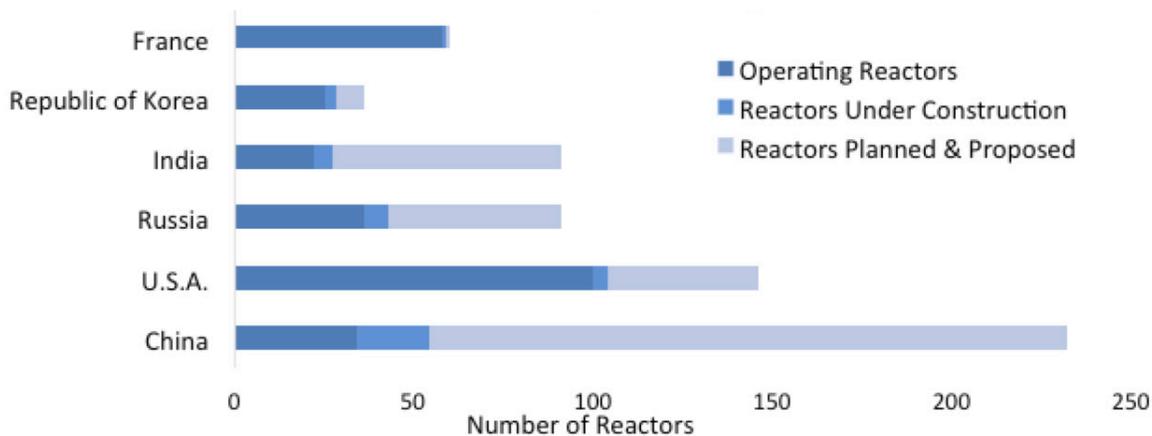


Emergence as a Global Commercial Nuclear Leader

China aims to achieve self-sufficiency across the nuclear supply chain and emerge as the world leader in related exports for the foreseeable future. Driven by billions of dollars in investment, the Middle Kingdom’s commercial program is expanding rapidly. Nuclear power is projected to steadily increase at 1.9 percent annually, with growing output at 11.2 percent through 2035.¹⁹ The country currently has 35 operating nuclear reactors with 20 under construction. With an expected doubling of capacity from 27 gigawatt electric (GWe) to 58 GWe by 2020 and projected 150 GWe by 2030, China is likely to host eventually a third of the world’s nuclear infrastructure.^{20,21}

China has also made considerable advancements in developing its fuel cycle program, especially its uranium enrichment sector. In 1985, the country lacked any enrichment capacity, compared to 27,300 thousand SWU²³ per year in the United States. Today, China enjoys a capacity of 5,760 thousand SWU annually, while commercial SWU produced in the United States with indigenous technology has collapsed to zero. Interestingly, while the United States has become totally dependent on nuclear fuel produced by foreign technologies, China has gradually become self-reliant.

Nuclear Reactors per Country, 2016



Source: Data from the *World Nuclear Association, 2016*²²

The success of the Chinese civil nuclear program is largely due to the acquisition, adoption, and improvement of foreign technology. Beijing has played it smart, leveraging its commercial power whenever possible. Given its overwhelming dominance in global new builds, this card is relatively easy to play. Western vendors increasingly need a slice of the Middle Kingdom's market to remain in business, particularly given the shortfall in demand for nuclear power in their own countries resulting from the Fukushima disaster and other poor market conditions.²⁴

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In 2007, for example, China awarded a major contract to Westinghouse – the building of four, third-generation AP1000 nuclear plants – only when the Pittsburgh-based company agreed to transfer key cutting-edge technologies. This deal, while perhaps making short-term economic sense, arguably helps undermine the long-term competitiveness of U.S. nuclear industry, including Westinghouse's.²⁵ China, which has been allowed to leapfrog older reactor designs, is likely to “tweak” the AP1000 technology and sell its own reactor to foreign markets, thus shutting out Westinghouse in future deals or relegating it to a minor licensee.

In more recent years, China's significant investment in research and development and its regulatory friendly environment have attracted U.S. entrepreneurs who are seeking to develop and commercialize fourth-generation nuclear reactors. After years of talks with Beijing, Bill Gates, Microsoft co-founder and chairman of nuclear start-up TerraPower, negotiated a contract in 2015 to build a prototype of an advanced reactor in China, followed by a commercial version.²⁶ Gates has explained that “there isn't the same huge budget that there was traditionally for doing experimental type reactors [in the United States] ... Today, there's more experimentation to do in China than elsewhere.”²⁷

Contributing to Chinese nuclear innovation and global outreach are two primary, state-owned nuclear operators, China National Nuclear Corporation (CNNC) and China General Nuclear Power Group (CGN).

