Testimony Before the U.S.-China Economic and Security Review Commission

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"Made in China 2025—Who is Winning?"
Panel II: The Next Decade of U.S.-China Tech Competition

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I. Introduction

Members of the U.S.-China Economic and Security Review Commission, it's an honor to be invited here today to share my perspectives on the next decade of the U.S.-China tech competition. My name is David Lin. I am Senior Director for Future Technology Platforms at Special Competitive Studies Project (SCSP), a nonpartisan, nonprofit making recommendations to strengthen U.S. competitiveness as emerging technology is reshaping our economy, national security, and society. At SCSP, the Future Tech Platforms team is charged with scanning the horizon for emerging geopolitical and tech trends and developing policy recommendations for the United States to maintain positional advantage vis-à-vis our competitors.

My testimony today draws from the work we have been doing at the SCSP and will provide our assessments on which technology areas China leads today, which sectors China intends to lead in tomorrow, and offer some recommendations on how the United States should position itself going forward into the next decade.

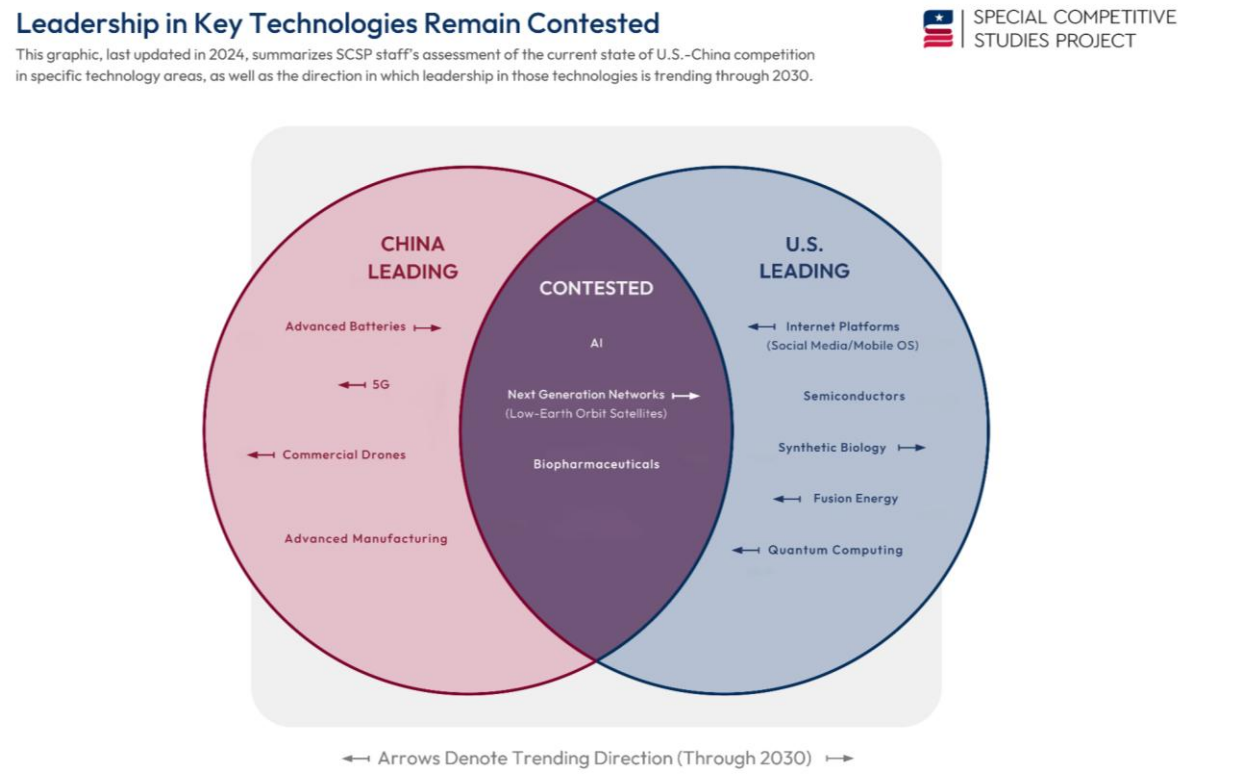
I got to witness the early years of Made in China 2025 firsthand when I was posted there as an economic officer in the U.S. Consulate Shanghai. I had landed in China just months after the initial rollout of Made in China 2025 and recall attending several local industry conferences and seeing the excitement surrounding the industrial plan. Local Party leaders and industry executives looked at Made in China 2025 as an industrial reawakening. A common refrain at the time was that China's aspiration was to move up the value chain—to ultimately change the Apple iPhone tagline from "Designed in California, Made in China," to "Designed in China, Made in China." I remember at the time how inconceivable it was to many that China would ever be able to manufacture a piece of technology that could match the caliber of an Apple iPhone. But fast forward ten years, and here we are—numerous homegrown Chinese companies – Huawei, ZTE, Oppo, Vivo, Xiaomi—are producing leading-edge smartphones and becoming serious global competitors. And this is just the beginning of the story.

