Written Testimony of Dr. Bob Mumgaard, Co-Founder and CEO, Commonwealth Fusion Systems

House Committee on Science, Space, and Technology, Subcommittee on Energy

“Igniting America's Energy Future: The Promise and Progress of Fusion Power”

September 18, 2025

Chairman Weber, Ranking Member Ross, and members of the Committee. Thank you for the opportunity to appear before you today. I am Bob Mumgaard, CEO of Commonwealth Fusion Systems (CFS), and I’m grateful to be back before this Committee, having last testified in November of 2021. Since that time, the landscape of the fusion industry has undergone a dramatic transformation. We have seen surging private capital investment, increasing linkages between fusion and artificial intelligence (AI), and significant scientific milestones on an accelerated path to commercialize this game-changing technology, all while facing increasingly sharp competition from foreign nations.

Commonwealth Fusion Systems: A Journey from Promise to Progress

When I last testified, CFS had just achieved a critical technological validation—the successful testing of the world’s most powerful high-temperature superconducting (HTS) magnet. That breakthrough helped us raise $1.8 billion and it has since formed the foundation of our work.

In the past four years, we have translated that magnet technology breakthrough into tangible, real-world progress. We have progressed from a research and development phase to full-scale construction of the SPARC tokamak, our demonstration machine, in Devens, Massachusetts. CFS as a company has grown to over 1,000 employees, a 4 fold increase, building HTS magnets in our factory and assembling SPARC on a site that we had barely broken ground on the last time I spoke with you. Today, SPARC is actively being assembled, over 70% complete, with major components like the cryostat base already in place, subsystems in the commissioning phase, and our vacuum vessel - which serves as the heart of the machine - is scheduled to arrive shortly. We have a clear path to demonstrating net energy from fusion—what is known as Q > 1—and are aiming for 2027. Increasingly, the world is turning to SPARC to validate that fusion can be made at commercial scale.

Generating net energy with the first commercially relevant, grid-scale machine will be a civilization defining moment. It is our “Kitty Hawk” moment, ushering in a new era of virtually unlimited fusion power.

Beyond the SPARC machine, our focus has expanded to our commercial product for fusion power. This includes securing the site for our first 400MW ARC commercial power plant in

Chesterfield County, Virginia[1], and forging a landmark strategic partnership with Google, which has committed to purchase power from that plant once it is on the grid. We aim to commence construction on the ARC power plant in 2028, with the first fusion power on the grid by the early 2030s. This progress is a direct result of strong, consistent support from our investors, including our recent $863 million Series B2 funding round[2], leading our total private capital raise to just shy of $3 billion, from blue chip investors such as NVIDIA, Google, and the private arm of Fidelity. The funding and size makes CFS the largest dedicated fusion organization in the U.S. and one of the largest in the world, after the Chinese and U.K. national programs.

CFS isn't just the largest private fusion company, we are one of the largest privately funded “tough tech” startups in the world. That reflects the capital-intensive nature of our work, but it’s also a signal from discerning investors and market demand that commercial fusion is closer than many realize.

A Broader Fusion Industry Taking Shape

The momentum at CFS is a reflection of a wider trend in the global fusion ecosystem. Over the last four years, the private fusion sector has grown at an unprecedented rate, attracting billions of dollars in new capital. In 2021, there were 23 fusion companies that collectively raised $1.78 billion in private capital. Today, there are 53 private fusion companies that have raised $10.6 billion in private funding, 85% of which has been invested in American fusion companies, with the largest in CFS. This increased investment is a clear signal that the private market now sees fusion not as a distant dream, but as a viable commercial opportunity. The continued growth of AI, advanced manufacturing, electrification of things and resulting energy demands will accelerate these trends.

This shift in perception has been accelerated by key scientific breakthroughs, most notably the achievement of fusion ignition at the National Ignition Facility (NIF) in December 2022. For the first time, a fusion reaction produced more energy than was delivered by the lasers, proving the fundamental science of fusion energy gain. This landmark achievement has inspired confidence across the industry and started a global race to commercialize fusion power.