The CNNC, which hammered out the deal with Gates and TerraPower, is a critical participant in the development of the country's nuclear sector and its framework that incorporates research, experimentation, and scientific technology innovation. The Corporation has established itself as a leading player in nuclear energy development, working with eight industrial sectors that cover a range of nuclear concerns from civilian products, the environment, fuel, and power generation.²⁸

The CNNC is also a significant catalyst in promoting China's nuclear market abroad and establishing international relationships concerning energy and related technology advancements. As China's only nuclear power plant exporter, the company has currently sold seven

power units and eight reactors to seven countries and is communicating with over 40 more.²⁹

The CGN is also an important player in representing Chinese civil nuclear interests.³⁰ China's nuclear business relations are quickly extending into Europe, as demonstrated by the 2015 Nuclear New Build Supply Chain meeting between China, the United Kingdom (UK), and France. Held in Beijing and led by the CGN in 2015, the meeting had two general incentives, first to provide Chinese businesses the opportunity to partake in the UK's Hinkley Point nuclear power project and second, to establish cooperation with France in the UK.³¹

This is a direct indication of Beijing's efforts to expand its civil nuclear influence beyond its borders, particularly into the West. London's approval of Chinese involvement in Hinkley has allowed China to enter the UK and establish a foothold in European nuclear markets. More importantly, the deal has bolstered the international reputation of Chinese nuclear technologies.

China's push to participate in the Hinkley project was not without hiccups, however. Incoming British Prime Minister Theresa May ordered security services to determine whether it was safe to give China such a position in the UK's nuclear industry. While London green lighted the project after a six-week review on condition that the UK could veto any change in ownership, it was made clear that

the British did not trust the CGN and for good reason.³² Chinese state-owned nuclear power companies and the individuals who work for them have a long history of "garnering" information for Beijing about Western nuclear innovations and technologies.

One month after the UK's review announcement of the Hinkley deal, the United States accused the CGN of plotting to steal nuclear technologies. Following an FBI investigation, Washington charged nuclear engineer Szuhsiung "Allen" Ho for recruiting U.S. consultants for the CGN. Ho and the CGN were indicted for "conspiring to help Beijing obtain restricted nuclear technology over two decades" and "acting as an unregistered agent of the Chinese government" for what is considered a national security threat of extreme significance.³³ Ho and the CGN had apparently pressed U.S. nuclear consultants to provide proprietary technology information and documentation and may have succeeded in getting some of that material.

Ho's case was not the first time the United States indicted Chinese enterprises and individuals for having conducted suspicious business activities on U.S. soil. In 2014, Chinese national Karl Lee was under investigation as being the "principal contributor" to Iran's ballistic missile program.³⁴ Lee's operations as a middleman were conducted through a network of 12 to 26 companies through which he allegedly provided considerable amounts of materials for Iran, contrary to UN sanctions. Also in 2014, ten-count



charges were pressed against Shanghai resident Sihai Cheng for also operating as a middleman, in this case pursuing U.S. constructed pressure transducers for Iran's nuclear program through his subsidiary trading company Sohi Technology Co. Ltd.³⁵ Lee's case was particularly concerning because Beijing either could not or was unwilling to take investigative and responsible action.

These cases are noteworthy because they reveal the "serial diversion" threats from Chinese individuals and enterprises and the challenges they pose to enforcement of nonproliferation controls.³⁶ They also provide insight into possible Chinese government covert operations.

The Geopolitics of Nuclear Energy and Proliferation Through the Eyes of Beijing

As we have seen with U.S. ties to key allies such as Japan and South Korea, civilian nuclear energy cooperation is an important element of a long-term strategic alliance. A robust nuclear energy program and growing influence as a nuclear exporter will enable Beijing to establish century's long strategic ties to nations around the world. These ties can be based on assisting nations with their energy security and development. However, the expansion of Beijing's capabilities can also lead to growing Chinese influence over global norms for nuclear safety and nonproliferation.

