



INTERSECTIONS

Technology, National Security, and US-China Strategic Competition

With this issue, CNA's China and Indo-Pacific Security Affairs Division launches *Intersections*, a limited-series news digest describing the interplay between the People's Republic of China's (PRC's) technology acquisition efforts, US and partner nation responses to those efforts, and the critical and emerging technology risks for the US defense industrial base posed by the PRC's actions.

CNA has documented a wide range of legal and illegal [techniques to acquire foreign technologies](#) that the PRC uses to achieve its national security objectives and build military capabilities (see graphic on page 7).¹ Recognizing these techniques, and evaluating the evolving global technology landscape, is essential for understanding US-China strategic competition and devising technology protection policies. This newsletter highlights recent developments in PRC technology acquisition strategies, technology transfer risks, and government actions to protect critical and emerging technologies that have military applications.

In this inaugural issue, we cover a recent investigation into PRC hypersonic missile development using US software, actions taken by the US government to clarify investment screening and limit PRC access to semiconductors, European Union (EU) export control and investment screening updates, changes to Canada's investment screening rules, and Australia's identification of its critical and emerging technologies.

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TECHNOLOGY TRANSFER TO THE PRC

This section highlights recent examples of [methods](#) that the PRC uses to access foreign technology, including creating “shell” companies and going through third parties to circumvent US export law, taking advantage of lax enforcement of US licensing rules, and boosting China’s research expertise through talent programs.

VIOLATING US EXPORT AND LICENSING LAWS

PRC hypersonic missile research programs access US technology via third-party PRC entities in potential violation of US export laws. The *Washington Post* [reported](#) in October 2022 that US-made technology and software have reached PRC military organizations and academic institutes involved in hypersonic weapons research.² According to this article, US firms sold to private PRC firms aeronautic engineering software that can be used for hypersonic missile design and testing. Those PRC firms then sold or transferred the software to PRC military research academies and entities.

The *Washington Post* quotes executives of several US firms, many of which received US Department of Defense funding, denying any knowledge that the technology would ultimately be used by entities engaged in military hypersonic research. Despite these denials, the article documents several instances of PRC firms purchasing US software even though those firms publicly advertised their PRC military affiliations. The transfer of US-developed hypersonic technology to Chinese military entities through third parties is not limited to software: the article also notes that a US company sold interferometer technology—which is used in wind tunnel research essential to developing hypersonics—to a PRC distributor that ultimately sold it to a PRC air-to-air missile research institute.

A US resident working for a National Aeronautics and Space Administration contractor illegally exported sensitive US Army aeronautics software to a PLA-affiliated university. In May 2022, the US Department of Justice [charged](#) Jonathan Yet Wing Soong, a San Francisco Bay Area resident, with exporting sensitive US Army aviation-related software to Beijing University of Aeronautics and Astronautics (or “Beihang University”), which is on the US Entity List.³ Organizations on the US Entity List are prohibited from receiving this type of software without a special license from the US government. The defendant reportedly funneled payments through an intermediary Chinese company to circumvent US export law. Beihang University conducts research on PRC military rocket systems and unmanned aerial vehicles (UAVs).

This case is one of several recent high-profile examples of US residents using intermediate companies to violate US export laws. In another example, in April 2021, PRC national Qin Shuren [pled guilty](#) to establishing an intermediary company to [unlawfully export hydrophone technology](#) relevant to anti-submarine warfare to Northwestern Polytechnical University, a Chinese military research institution on the US Entity List.⁴

The [US Entity List](#) imposes trade restrictions on foreign persons, businesses, research institutions, governments, or private organizations.⁵ The Department of Commerce’s Bureau of Industry and Security (BIS) manages the US Entity List and describes it as a tool “to restrict export, reexport, and in-country transfer of items subject to the Export Administration Regulations.”⁶

Cutting-edge battery technology was transferred to China because licensing agreements were not enforced. National Public Radio (NPR) [reported](#) in August 2022 that PRC firm Dalian Rongke Power Co., Ltd., obtained a license to manufacture a cutting-edge battery invented and patented in the US.⁷ Vanadium redox flow batteries (VRFBs) use a unique mix of electrolytes and acid to store larger amounts of energy

than conventional lithium-ion batteries can without degrading, giving them the potential for [large-scale power generation](#).⁸ The VRFB technology was created at the Pacific Northwest National Laboratory, a Department of Energy (DOE)-run facility. The lead project scientist, Gary Yang, applied for a DOE license in 2012 to manufacture the battery in the US, but subsequently asserted that no US investors were interested in funding production. Yang then sought a partnership with Dalian Rongke Power Co., Ltd., which was granted a DOE sublicense in 2017 to manufacture VRFBs in China. In 2021, Yang transferred his license to Dutch firm Vanadis Power, which openly stated its intent to continue manufacturing the battery in China.