II. Where China Leads Today

In 2015, Beijing laid out its ambitious state-led plan to transform the country into a global manufacturing and technological powerhouse, targeting ten strategic sectors from robotics to next-

generation information technology to electric vehicles.[1] Nearly a decade into this initiative, a clear pattern has emerged: China's greatest advances and closest approaches to global leadership are in sectors that leverage the country's sprawling manufacturing industrial base.[2] China's infrastructure-first approach to technological development has yielded formidable industrial advantages in scaling and implementing technologies, exemplified by its high-speed rail systems and renewable energy development. China's manufacturing prowess has enabled it to move beyond imitation to iteration; by co-locating manufacturing facilities with R&D hubs, China has been able to rapidly experiment and deploy new innovations.[3]

At SCSP, we identified six battleground sectors that we judge to be central to the U.S.-China technology competition—advanced manufacturing, biotechnology, advanced compute and microelectronics, next-generation energy, advanced networks, and artificial intelligence (AI). Within these sectors, we down-selected twelve key technologies to assess where China is ahead, where the United States is ahead, and where the technology competition is headed next.[4]



Focusing on the four technologies that are in the red sphere, where we assess China to be leading, we see China's industrial manufacturing advantages shine through. All four of these technologies

[1] An Initiative So Feared that China has Stopped Saying its Name, The Economist (2025).

[2] Harold Thibault, Ten Years On, The Relative Success of Beijing's Made in China 2025 Plan, Le Monde (2025); Joe Weisenthal & Tracy Alloway, Almost 10 Years Later, China's 'Made In 2025' Has Succeeded, Bloomberg (2024).

[3] Dan Wang, "China's Hidden Tech Revolution," Foreign Affairs (2023).

[4] Welcome to the Arena: Who's Ahead, Who's Behind, and Where We Are Headed Next in the U.S.-China Technology Competition, Special Competitive Studies Project (2025).

are infrastructure and manufacturing-intensive. Beijing has demonstrated particular strength in commercializing and deploying advanced batteries, 5G infrastructure, commercial drones, and, of course, advanced manufacturing.

In **advanced batteries**, China's strategic focus on refining critical minerals like lithium and graphite has enabled it to control 80% of the world's lithium-ion battery component shipments in 2023, while simultaneously developing an unparalleled battery manufacturing capacity of 1,705 gigawatt-hours (GWh).[5] As a result, China maintains its global market leadership through this low-cost battery production dominance. Yet, recent U.S. investments through the Inflation Reduction Act have begun to narrow this gap by spurring our own manufacturing capabilities. The sector is now trending toward becoming contested rather than China-dominated.