Artificial Intelligence and Fusion

The convergence of artificial intelligence and fusion is creating a powerful, mutually beneficial relationship that is fundamentally accelerating our progress. On one hand, AI is becoming an indispensable tool for solving the immense technical challenges of fusion. On the other, the soaring energy demands of the AI boom are creating a powerful new commercial imperative for fusion energy. We should embrace these connections.

The rapidly growing energy needs of data centers and AI training models are creating an urgent demand for a new kind of power source. The energy consumption of these centers is projected

[1]Commonwealth Fusion Systems to Build World’s First Commercial Fusion Power Plant in Virginia
[2]Commonwealth Fusion Systems Raises $863 Million Series B2 Round to Accelerate the Commercialization of Fusion Energy

to skyrocket in the coming years, placing immense stress on existing grids and demanding a firm, clean, and reliable source of electricity. This is where fusion comes in. A commercial fusion power plant can provide consistent, 24/7 power that can support a data center's continuous operation. Thanks to recent actions by the Nuclear Regulatory Commission[3] and Congress[4], we can license and build fusion power plants safely and quickly. And they can be built where the power is needed, like data centers, minimizing the need for building new transmission lines. This symbiotic relationship is driving strategic partnerships between tech companies and fusion developers. CFS and the rest of the fusion industry are getting closer to turning fusion into a business venture, and we need a lot of new energy at the moment this is happening. The recent $863 million funding round we received from investors, including new investments from Nvidia and increased investment from Google, is a clear signal that the AI industry sees fusion as an essential part of its future infrastructure. This capital, paired with Google's landmark power purchase agreement for 200 megawatts of power from our first commercial plant, highlights a new, powerful commercial pathway for fusion that goes beyond traditional climate arguments.

At the same time, advanced AI is being used across our industry to accelerate breakthroughs and reduce risk. At a fundamental level, AI-enhanced simulations are helping scientists at institutions like MIT to decode the turbulent behavior of plasma, a notoriously complex phenomenon. Using machine learning, researchers can create "surrogate models" that mimic complex physics simulations, but run in milliseconds instead of minutes. This is a game-changer for designing, optimizing, and controlling a fusion device. We've also leveraged cloud computing capabilities to model our machines, inform designs, reduce scientific risk and accelerate progress towards our commercial goals. CFS will announce some additional AI tools we have been utilizing in the near future.

Increasing Global Competition and the Case for U.S. Leadership

Despite the tremendous progress at home, the United States' leadership position in fusion is not guaranteed, and is eroding day by day. We are in a race to see which nation can first deploy a scalable, commercial fusion technology. Our competitors, particularly in China, are making significant strides backed by massive state-level investment and a coordinated national strategy. The Special Competitive Studies Project (SCSP) Commission on Scaling Fusion Energy, of which I am a member, just released an analysis of China's fusion efforts[5], including $6.5 billion of investment in commercial-relevant facilities since the 2022 NIF shot. That's 3 times what the US spent during the same period. Despite all the positive news coming out on the significant investments in the fusion industry, including our recent B2 raise, Chinese equity investments in their fusion companies have outpaced investment in US fusion companies for the last three years in a row[6].

China's national program, with its Experimental Advanced Superconducting Tokamak (EAST) "artificial sun," has set and re-broken world records for sustaining high-temperature plasma for

[3] NRC to Regulate Fusion Energy Systems Based on Existing Nuclear Materials Licensing
[4] FIA: US Senate Passes ADVANCE Act, Including Legislation to Codify US Fusion Regulations
[5] SCSP: "Cash, Scale, and Speed: Why China's $6.5 Billion Fusion Buildout Should Shock the World"
[6] Fusion Energy Base: September 2025 Fusion Equity Investment Update

over 1,000 seconds. This is a testament to their dedicated, long-term approach to fusion research. Beyond scientific milestones, China is also developing a robust industrial base and supply chain, which gives them a distinct advantage in the rapid deployment of large-scale projects. Their government's strategy is now fully entering the commercial race with the completion of the Comprehensive Research Facility for Fusion Technology (CRAFT), which serves as a national platform to explore and master critical enabling technologies. The 4 million square foot CRAFT facility will provide China with cutting edge research infrastructure and test stands to close many key science and technology gaps identified by the US' 2020 Long Range Plan[7], but that we have failed to act on them. China is also constructing a less sophisticated competitor to the SPARC demonstration machine, the Burning Plasma Experimental Superconducting Tokamak (BEST), a compact, high-field tokamak designed to achieve high-performance plasma. BEST and SPARC are both targeting 2027 for achieving a civilization-defining achievement of Q > 1. This coordinated effort is now being backed by direct state investment, including the recent formation of China Fusion Energy Co. (CFEC), a state-owned company with registered capital of approximately $2.1 billion, with the explicit goal of accelerating the industrialization of fusion energy. This is effectively a state-backed competitor to my company.