In the decades following the Communist takeover, Chinese leadership openly backed the right of sovereign states to develop atomic weapons for self-defense purposes.³⁷ Chairman Mao Zedong went so far as to determine that Chinese foreign policy should actively promote proliferation. He told a delegation of Algerians during their war of independence with France, "We don't have atom bombs and can only send you lesser guns...when we have more steel and atom bombs, your situation will also be changed accordingly."³⁸ Beijing argued that proliferation enhanced nuclear deterrence and improved global stability – a view reflected in Premier Zhou Enlai's statement that "if all countries have nuclear weapons, the possibility of nuclear wars would decrease."³⁹

Multiple U.S. threats to use nuclear weapons against Chinese conventional forces, particularly during the Korean War, convinced Mao by the beginning of 1955 that China needed a nuclear deterrent.⁴⁰ China detonated its first nuclear weapon in 1964 and subsequently gained formal recognition as a nuclear weapon state. Chinese open disregard for multilateral agreements during the 1970s brought to light Beijing's willingness to implement Mao's proliferation vision. In the 1980s, China – under the leadership of Deng Xiaoping – exported unsafeguarded nuclear mate-

rials and sensitive technologies to the developing world, including sixty tons of Low Enriched Uranium (LEU) to South Africa, heavy water and LEU to Argentina, and uranium enrichment and weapon design to Pakistan.⁴¹

With China's "opening" and desire to gain access to export markets in the West, Beijing's official position evolved and aligned more closely with that of the United States, including its 1992 ratification of the Non-Proliferation Treaty (NPT).⁴² By the 1990s, Chinese leadership frequently expressed absolute opposition to the spread and transfer of nuclear weapons and related technologies – a formal policy that remains today. However, while Beijing claims that it does not export sensitive technologies, the facts suggest otherwise, particularly as to Pakistan and North Korea. Vestiges of Mao's world view remain, especially in national security circles that plot to advance China's interests vis-à-vis India and the United States and its allies.⁴³

The Sino-Indian rivalry has largely defined China's bilateral relations with Pakistan, including its decades-long nuclear cooperation. The transfer of fissile material and bomb designs to Pakistan in the 1980s is widely credited for accelerating the development of Islamabad's weapons program.

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In more recent years, China has stood accused of neglecting standards set by the Nuclear Suppliers Group (NSG)⁴⁹ in order to support Pakistan's civilian nuclear program for "geopolitical purposes."⁵⁰ In 2003, one year before joining

the NSG, Beijing agreed to build Pakistan's first two nuclear reactors and then followed with subsequent deals that did not adhere to NSG consensus guidelines.⁵¹ Those principles confirm that the transfer of nuclear materials and technology under new supply arrangements should require the recipient's commitment to full International Atomic Energy Agency (IAEA) safeguards and a rejection of nuclear weapons. Pakistan has refused both conditions.

China has justified the arrangement by arguing that the commercial projects were grandfathered under bilateral agreements made in 1986 and thus, did not violate any NSG obligation.⁵² In February 2015, Beijing confirmed its involvement in at least six additional civilian nuclear power projects in Pakistan.⁵³ While China's current aid to the Pakistani commercial nuclear program is unlikely designed to assist in further weapons development, the fact that Chinese leadership appears unfazed by international criticism suggests that Beijing will export civilian nuclear technology on its own terms.

A nuclear North Korea, however, poses considerable risks to Chinese long-term interests if it were to drive Japan to develop its own nuclear arsenal as President Donald Trump suggested during the 2016 U.S. presidential campaign.

North Korea is a more complex case. China is undoubtedly responsible for the continued existence of Kim Jong-un's regime. North Korea conducts roughly 90 percent of its trade with China and is heavily dependent on Chinese raw materials, energy imports, and food. Analysts point out that Beijing feels compelled to "prop up" the regime to avert a refugee crisis resulting from any political collapse. Former U.S. National Security Council (NSC) official Victor Cha points out that the two countries are "caught in a mutual hostage relationship – the North needs Chinese help for their survival, and the Chinese need the North not to collapse."⁵⁴ This concern may explain why China has accepted the risk of allowing North Korea to earn hard currency through illicit means – for example, by shipping prohibited missile components to Iran aboard commercial flights through Beijing.⁵⁵