In **5G infrastructure**, China has significantly strengthened its lead over the past three years, deploying low-cost networks at scale. With 4 million base stations deployed domestically, over 1 billion 5G connections, and coverage for 88% of its mobile users, China has achieved a broader, denser, and more affordable 5G network compared to the United States.[6] Globally, China is also working to enmesh itself in 5G networks through its Digital Silk Road initiative.[7] Years of policy gridlock and slow progress on Open RAN development have allowed China's advantage to grow even further, but recent Congressional movement on spectrum policy and federal funding for removing Chinese infrastructure are positive signs that U.S. competitiveness in this tech area may be getting back on track.

The **commercial drone** sector remains firmly under Chinese control as DJI holds 90% of the global consumer market and nearly 70% of the drone sector writ-large.[8] In the United States alone, DJI controls 80% of the commercial market.[9] Chinese drones consistently outperform competitors in reliability, cost-effectiveness, and operational stability. While the United States has seen some promising drone startups emerge, China's leadership position remains secure.

Perhaps most significantly, China has established a clear lead in **advanced manufacturing**. As the Made in China 2025 strategy set out to do a decade ago, China now leads the world in manufacturing capacity and, in 2023, deployed as many industrial robots as the rest of the world combined, positioning the country to capitalize on advanced manufacturing trends.[10] China's

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[5] China's Market Share in Key EV Battery Components Tops 80%, Nikkei Asia (2024); Leading Countries by Battery Manufacturing Capacity Worldwide in 2023, Statista (2023).

[6] Juan Pedro Tomas, China Reaches Over 4 million 5G Base Stations, RCR Wireless (2024); Number of 5G Base Stations in Selected Countries Worldwide 2023, Statista (2024); The 5G Marathon, KPMG UK (2024); China's 5G 'Subs' Climb to 1.15 billion, Telecom TV (2024); Catherine Sbeglia Nin, China to surpass 1 billion 5G Connections this year, RCR Wireless (2024); Dan Strumpf, U.S. vs. China in 5G: The Battle Isn't Even Close, Wall Street Journal (2020).

[7] Mid-Decade Challenges to National Competitiveness, Special Competitive Studies Project (2022).

[8] Zeyi Yang, Why China's Dominance in Commercial Drones Has Become a Global Security Matter, MIT Technology Review (2024); Ishveena Singh, The Secret to DJI's Drone Market Dominance: Revealed, DroneDJ (2024).

[9] Brad Dress, China's Dominant Drone Industry Is a Step Ahead of Congress, The Hill (2024).

[10] Richard Baldwin, China is the World's Sole Manufacturing Superpower: A Line Sketch of the Rise, Centre for Economic Policy Research (2024); Record of 4 Million Robots in Factories Worldwide, International Federation for Robotics (2024).

ability to rapidly adopt, scale, and deploy new manufacturing techniques throughout its domestic supply chain, has allowed it to set global standards in this space.[11]

III. Where China Seeks to Lead Tomorrow

China will be facing major headwinds as it looks toward the next decade of technological and industrial development. China's era of double-digit economic growth is over: GDP growth will likely slow to 4.5% this year and to 4.2% in 2026, though some economists speculate the growth will be even lower.[12] At the same time, China faces demographic challenges as its population fell once again for the third year in a row.[13] This is all occurring as geopolitical tensions with the United States are poised to continue to escalate, especially with proposed trade restrictions and export controls.[14] For all three challenges, Beijing views technology and innovation as being central to the response.

Nevertheless, China continues to strive for dominance in these critical tech domains. This is demonstrated through two case studies: first, artificial intelligence, which received widespread attention last week with the entrance of DeepSeek, and second, perhaps a less well-covered emerging technology, fusion energy, something that has not yet been commercialized, but a sector expected to experience big movements in the next five to ten years.

Artificial Intelligence. AI is a convergence of a multitude of factors, from algorithms to data centers, leaning on a nation's hardware and software capabilities.[15] AI is one of China's highest-priority sectors, featuring prominently in several of Beijing's high-level industrial plans and strategies, including its 14th Five-Year Plan published in 2021,[16] and, of course, Beijing's 2017 New Generation AI Development Plan.[17] AI is expected to feature prominently in the upcoming 15th Five-Year Plan, which we should be seeing a preview of later this year. In SCSP's Gaps analysis report, we make clear AI is a hotly contested area.