From my vantage point, it feels more and more like it is the U.S. fusion industry versus China in the race to deploy and scale fusion. China is building research facilities and proof of concept machines, organizing a whole of government effort in which it is hard to distinguish between their public and private efforts, and laying the groundwork for a supply chain and workforce with global dominance as an ambition. This is a coordinated, state organized intention to win the fusion race. The next decade of fusion breakthroughs and scientific discovery is going to happen in China, not in the US, with the investments I am seeing.

The United States has nothing like this and is at serious risk of falling behind unless urgent action is taken soon. The U.S. Government effort is fragmented, weighed down by underwater mortgages on antiquated facilities, underfunded, and ill-equipped to deliver the focused mission-driven programs needed to complement the private sector to effectively compete with the U.S.'s primary geostrategic rival in this important space. A recent report by the General Accounting Office[8] put it pretty bluntly: over the last few years, only 1.2% of DOE-funded fusion efforts on an annual basis are going towards commercialization through public-private partnerships (PPPs), like the Milestone program.

The decisions the federal government makes in the next year or two could have generational implications. Fusion is not like most technologies. Once commercial, it has the potential to forever change the direction of human development. China understands this. It does not take a stretch of the imagination to think what China could do with a Chinese fusion power plant as an extension of its ambitious "Belt and Road Initiative."

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[7] FESAC: Powering the Future Fusion & Plasmas, 2020

[8] GAO: "Fusion Energy: Additional Planning Would Strengthen DOE's Efforts to Facilitate Commercialization" - January 2025

CFS and the other leading fusion companies are at the absolute edge of what venture capital is able to fund. I have no doubt we will work as hard as possible to achieve our commercialization goals. However, the US will lose a race to China if it does not mobilize to support this nascent industry. This would mean seriously investing in critical enabling fusion R&D at our National Labs and universities and can accelerate timelines for U.S. deployment by supporting the first commercial demonstration fusion power plants through cost-sharing programs, like it has for other critical technologies. It is for this reason that the Fusion Industry Association (FIA), the SCSP Commission on Scaling Fusion Energy[9], as well NGOs like Clean Air Task Force[10] are calling on the U.S. government to make a one-time, $10 billion dollar investment in fusion research and commercial demonstration efforts to ensure the US wins the race. I don't believe we can catch up at this point through the annual federal budget process alone.

Recommendations

With this context in mind and the critical moment we are in, I'd like to offer the following recommendations to inform your work.

1. **Fund public private partnerships at the level required to compete**. Thanks to this Committee's efforts in the form of the bipartisan Energy Act of 2020, signed into law by President Trump, many of the critical programs and authorities we need are already in place. We simply need to fund them.

   CFS is one of eight companies participating in the **Milestone-based Fusion Development program**[11]. Modeled on the highly innovative and successful NASA program that enabled SpaceX to pave the wave for a US dominated commercial space industry, the companies in the fusion milestone program are working towards finalizing the designs of our fusion power plants, like CFS' ARC powerplant. This program leverages the highly effective milestone-based approach, with the private industry taking on all the financial, scientific and project schedule risk. The federal government only provides a limited cost-share when we successfully achieve our milestones. The private industry, not the taxpayer, bears all the risk. I believe in this program. We fought hard for it. While I am grateful for the funding the program has received, it is not remotely at a scale to significantly attract meaningful new private capital to the field. We should fund the existing Milestone program at the federal cost-share levels the industry has asked for - on the order of $2 billion[12] - to accelerate fusion companies' efforts to complete their power plant designs.