These transactions violated the terms of the DOE license, which required that the firms manufacture substantial portions of their batteries in the US. NPR reports that these terms were never met, adding that “the [batteries] that did sell [in the US], including in one instance to the US Navy, were made in China.”⁹ According to NPR, no one in DOE vetted either transaction to determine compliance before approving them. Following release of the NPR story, DOE reportedly terminated Dalian Rongke Power Co.’s sublicense to manufacture the battery. On September 14, US Senators John Barasso (R-WY) and Joni Ernst (R-IA) sent a [letter](#) to the Inspector General of the DOE requesting an investigation into why these licensing violations were not identified and stopped.¹⁰

BOOSTING TALENT THROUGH RECRUITMENT PROGRAMS

PRC labs recruit US scientists to support China’s military technology development. A 2022 [report](#) from Strider Technologies, titled *The Los Alamos Club: How the People’s Republic of China Recruited Leading Scientists from Los Alamos National Laboratory to Advance Its Military Programs*, documents 162 instances of scientists who had worked at Los Alamos National Laboratory joining PRC labs via talent recruitment programs between 1987 and 2021.¹¹ Of the 162 instances of recruitment documented in the Strider report, 59 occurred under the PRC’s [Thousand Talents Program](#), which targets both foreign and Chinese academics at prestigious overseas universities to collaborate with PRC research institutions.¹² These scientists subsequently contributed to China’s development of military and dual-use technologies, including hypersonics, jet engines, deep-earth penetrating warheads, submarine warfare, and UAVs.

Talent programs are a long-standing method for countries to boost their technological knowledge, and the PRC has used them widely. Participating in such programs may be legal but is often subject to restrictions. DOE employees and researchers who receive US government funding or work at US government facilities, such as Los Alamos, “[must disclose](#)” participation in foreign government talent recruitment programs, but these disclosure requirements are either recent or have not always been monitored or enforced.¹³

US, ALLY, AND PARTNER ACTIONS

As concerns about PRC technology transfer activities have risen, the US and other advanced industrial nations have taken steps to strengthen their domestic technology protection policies by enhancing export controls, creating investment screening procedures, and identifying critical technologies that could affect national security in the future.

POLICY ACTIONS FROM THE UNITED STATES

US government imposes sweeping new rule to limit export of advanced integrated circuit technology. On October 7, the US Department of Commerce issued a new [rule](#) that drastically restricts the export of advanced microchips and chip-making equipment by US companies and persons, and by foreign entities that use US equipment or technology in their production processes.¹⁴ According to the [New York](#)

[Times](#), the new rule adopts a comprehensive approach to limiting PRC access to advanced semiconductor technologies and “appeared to impose the broadest export controls issued in a decade.”¹⁵ The [interim final rule](#) was published on October 13.¹⁶ The Department of Commerce’s Bureau of Industry and Security (BIS) will implement the rule, which includes the following measures:

- Requires companies to obtain a special license to supply advanced chips, chip-making equipment, and related products to the PRC. In considering whether to issue licenses, the Department of Commerce will adopt a “presumption of denial” approach to granting licenses.¹⁷
- Directly bans a range of products made with US technology from being transferred to 28 PRC companies on the US Entity List.
- Restricts US citizens from supporting PRC advanced semiconductor manufacturing, production of integrated circuits, or the development of advanced integrated circuits.¹⁸

The US Semiconductor Industry Association [stated](#) that it was “assessing the impact of the export controls on the industry and working with companies to ensure compliance.”¹⁹

US White House Executive Order (EO) emphasizes priorities for investment review under the Committee on Foreign Investment in the United States (CFIUS). On September 15, [Executive Order 14083](#) clarified five factors that deserve particular attention as part of the CFIUS review process.²⁰ These factors, although already considered during the CFIUS process, require redoubled scrutiny given changes in adversarial tactics aimed at US supply chains, technology, and data. They are the following:

- “Critical US supply chains that may have national security implications, including those outside of the defense industrial base”
- US technological leadership, including such areas as microelectronics, artificial intelligence, biotechnology, quantum computing, and climate change adaptation technologies
- Industry investment trends in a particular sector
- Cybersecurity risks “that threaten to impair national security”
- Sensitive data of US persons

Although the EO does not grant CFIUS new powers, a [Financial Times article](#) cites an unnamed US official saying that one purpose of the EO is to “send a very clear public message to the private sector” about areas of focus for CFIUS.²¹ The *Financial Times* cites another US official saying that the EO is intended to emphasize that, when considering national security risks, CFIUS should examine “patterns” of foreign investment behavior rather than individual transactions in isolation.