Although Beijing remains publicly committed to the Peninsula's denuclearization,⁵⁶ China and North Korea

share common interests vis-à-vis the United States and its allies. The North serves as a buffer between China and the Republic of Korea (ROK) – home to 28,500 U.S.-based troops. A nuclear-armed regime in the North provides a deterrent to a potential U.S. or ROK intervention that could force reunification, thus bringing the U.S. army to China's border. While the U.S. military presence in the ROK seems small in comparison to China's purported army of 2.3 million, Beijing recalls all too vividly how aggressors, especially Imperial Japan, used Korea as a launching pad for invasions of Manchuria and other parts of China.⁵⁷

A nuclear North Korea, however, poses considerable risks to Chinese long-term interests if it were to drive Japan to develop its own nuclear arsenal as President Donald Trump suggested during the 2016 U.S. presidential campaign.⁵⁸ Even Mao-leaning nationalists, considering this scenario, are likely to hold mixed views on the North's nuclear weapons program.

Despite its backing of official international sanctions against Pyongyang, China has undoubtedly provided technical assistance that has benefited the North's nuclear and missile program. Most of this aid in recent years seems principally indirect through individuals and firms, sanctioned or not by Chinese government officials.⁵⁹

UN auditors have blamed the North's expansion of its nuclear weapons capabilities on "the low level of implementation" – a diplomatic way of saying "sanctions-busting" – by member states. While the UN has not officially called out Beijing for several reasons – the most important of which is the fact that Chinese officials participate in UN report reviews, independent experts understand that China is the primary culprit.⁶⁰

China has embraced "plausible deniability" in many cases. A prime example is the 2011 export by the China Aerospace Science and Industry Corporation of rugged, 16-wheel trucks to Pyongyang, which Beijing claimed was to help haul timber. The North, however, has used them to transform its stationary ballistic-missiles into a mobile force – thus making it more difficult for the United States and its allies to track. Per experts, this was the first-time China had exported these trucks; moreover, they argue that the trucks are too large for North Korea's forest roads.⁶¹

North Korea's provocations have at times strained relations with Chinese leadership,⁶² but Beijing has dismissed repeated U.S. calls to place enough pressure on Pyongyang to surrender its nuclear weapons program. In the judgment of former U.S. Director of National Intelligence James

Nuclear Weapons States

Standard	NUCLEAR-WEAPON STATES														
	China			France			Russia			UK			U.S.		
	2010	2013	2016	2010	2013	2016	2010	2013	2016	2010	2013	2016	2010	2013	2016
Banning Nuclear Testing	B	B	B+	A	A	A	A	A	A	A	A	A	B	B	B+
Ending Fissile Material Production for Weapons	B	B	B	A	A	A	A	A	A	A	A	A	A	A	A
Reducing Nuclear Weapons Alert Levels	A	A	B-	B	B	B-	C	C-	C-	B	B	B	C	C	C
Nuclear Force Reductions	F	D	F	C+	D+	D	B-	B+	B-*	D+	C+	C+	B-	B	B+
Negative Security Assurances	B+	B+	B+	C	C	C	C	C	C-	C	C	C	B	C	C
Nuclear-Weapon-Free Zones	B	B	B+	B	B	B+	C	B	B+	B	B	B+	C	C	C+
IAEA Safeguards	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nuclear Weapons-Related Export Controls	C-	F	F	A	A	A	C	C	A	A	A	A	A	A	A
Multilateral Nuclear Security Commitments	B+	A	A-	B+	A	A	A-	A-	B-	A	A	A	B+	B+	A
Criminalization and Illicit Trafficking Commitments	B+	A	A	B+	B+	A	A	A	A	A	A	A	B+	B+	A
OVERALL GRADE	B-	B-	C+	B	B	B	B-	B	B	B	B+	B+	B	B-	B

Source: *Arms Control Association, 2016*⁶⁶

Clapper, North Korea views its bombs and missiles as key to its preservation, which makes it highly unlikely that Kim Jong un would ever surrender them willingly.⁶³

Beijing's national security apparatus is likely to agree that a nuclear-armed North Korea – one that is manageable from the Chinese perspective – promotes political stability and increases the Middle Kingdom's security. Accordingly, it is unlikely that China would pull the plug on its economic lifeline unless the strategic costs of buttressing Pyongyang far outweighed the benefits associated with averting a regime collapse or protecting the Korean buffer zone.

What Does China do with a Commercial Nuclear Monopoly?