   As this Committee thinks about new policies and funding mechanisms to accelerate commercialization and compete with other nations, I would strongly urge for the creation of a **Milestone-based Fusion Demonstration Program**. Think of it as a demonstration phase of the existing Milestone program. If funded at the scale of other demonstration

[9] SCSP Commission on Scaling Fusion Report - February 2025
[10] Clean Air Task Force: "Fusion on the Grid" - April 2025
[11] FIA: "Department of Energy Announces Milestone Public-Private Partnership Awards" - May 2023
[12] FIA Testimony: "From Theory to Reality: The Limitless Potential of Fusion Energy" - June 2023

programs, such as the Advanced Reactor Demonstration Program[13] for the advanced fission industry, of $2.7 - $3 billion it could help cost share the first 2-3 technologically diverse commercial demonstration fusion power plants, putting the first fusion power on the grid within just a few years from now. The FIA has drafted legislation to authorize this program and we stand ready to work with you and the Administration on this proposal.

2. **Build the critical fusion science & technology facilities and test stands.** Deploying and scaling fusion power requires closing some well known, long understood gaps in fusion materials and technologies. To do this, we need to build some critical facilities and test stands at National Laboratories and universities in the areas of materials science and fusion fuel cycles[14]. No single fusion company can take on these challenges, DOE funding and leadership is essential. The fusion community has been clear and consistent on the importance of these facilities for years. Yet, the federal government has done little to advance these essential projects beyond planning stages. China is building them all.

   Recent efforts by the FES (FIRE Collaboratives and BRIDGE) and ARPA-E are seeking to change this, though they simply are not a scale to close these gaps - we need the facilities. We simply have to change this dynamic and prioritize the necessary resources to move these facilities from planning to construction. PPPs and fixed-price, milestone-based approaches could be leveraged to manage costs and move them forward quickly.

3. **Transitioning DOE's fusion mission.** With each passing day, it becomes increasingly clear to me that commercial fusion is outgrowing its home within the Office of Science (SC). The staff within the Fusion Energy Sciences (FES) program are first rate. They are dedicated public servants who are a tremendous asset to our Nation. But a fusion commercialization effort within SC is already starting to stretch beyond the program's core mission, capabilities, and is often in competition with other scientific funding priorities. When we have the first fusion power on the grid, fusion research will rapidly need to transition to an applied focus, with new opportunities and challenges in workforce, supply chains, regulatory technical assistance, international cooperation and export markets. We should begin preparing for this transition now.

   I would point out that there used to be an Office of Fusion Energy. The Committee should consider restoring that office or moving commercially oriented fusion efforts to another home as part of a broader DOE reorganization. I avoid the temptation of rolling fusion energy into the Office of Nuclear Energy, as the technologies are fundamentally different. Regardless of which path we choose, I would urge this Committee to begin this organizational planning work. CFS and the FIA stand ready to work with you, the Administration, and our other partners in fusion research to effectuate this needed change.

[13] DOE Advance Reactor Demonstration Program
[14] FESAC: "Facilities that Best Serve Fusion" - April 2024

4. **Supporting the fusion workforce and supply chain.** Another theme I would like to touch on is the critical pipeline of talent coming out of our Nation's universities. CFS spun out of MIT and we understand the importance of nurturing a strong workforce. Investments in not only plasma physics but engineering across a broad spectrum (electrical, mechanical, civil, industrial, software, etc) as well as highly skilled technicians and welders needed to make our machines and building trades to build our factories and power plants are all paramount to maintaining the US leadership in this sector. I applaud Members of this Committee who introduced the "Fusion Workforce Act" to improve efforts by DOE and the National Science Foundation to support the fusion workforce.

   Likewise, there are steps Congress and the Administration can take to help ensure a robust and resilient fusion supply chain. Leveraging existing tools, like the DOE's Loan Program Office, as well as expanding the 45X Advanced Manufacturing Production Tax Credit, which currently excludes fusion as an eligible technology, would help significantly. The Defense Production Act could be used to expand certain minerals and metals that will be needed in our machines, from molten salt blankets, to hardened materials, like vanadium and tungsten, for our plasma-facing components. Supporting these investments in the fusion supply chain would not only create jobs and ensure resilience, it would help the US stay in the game with the dramatic moves China is making in this sector. For this Committee, I would focus on enabling R&D in the fusion supply chain in areas like fusion fuel cycles and radiation hardened robotics to develop the materials needed to withstand the extreme conditions of fusion. The DOE is starting to make progress here, but more prioritization and resources are needed, with additional focus on enabling these elements of the fusion supply chain.