CFIUS is an interagency committee authorized to review transactions that could result in control of a US business by a foreign person to determine the potential effect on national security of these “covered transactions.”²² The US Congress passed investment screening changes in 2018 as part of the Foreign Investment Risk Review Modernization Act ([FIRRMA](#)), which expanded the scope of covered transactions, adjusted timelines for CFIUS review, and strengthened some mitigation requirements.²³

PARTNER AND ALLY ACTIONS

European Commission approves reports on European Union (EU) export control and investment screening regimes. On September 2, the [European Commission](#) issued two reports describing the status of EU foreign direct investment (FDI) screening and export control regulations.²⁴ Prior to 2019, the EU did not have a common FDI screening framework, but 25 of 27 EU member states have now established national FDI screening mechanisms.²⁵ The [second annual EU report on FDI screening](#) summarizes investment trends, legislative developments, and screening activities by member states.²⁶ Of the 740 projects that member states evaluated in the past two years, only a small number of transactions were blocked. In 2021, approximately 71 percent of applications “did not require formal [FDI] screening” because there was no “impact on security or public order [i.e., national security].”²⁷ In 2021, “national authorities ultimately blocked transactions in only 1 percent of all decided cases,” and about 3 percent of transactions were withdrawn. Manufacturing and information communications technology represent over 66 percent of all the reviewed transactions.

According to the [export controls report](#), in May 2021, the EU adopted “a new [Export Control Regulation](#)” and has enhanced cooperation through the US-EU [Trade and Technology Council \(TTC\)](#).²⁸ The TTC was established in June 2021 and has 10 working groups, one of which is dedicated to export controls. The new [Export Control Regulation](#) added provisions to include risks associated with “internal repression or serious violations of human rights and/or international humanitarian law,” and the Surveillance Technology Expert Group is devising due diligence measures associated with those new provisions.²⁹

Investment Canada Act intended to increase visibility of security risks for government. On August 2, two key changes to the [Investment Canada Act](#), which governs national security review of foreign investments into Canada, came into force.³⁰ First, foreign investors whose transactions in Canada previously did not meet the criteria for mandatory notification to the Canadian government now have the option of voluntary notification. Second, the government has expanded the period during which it can review transactions from 45 days to 5 years. Together, these two changes are reportedly [intended](#) to incentivize foreign investors to report more transactions voluntarily and to provide the Canadian government more time to identify non-notified transactions that may pose security risks.³¹ The lengthy 5-year window for post hoc review also brings Canadian investment law more in line with the US investment screening process, which does not limit the CFIUS review period for previously non-notified transactions.

Canadian government orders three PRC state-owned firms to divest from critical mineral companies. On November 2, the government of Canada [ordered](#) three PRC firms to divest from Canadian critical mineral companies.³² Sinomine (Hong Kong) must divest from Power Metals Corporation, Chengze Lithium is required to divest from Lithium Chile Inc, and Zangge Mining must divest from Ultra Lithium. According to Canada’s Minister of Innovation, Science and Industry Francois-Philippe Champagne, the Canadian government “will act decisively when investments threaten our national security and our critical minerals supply chains, both at home and abroad.”³³ According to the *Financial Times*, a former US Commerce Department official [stated](#) that “the move was significant because it marked ‘a shift in Canadian national security policy from traditional national security risks to critical supply chain risks.’”³⁴

EMERGING AND CRITICAL TECHNOLOGY TRENDS

The US government defines critical and emerging technologies as “a subset of advanced technologies that are potentially significant to US national security.”³⁵ Although predicting how long-term technology trends

will affect national security is challenging, efforts are underway to [identify technology trends](#) likely to have future military applications and national security implications.³⁶

US National Institute of Standards and Technology (NIST) to develop post-quantum cryptography alongside US and partner country firms. US companies Amazon, Microsoft, and Cisco, and South Korea's Samsung, are among 12 companies [selected](#) in July 2022 by NIST to develop new algorithms for post-quantum cryptography, or PQC.³⁷ PQC refers to data-encryption techniques intended to be resilient to attacks by quantum computers. Developing quantum-resilient encryption is vital to national security as many current US government and military systems are not designed to withstand quantum attacks.³⁸ Most experts agree that the US remains ahead of China in quantum computing, but the PRC is investing substantial resources in this area. For example, PRC scientists recently unveiled what could be the world's most powerful [quantum computer](#).³⁹

The US **National Institute of Standards and Technology (NIST)** “promotes US innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security.”⁴⁰