Beijing's spotty proliferation record has not gone unnoticed. The Arms Control Association, a U.S.-based non-profit organization, gave China an overall C+ grade

on its nuclear developments and control measures in its progress assessment report for 2013-2016 (See Table).⁶⁴ The report gave China an "F grade" on "nuclear weapons-related export controls," largely because of its relationship with Pakistan overriding NSG guidelines and missile technology sales to countries of concern.⁶⁵

Accordingly, China's rapid rise as the global leader in the commercial nuclear energy space should create anxiety across the nonproliferation community. Experts on the country's program agree that the Chinese are fast positioning themselves to capture a monopoly on the global market for civil reactors and the export of components across the supply chain – in as little as five to ten years. Today, the concern is what effect this emerging monopoly could have on the spread of sensitive technologies.

Some analysts will argue that China has a vested interest in preserving the non-proliferation regime that the West has

created and will thus ensure that countries acquiring civil nuclear technology will develop programs solely for peaceful purposes. Once the Middle Kingdom achieves its super-power status, Beijing will have too much to lose, they say.

Writing in *People's Daily* in 2011, Le Yucheng, Director-General of the Policy Planning Department of the Ministry of Foreign Affairs at the time, wrote, "China's road to peace and development does not intend to overthrow the existing international system... It is groundless that the West has accused China of trying to overthrow the existing international system, build up its own, and challenge the West."⁶⁷ However, Le, who later became China's Ambassador to India, warned in the same opinion piece, "the international system must keep abreast with times and adjust itself... [a]s the new economies develop, their share in global economic management should be expanded and increased accordingly."⁶⁸

In this vein, Western observers should expect China – once it achieves its monopoly – to demand the most influential voice in managing the global nonproliferation regime. If the United States rejects China's new power, Beijing is likely to ignore Washington and simply do what it wants to do – as it has done with Pakistan amidst concerns from the Nuclear Suppliers Group. Judging from its past behavior, China, if deemed necessary, would form its own international nuclear organization without the participation of the United States. Beijing created the Asian Infrastructure Investment Bank (AIIB), for example, in response to the U.S. refusal to give China the influence it expects, demands, and probably deserves in existing multilateral financial institutions.

This development would have major negative implications for the West. Foreign governments seeking to deploy civilian nuclear power – and potentially using those programs to advance weapons capabilities – would go to Beijing for approval and not to Washington. The West would only watch from the sidelines as China determines which countries join the nuclear energy club.

Most analysts are likely to dismiss this possibility, but this scenario would become more and more likely with a nuclear arms race or a substantial shift in U.S. foreign policy – a rapprochement with Russia, a rejection of the One China principle, or support for nuclear weaponization in Japan and other countries viewed by China as rivals.⁶⁹

Given the declining state of its own civil nuclear sector and marginalization, the United States would face greater difficulty countering Chinese moves to set the rules for global nuclear trade without regard for NSG concerns.⁷⁰ With nuclear technology dominance, Beijing would have

an amplified ability to use technology transfer as a means of growing its influence in specific countries and in key strategic areas, such as the Middle East. Moreover, China could determine to more rapidly check U.S. power by transferring nuclear technology and know-how to Western rivals – as it did in the case of India with Pakistan.

China's growing dominance in the global civil nuclear market cannot be stopped, but it can be managed with effective, smart policies – thereby reducing negative impacts to U.S. and Western interests. ... Revitalizing the U.S. civil nuclear program would be crucial to any such effort.

Policy Recommendations

National power is defined largely by economic strength, while influence in global commerce flows from the ability of a government to exploit the competitive advantages of its industries. In the case of nuclear power, U.S. companies – which dominated the global market for decades – no longer have the same stature.

The U.S. nuclear sector is in sharp decline and unlikely to recover without fundamental changes to U.S. policy. This disturbing trend has been known since the early days of the Obama Administration, when the International Trade Administration (ITA) warned of the atrophying of the U.S. nuclear industry.⁷¹ Plans to shut down eight civilian reactors have been announced since 2013, with as many as 20 more plants at risk.⁷² Meanwhile, our nuclear vendors are mainly peripheral players, increasingly dependent on foreign markets and supply chains.

If the United States is not a leader in building new reactors at home and abroad, our ability to shape civilian nuclear programs in other countries is greatly diminished. And if foreign governments go to other countries to help develop their commercial nuclear sectors, how much influence could Washington possibly have in ensuring nuclear safety, security and preventing those programs from ever becoming weaponized?