5. **Cutting DOE red tape, aligning around first principles.** Fusion is incredibly technically challenging, requiring deep collaboration with DOE National Labs like Oak Ridge National Laboratory (ORNL). CFS has relationships and funds work with 13 of the 17 DOE National Labs. Yet the contracting negotiations on some of these awards can take a year or longer. In several instances, the value of the staffing resources required to negotiate these awards are on par with the value of the awards themselves. Further, each National Lab has its own processes and varying requirements from one lab to the next, causing an inconsistent set of requirements from one project to the next. As a frequent partner with our National Labs, these delays can often hinder progress and our shared deployment goals.

   I understand that many of these procedures and safeguards exist at the National Labs for good reason. But there has to be a better way, especially when resources are limited and we're in a race with other nations. For Milestone companies that have already been heavily vetted and scrutinized by the DOE, for example, we should consider expedited or prioritized contracting methods with National Labs. A simplified, expedited approach to facilitate research across the DOE National Lab system for previously vetted Milestone companies, who are at the leading edge of the US' efforts to commercialize fusion power, could improve efficiency, cut red tape, and make the highest and best use of limited resources.

More broadly, we need better alignment on first principles with pioneering programs, like the Milestone program. It took the eight fusion companies over a year to negotiate terms with DOE for a $46 million award that covers the first 18 months of the program. A challenge I noticed is that the DOE did not distinguish between how it traditionally conducts business versus the critical first principles of newly established programs, like Milestone. These misalignments on the actual principles behind the programs led to considerable time consumed negotiating IP terms with the fusion industry. DOE's Other Transaction Authority (OTA), which Congress required DOE to utilize in the Milestone program, gives DOE broad discretion and flexibility to negotiate these terms. But even with that Congressional direction, the lack of first principles alignment protracted these negotiations. The value of the Milestone program to the taxpayer is the creation of a new industry that powers the global economy, employs millions of people, strengthens energy security, and generates billions of dollars a year in economic activity. As the Committee entertains policy recommendations to improve PPPs with the DOE, I'd welcome the opportunity to explore these areas further and provide recommendations. We have developed legislative language with the FIA to that end.

Closing

The path to commercial fusion energy has been long and challenging, but it is a path that will define the future of global energy security, economic competitiveness, and human development for generations to come. American ingenuity has laid the groundwork, but increased support and a refocusing of the DOE's fusion efforts are essential to ensure that the United States remains the undisputed leader in this critical technology. We must move with a sense of urgency and purpose, recognizing that our competitors are not waiting for us to catch up.

Thank you for inviting me to testify, I am happy to answer any questions you may have.