According to the PRC's 2017 AI Development Plan, by 2025, Beijing sets the goal of *"[achieving] major breakthroughs in basic theories for AI, such that some technologies and applications*

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[11] Robert D. Atkinson, China Is Rapidly Becoming a Leading Innovator in Advanced Industries, Information Technology & Innovation Foundation (2024); Gerard DiPippo, et al.,Red Ink:Estimating Chinese Industrial Policy Spending in Comparative Perspective, Center for Strategic and International Studies (2022).

[12] Kevin Yao, China's Growth Seen Slowing to 4.5% in 2025 as US Tariffs Bite, Reuters (2025); Claus Soong & Andreas Mischer, MERICS China Forecast 2025: Economic Stress Increases Risk of Domestic Instability, MERICS (2025).

[13] Christopher Bodeen, China's Population Falls for a Third Straight Year, Posing Challenges for its Government and Economy, Associated Press (2025); Lizzi C. Lee, Xi Jinping Doesn't Have an Answer for China's Demographic Crisis, Foreign Policy (2024).

[14] China 2025: What to Watch, Asia Society Policy Institute (2024); MERICS China Essentials Special Issue: China in 2025, MERICS (2024).

[15] Paul Triolo & Kendra Schaefer, China's Generative AI Ecosystem in 2024: Rising Investment and Expectations, The National Bureau of Asian Research (2024).

[16] 中华人民共和国国民经济和社会发展第十四个五年规划和2035年远景目标纲要 (Outline of the 14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Long-Term Objectives for 2035), Xinhua News Agency (2021).

[17] 新一代人工智能发展规划 (New Generation Artificial Intelligence Development Plan), State Council (2017).

achieve a world-leading level and AI becomes the main driving force for China's industrial upgrading and economic transformation, while intelligent social construction has made positive progress." By 2030, China aims to be "*the world's primary AI innovation center.*" You can argue that with DeepSeek's R-1 model unveiled just a few weeks ago, China may well have taken one big step toward reaching its 2025 goal. There are still many questions we don't know the answer to yet surrounding DeepSeek and its latest model, but one thing that the PRC firm has demonstrated is how improving and combining AI functions can lead to breakthrough performance at lower computing cost and also form a pathway toward artificial general intelligence (AGI).[18] In fact, DeepSeek's company tagline references AGI as an implicit goal: "DeepSeek, unravel the mystery of AGI with curiosity. Answer the essential question with long-termism."[19]

China has at least two national programs with the open ambition to achieve AGI. Beijing Academy of Artificial Intelligence (BAAI) focuses on fundamental research and talent cultivation, aiming to achieve breakthroughs in core AGI technologies.[20] Beijing Institute for General Artificial Intelligence (BIGAI) is dedicated to building safe and controllable AGI systems, with a strong emphasis on cognitive science and neuroscience.[21] DeepSeek's emergence, however, is an interesting contrast to what is typically described as a government-centric, heavy-handed approach to innovation in China. The company's relative obscurity, combined with its lack of a direct government connection and even a lack of a direct commercial tie to China's big AI developers like Alibaba, Tencent, and Baidu, puts a spotlight on the role of a small group of moderately-funded Chinese engineers can play in China's innovation ecosystem and how Beijing is turning to open-source as a pathway to technological advancement. Indeed, this may be a new path for Beijing to reach its stated AI goal that by 2030, *"China will achieve major breakthroughs in basic theories for AI, such that some technologies and applications achieve a world-leading level and AI becomes the main driving force for China's industrial upgrading and economic transformation, while intelligent social construction has made positive progress."*

Fusion Energy. China is also rapidly closing the gap with the United States in fusion. While the United States currently leads in fusion energy—exemplified by the Lawrence Livermore National Laboratory's (LLNL) fusion breakthrough in 2022—the race to build the first commercial fusion machine highlights America's challenges with first-of-a-kind infrastructure deployment.