China's growing dominance in the global civil nuclear market cannot be stopped, but it can be managed with effective, smart policies – thereby reducing negative impacts to U.S. and Western interests. Irrefutably, revital-

izing the U.S. civil nuclear program would be crucial to any such effort, but doing so would require an enduring, bipartisan strategic outlook that seems like a long shot in today's domestic political environment. It would also require U.S. policymakers to comprehend the problem and appreciate the link between the vitality of the U.S. commercial nuclear sector and their ability to influence allies and potential allies through the century's long strategic relationship that nuclear energy cooperation establishes. This relationship enables the ability of the U.S. to shape the global nonproliferation and safety regimes.

Some needed fixes would require major adjustments to U.S. policy. Federal and state governments should back technology-neutral standards for achieving reductions in pollution and carbon emissions – rather than support subsidies and mandates for renewables that undermine the competitiveness of much of the existing fleet of reactors and deter private sector investment. In addition, U.S. capacity markets should sufficiently value reliable baseload power,⁷³ like nuclear.

Globally, U.S. policymakers should also pursue a more rational approach to nuclear trade policy that reflects the current state of the market, including a recognition that formidable competitors will continue to seek greater market share to the detriment of U.S. national interests. Moreover, the United States should consider negotiating international frameworks that would develop financing guidelines for nuclear programs, which could help level the playing field for Western vendors vis-à-vis Chinese and Russian entities, as well as granting the U.S. Nuclear Regulatory Commission (NRC) more authority over global safety issues as they pertain to U.S. reactor designs.

While working toward long-term solutions is important, the federal government should focus more of its attention on actions that seek more immediate results. As the Trump administration reviews policies impacting the U.S. civil nuclear sector, the American Council for Capital Formation (ACCF) recommends the following FOUR measures than can be taken in the short term:

1. The United States should embrace a comprehensive approach to nuclear energy policy that weighs domestic energy, international trade, research and innovation, and nonproliferation concerns. For too long, these overlapping areas have been siloed and compartmentalized, complicating the U.S. ability to think strategically.

A nuclear energy point person in the White House – a political appointee with substantial policy and political

experience – should be selected to serve as the coordinator for the interagency process. Immediately, that person should begin developing a bipartisan plan on steps to restore U.S. leadership in civil nuclear energy with the input of interested stakeholders.

2. The United States should commence working closely with allies with similar interests, such as Japan and the Republic of Korea (ROK). Closer coordination would bolster nuclear research, promote U.S. nuclear technology exports, and enhance the political influence of the U.S. and its allies in global nonproliferation and safety.
3. The United States needs to manage the degree of technology transfer to China, particularly for the latest generation of reactors and their components that have already been commercialized. Westinghouse and other U.S. companies, undoubtedly, will face growing pressure to surrender more intellectual property rights in exchange for wider access to Chinese domestic new builds.

The access of U.S. vendors to the Chinese market is crucial to their health. However, proper support from the Departments of Energy and State, for example, in the intellectual property negotiation between U.S. entities and China's CNNC should be undertaken to help level the playing field for U.S. companies. The absence of advocacy from the U.S. government would almost certainly result in the handover of larger amounts of technology – some of which was helped financed by U.S. taxpayers – to Chinese interests.

4. The United States needs to protect its advantage in more advanced technologies that have not yet been commercialized. The Administration and Congress should support legislation that enables the private sector to invest in advanced reactor technologies and provide a clear path forward to attract investment for prototype development in the United States.

While the Nuclear Regulatory Commission (NRC) has established itself as a “gold standard” for managing civil nuclear matters, it is ill-equipped to process licenses for advanced reactor technologies in an expeditious and foreseeable manner. This hurdle obstructs U.S. private investment and technology development.

As part of this process, leading entrepreneurs like Bill Gates should inform what government measures need to be taken to convince startups not to move their innovation abroad. TerraPower's prototype of its advanced reactor, for example, should be built in the United States – and not in China.



About the Author

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Endnotes

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- ¹⁹ British Petroleum, “BP Energy Outlook, 2016 Edition: Outlook to 2035.”
- ²⁰ World Nuclear News, “Nuclear Growth Revealed in China’s New Five-Year Plan” (World Nuclear News, March 23, 2016), <http://www.world-nuclear-news.org/np-nuclear-plans-revealed-in-chinas-new-five-year-plan-2303166.html>. At the same time, nuclear generation is expected to fall in both Europe (-29 percent) and North America (-13 percent) by 2035 as older plants are decommissioned and renewables continue to be heavily subsidized.
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