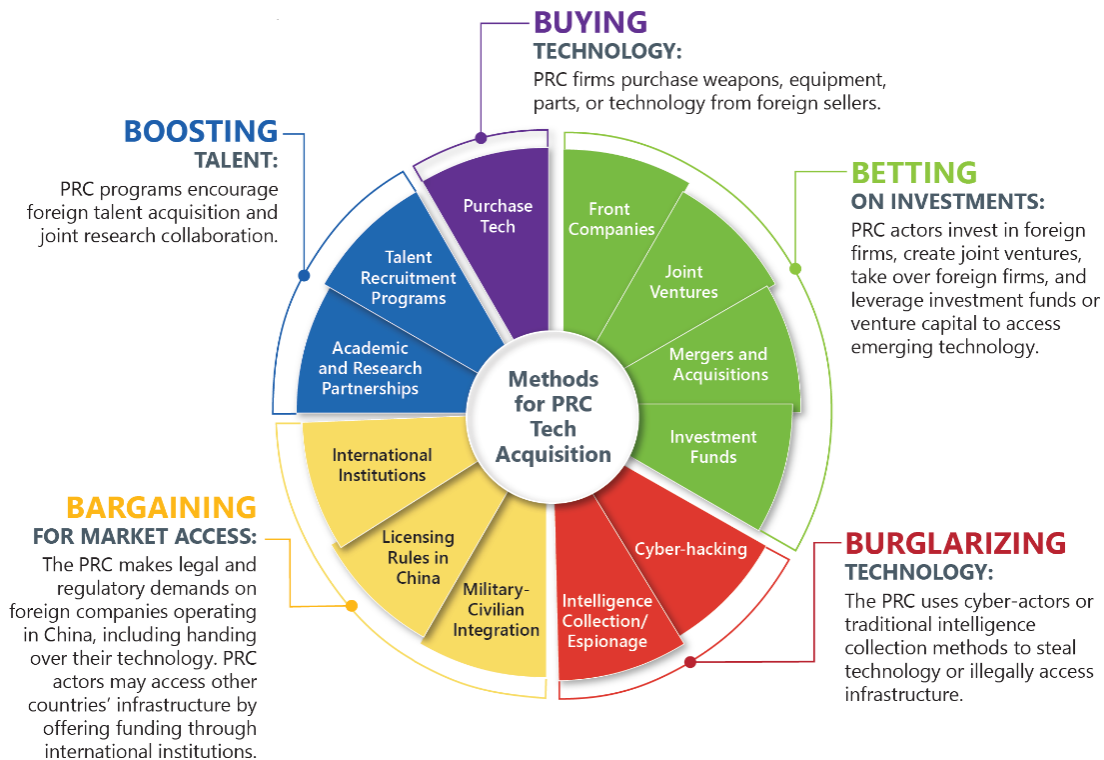
Australia's Department of Industry, Science and Resources (DISR) sought feedback on its second “List of Critical Technologies in the National Interest.” DISR issued a [consultation paper](#) for the 2022 edition, which includes [technologies](#) described as “current and emerging technologies . . . with the capacity to significantly enhance or pose risk to Australia's national interest, including our economic prosperity, social cohesion, and national security.”⁴¹ The [inaugural edition](#), issued in 2021, included 63 technologies in 7 categories: (1) advanced materials and manufacturing; (2) artificial intelligence, computing, and communications; (3) biotechnology, gene technology, and vaccines; (4) energy and environment; (5) quantum computing, sensors, and cryptography; (6) sensing, timing, and navigation; and (7) transportation, robotics, and space.⁴² The stakeholder comment period ran from September to early October; DISR will issue a revised list in November 2022.

PRC controls vast majority of global solar panel raw material production. An [article](#) in the American Chemical Society's weekly publication *Chemical and Engineering News* raises a fundamental issue facing the US solar industry: PRC control over polysilicon, a material used to make solar panels.⁴³ The article notes that the PRC makes over 75 percent of the world's polysilicon, enabling the PRC to dominate the market for finished solar power products as well. An International Energy Agency [report](#) estimates that the PRC manufactures over 80 percent of all solar cells and panels.⁴⁴

PRC dominance of the polysilicon production market represents a major shift in recent years. In 2010, according to the article, production was “split almost evenly among the US, Europe, South Korea, Japan, and China.” Since then, the US has gone from nearly a dozen factories producing polysilicon in 2014, to none as of 2022. PRC control over polysilicon production represents a supply chain risk to the US solar industry. For example, a [report](#) by the US National Renewable Energy Laboratory notes that in 2020, an explosion at a PRC polysilicon plant temporarily halted 10 percent of the world's production capacity.⁴⁵

HOW CHINA ACCESSES FOREIGN TECHNOLOGY: THE 5 Bs

The PRC uses a variety of techniques to obtain access to critical technology, described in the figure below.



Source: CNA.

NOTES

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