While China's strategic approach deliberately mirrors U.S. development plans, China is investing nearly double the U.S. Department of Energy's fusion budget.[22] The nation also produces ten times as many fusion science Ph.D.s as the United States, and surpassed American patent applications in fusion technology two years ago.[23] China is translating this research and funding into tangible results, constructing a complete development pipeline. Facilities that are underway, like the Experimental Advanced Superconducting Tokamak (EAST), the Burning Experimental

[18] Urgent Memo to the President on DeepSeek's Arrival, Special Competitive Studies Project (2025).

[19] DeepSeek Homepage, DeepSeek (last accessed 2025).

[20] About BAAI, Beijing Academy of Artificial Intelligence (last accessed 2025).

[21] Beijing Institute for General Artificial Intelligence (last accessed 2025).

[22] Jean Paul Allain, Building Bridges: A Bold Vision for the DOE Fusion Energy Sciences, Office of Science for Fusion Energy Sciences (2023).

[23] Jennifer Hiller & Sha Hua, China Outspends the U.S. on Fusion in the Race for Energy's Holy Grail, Wall Street Journal (2024); Rimi Inomata, China Tops Nuclear Fusion Patent Ranking, Beating U.S., Nikkei Asia (2023).

Superconducting Tokamak (BEST), and the China Fusion Engineering Test Reactor (CFETR), all build upon each other towards a functioning, gigawatt-scale fusion power plant by the 2050s.[24]

China is also actively securing dominance in the fusion supply chain and leveraging its already tight control over critical minerals and manufacturing to scale fusion energy. This mirrors its success in other energy technologies, like solar PVs or electric vehicle batteries, and raises concerns that the United States may be the first to invent but struggle to scale its fusion breakthroughs into commercial reactors. These concerns are amplified as China already has a robust nuclear industry overall. With 22 of 58 global nuclear fission reactors under development, China has a significant infrastructure advantage.[25] In contrast, the U.S. regulatory hurdles have delayed conventional nuclear expansion, which could impact how quickly the nation can transition from demonstration to deployment of fusion power.

At the current pace, experts predict China could overtake U.S. and European magnetic fusion capabilities within three to four years.[26] While American leadership in foundational research and private investment remains strong, the path to commercial fusion requires bridging the gap between laboratory success and scalable power plants—precisely the kind of infrastructure challenge where China's comprehensive, state-backed approach could prove decisive.

IV. Opportunities for U.S. Action: Protect and Promote

For the United States to lead in critical technology, it will be paramount to deploy a two-pronged approach where we protect our nation by developing policy measures designed to counter and slow our adversaries, all while we promote our technology through policy measures designed to build domestic capacity and accelerate homegrown innovation. To achieve these goals, I would like to share two recommendations: 1) the **United States must develop a clear framework to better prioritize the way we address technology threats** posed by our competitors, and 2) the **United States requires a roadmap to win the future technology transition**.

First, why do we need a better framework to guide how we prioritize protecting ourselves from foreign technology threats? In the era of technology competition, we must operate in a reality that:

1. Virtually all technology is dual-use, with both military and civilian applications;
2. Anything connected to the Internet is hackable and exploitable; and
3. Virtually every supply chain for technology commodities today has a link to China.

In light of that, we have recently seen in the headlines a wide spectrum of technologies that could pose a threat to both national interests and to the individual American consumer, ranging from commodity electronics like PRC-origin mesh routers and OLED panels to software and mobile applications to industrial-scale infrastructure, like smart cranes and interconnected vehicles. There are technical explanations for how China could exploit these technologies. There are also technical measures that could be adopted to mitigate those threats. The current ad-hoc, patchwork of policy

[24] Welcome to the Arena: Who's Ahead, Who's Behind, and Where We Are Headed Next in the U.S.-China Technology Competition, Special Competitive Studies Project (2025).
[25] Sha Hua, Atomic Power Is In Again—and China Has the Edge, Wall Street Journal (2023).
[26] Jennifer Hiller & Sha Hua, China Outspends the U.S. on Fusion in the Race for Energy's Holy Grail, Wall Street Journal (2024).

solutions to addressing these very different technologies could, in fact, unintentionally undermine public safety and, ultimately, national security. Hovering above the fray is the need for clear criteria, first principles, or a framework to help policymakers, business executives, or even everyday Americans assess risk so that we don't inadvertently undermine U.S. industry, hinder American innovation, and ultimately, leave the nation disadvantaged in the tech competition with China.