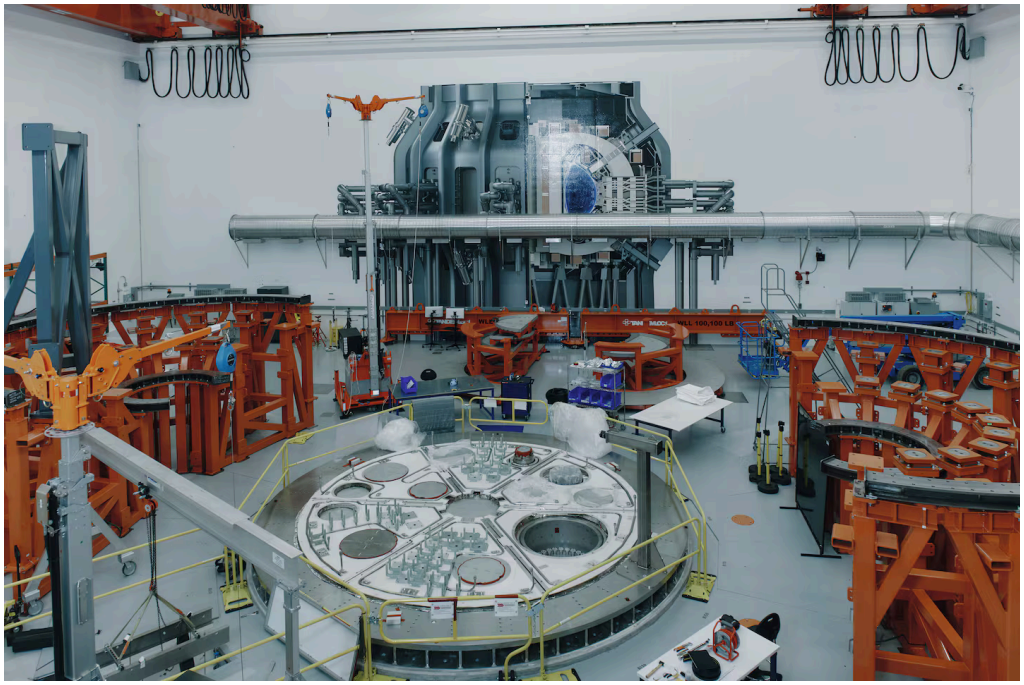
Appendix

SPARC in November 2021

SPARC and CFS Factory and HQ in 2025

SPARC Tokamak (foreground) and CFS HQ and factory (background)

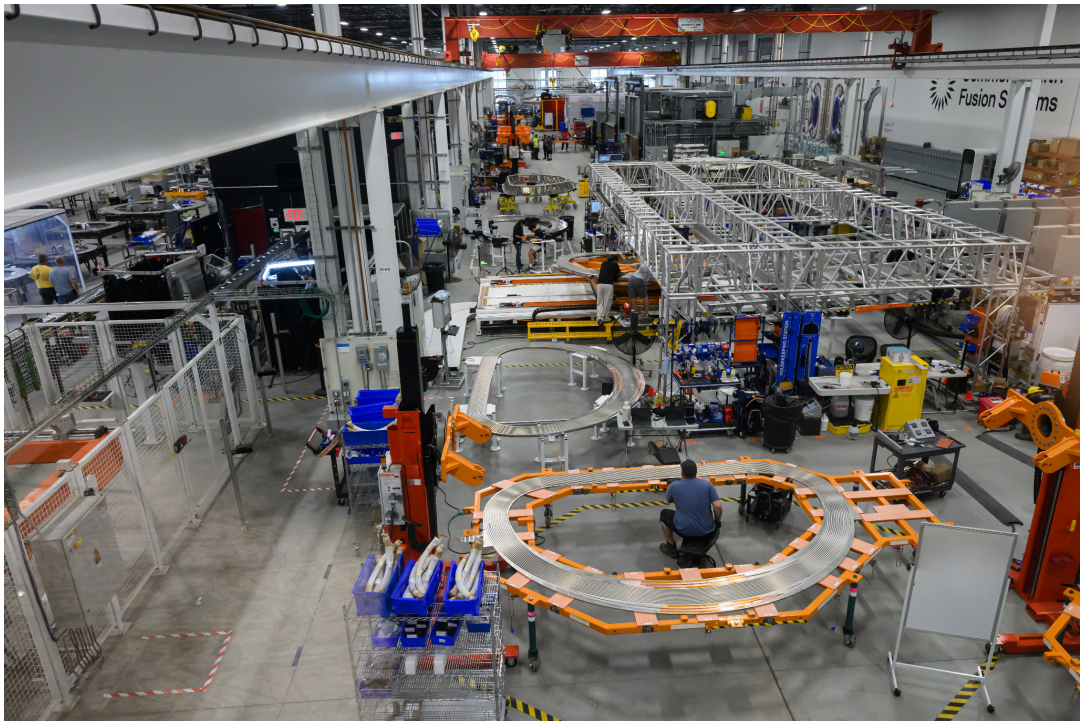
SPARC Tokamak Hall in 2025



SPARC vacuum vessel ready for shipment

TFMC Magnet Test, MIT - September 2021

CFS HTS magnet factory - 2025



China's Fusion Progress

Comprehensive Research Facility for Fusion Technology (CRAFT), Hefei, China

Satellite imagery of the existing CRAFT laboratory on the right and the BEST reactor on the left, Hefei, China. Source: Google Earth (satellite image provided by Maxar Images, Airbus) (December 19, 2024).

A satellite image from January 11, 2025 of Mianyang facility – Source Planet Labs PBC