To help policymakers sort through the signal from the noise, SCSP developed a strategic evaluation framework consisting of a set of strategic questions for policymakers. This framework offers policymakers a structured evaluation of how to determine which technologies require whole-of-nation attention through three lenses: a technological lens, a rival ecosystem lens, and through the lens of our domestic ecosystem.[27] This framework brings to the surface several key considerations that policymakers should be asking themselves when prioritizing foreign technology threats, such as:

1. How close is this technology to market adoption? What is the technology's tech readiness level (TRL)? What is its timescale for deployment?
2. How big of a technological chokepoint is the technology? Are there non-China alternatives? How commoditized is the technology?
3. Is the technology more geopolitically strategic or more commercially valuable to the United States? Does it shape entire critical industries, like semiconductor fabs, or is it more consumer-facing, like the video games industry?

The current ad-hoc policies addressing foreign technology threats risk inefficiencies and unintended consequences, making the need for a clear, structured framework more urgent than ever. The SCSP's strategic evaluation framework offers a methodical approach for policymakers to assess technological threats through the lenses of technology readiness, China's influence, and U.S. strategic interests. By prioritizing threats based on these criteria, the United States can better mitigate risks without stifling its own technological advancements. Ultimately, a proactive, well-defined roadmap will be essential to maintaining U.S. leadership in critical technologies and securing the nation's competitive edge in the decades to come.

My second point is more domestically focused, and that is how the United States must confront a broader obstacle of bridging the gap between technological innovation and deployment. Beijing's ability to turn strategy into action poses a threat to America's technological leadership. Should China gain the upper hand, an authoritative state would control the world's digital infrastructure, dominate the world's technology platforms, and command the means of production for critical technologies. Most importantly, China would be positioned to harness emerging general-purpose technologies to transform its society, economy, and military, potentially securing innovation power—the ability to invent, adopt, and adapt new technologies—for generations to come.[28]

[27] Platforms Interim Panel Report, Special Competitive Studies Project (2022).

[28] Mid-Decade Challenges to National Competitiveness, Special Competitive Studies Project (2022); Innovation Power for the Generative AI Flywheel, Special Competitive Studies Project (2023).

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Strategic Evaluation Framework

These questions can be used to find strategic signal in the noise to define national technology goals to enhance American competitiveness in the 2025-2030 timeframe.

Technology Factors

Is this technology strategically important enough to warrant fostering a dominant national position?

- Could this technology yield a revolutionary breakthrough that upends existing paradigms or fundamentally changes the way the world works?
- Is this a general purpose technology (GPT) like electricity that could subtend or accelerate many other sectors?
- Does this technology present or solve a novel, foreseeable, and material existential national security threat?
- Could this technology alter the economic fundamentals of the United States? Relatedly, does this technology or program present massive spinoff potential?
- Could this technology change the military balance of power outright by its existence?
- Could this technology transform the means of production of information and/or the control of its flow in society?
- Does this technology possess "first-mover" criteria such as scarce factors of production, network effects, or other forms of potential lock-in.

Rival Factors

Are U.S. rivals positioned for strategic advantage in this technology?

- Are rivals ahead in this area? Is there a need for an offset/leapfrog move due to blindspots of U.S. commercial investment?
- Are rivals substantially trying to get ahead (strategy, invested, determined, aligned public and private efforts towards its development)?
- Are rivals likely to get ahead due to technology readiness level in their ecosystems compared with the U.S. ecosystem?
- Do rival economic/political systems obviously favor development of this technology over others (e.g. resource allocation, regulatory environment, norms)?
- Does this technology represent a major or potential front along clashing tech-spheres of influence?
- How will U.S. rivals react to U.S. development of or leadership in this technology? Does this technology intersect with weaknesses, organizational inertias, or fundamental asymmetries of U.S. rivals?
- Can we foresee how future rival leadership in this space could fundamentally undercut U.S. leadership and power?

Domestic Factors

What needs to be done to ensure a strong U.S. position?

- Is the U.S. innovation ecosystem naturally generating sufficient advantage?
- Is there a clear U.S. competitive advantage surrounding this technology that needs a national endeavor to harvest?
- What is the maturity level of this technology? Would the U.S. need to "invent the future" to achieve positional advantage?
- Has the U.S. government listed this technology as a priority threat or opportunity area? What is the level of political or social will for this technology?
- Do allies and partners currently possess the key expertise and materials/resources in this technology?
- How might other countries respond to a U.S. national endeavor and are there obvious opportunities for joint efforts with allies?
- Which factors (incentives, financial, political, organizational, or regulatory) are currently limiting progress on this technology in the U.S.? Are these in the USG's control?

In light of these stakes, the United States currently faces five key obstacles to winning the tech competition. First, the federal government is often too focused on firefighting today's crises rather than strategic planning and investment in future technologies. Second, as previously mentioned, while the United States often pioneers groundbreaking technologies, China frequently stays ahead by rapidly adopting, refining, and scaling these innovations. Third, we are underinvesting in technology infrastructure. Fourth, bureaucratic hurdles are hindering the development and commercialization of potentially groundbreaking technologies. Finally, persistent security shortfalls leave critical systems vulnerable to exploitation and cyber attacks.[29]

To overcome these obstacles, America must **organize, innovate, build, deploy, and secure** the technology stack of the future. In SCSP's recent Memo to the President on the Future Technology Transition, we lay out five steps on how to do this.[30] First, the United States needs to **organize** and establish a White House Technology Competitiveness Council that can horizon scan and coordinate our national technology strategy. Second, we must **innovate** and increase funding for AI-powered research tools, like self-driving labs, that will accelerate discovery and enable scientific breakthroughs. Third, we have to **build** and break ground on critical technology infrastructure, such as next-generation energy systems, that form the foundation of emerging technologies. To execute these priorities effectively, the federal government should enable the **deployment** of technologies through the creation of regional innovation zones across the nation to empower localities to become "first movers" in critical technology areas, because innovation truly occurs at the local level.

Finally, we must **secure** American innovations, from development to deployment, to protect research, critical infrastructure, our supply chains, and even intellectual property because, ultimately, success in this technological competition with China requires a combination of both protection and promotion. We must simultaneously strengthen and accelerate our domestic innovation ecosystem while implementing targeted measures to hinder China from achieving dominance in critical sectors. This comprehensive approach that pairs strategy with action will be essential for maintaining American technological leadership today and tomorrow.

V. Conclusion

Overall, ten years after the launch of Made in China 2025, we see that China's success stems not from innovation alone but from its systematic ability to scale and deploy technologies across its vast industrial base. Even in areas where the United States maintains leadership—from fundamental AI research to fusion science—China's infrastructure-first approach and coordination between state and industry threatens to close these gaps faster than many expect.

The United States cannot afford to be complacent, even in areas where it currently leads. Today's edge in technologies like quantum or biotechnology could follow the same pattern as solar panels and drones without a more comprehensive approach to maintaining leadership. Success in this competition demands a proactive strategy that accelerates the transition from innovation to industrial-scale deployment, builds robust manufacturing capabilities, and creates regulatory

[29] Memos to the President: Future Tech Transition, Special Competitive Studies Project (2025).
[30] Memos to the President: Future Tech Transition, Special Competitive Studies Project (2025).

frameworks that enable rapid scaling while protecting security interests. The lesson from nearly a decade of Made in China 2025 is clear: technological leadership is not just about who invents the future, but who builds it.

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