S. HRG. 119–143

WINNING THE AI RACE: STRENGTHENING U.S. CAPABILITIES IN COMPUTING AND INNOVATION

HEARING

BEFORE THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

ONE HUNDRED NINETEENTH CONGRESS

FIRST SESSION

MAY 8, 2025

Printed for the use of the Committee on Commerce, Science, and Transportation

Available online: http://www.govinfo.gov

U.S. GOVERNMENT PUBLISHING OFFICE
61–426 PDF WASHINGTON : 2025

SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED NINETEENTH CONGRESS

FIRST SESSION

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WINNING THE AI RACE: STRENGTHENING U.S. CAPABILITIES IN COMPUTING AND INNOVATION

THURSDAY, MAY 8, 2025

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Committee met, pursuant to notice, at 10:02 a.m., in room SR–253, Russell Senate Office Building, Hon. Ted Cruz, Chairman of the Committee, presiding.

Present: Senators Cruz [presiding], Moran, Sullivan, Young, Budd, Schmitt, Curtis, Moreno, Sheehy, Lummis, Cantwell, Klobuchar, Schatz, Markey, Peters, Duckworth, Rosen, Luján, Hickenlooper, Fetterman, Kim, and Blunt Rochester.

OPENING STATEMENT OF HON. TED CRUZ, U.S. SENATOR FROM TEXAS

The CHAIRMAN. Good morning. The Senate Committee on Commerce, Science, and Transportation is called to order.

Welcome to our witnesses. Thank you for joining us this morning.

In the last two years AI has brought the United States and the world to a critical inflection point. AI may be a technology as transformative as the Internet or even more so.

It has unleashed a new global industrial revolution with the potential to unlock opportunities that improve our quality of life, create jobs, and stimulate economic growth.

The country that leads in AI will shape the 21st century global order. As a matter of economic security, as a matter of national security, America has to beat China in the AI race.

China has made AI central to its national strategy and China aims to lead the world in AI by 2030, investing heavily in AI adoption across industries like manufacturing and defense.

In this race the United States is facing a fork in the road. Do we go down the path that embraces our history of entrepreneurial freedom and technological innovation or do we adopt the command and control policies of Europe?

I would suggest that Congress draw on the lessons we can learn from the dawn of the internet. In the early 1990s Washington embraced the Internet and explicitly adopted a style of regulation that was intentionally and decisively a light touch.

Congress chose to deregulate under the Telecommunications Act of 1996 while President Clinton pursued tariff agreements and

treaties that protected America's intellectual property and technological exports.

Further, in 1998 Congress enacted a 10-year Internet tax moratorium so that state laws would not balkanize and stymie the promise of e-commerce.

The results of these decisions were extraordinary. By 2000, the United States has recorded five straight years of historic highs in productivity gains and investment growth.

Hundreds of thousands of new jobs were created and the United States became a top tech exporter with massive sums of private investment pouring into the U.S. digital economy.

By contrast, EU countries pursued a series of heavy-handed regulations that proved enormously costly. In 1993 the United States and Europe had economies virtually identical in size.

Today, the American economy is more than 50 percent larger than Europe's. The drivers of that are tech and the shale revolution. Those two comprise virtually the entirety of that massive growth over Europe.

According to one EU Commission report only 6 percent of global AI startup funding flows to EU firms—6 percent. That is one-tenth of the amount that is going to American companies.

The report directly blames this yawning chasm on the EU's nasty regulatory approach. And, yet, the Biden administration for inexplicable reasons tried to align AI policy with the EU to adopt their failed policies.

President Biden's sweeping AI executive order, the longest executive order in American history, cast AI as dangerous and opaque, laying the groundwork for audits, for risk assessments, and regulatory certifications.

Biden's approach inspired similar efforts in state legislatures across the country, threatening to burden startups, developers, and AI users with heavy compliance costs.

Some of my colleagues suggest that a friendlier version of the Biden approach makes sense. They want a testing regime to guard against AI, quote, "discrimination" and have government agents provide, quote, "guidance documents," seemingly something out of Orwell, that will usher in what they call best practices, as if AI engineers lack the intelligence to responsibly build AI without the bureaucrats.

Many in the industry foolishly have supported such paternalism. Harmful regulations take many forms. Biden's misguided midnight AI diffusion rule on chips and model weights would have crippled American tech companies' ability to sell AI to the world.

The Biden plan would have handed over key markets to China. We should want foreign countries, particularly our allies, to buy American.

I vocally opposed this rule for months and, indeed, the Ranking Member and I together urged the Biden administration not to adopt it and I am very pleased that President Trump has now confirmed he plans to rescind it.

All of this busybody bureaucracy, whether Biden's industrial policy on chip exports or industry and regulator-approved guidance documents, is a wolf in sheep's clothing.

To lead in AI the United States cannot allow regulation, even the supposedly benign kind, to choke innovation or adoption.

American dominance in AI depends on two factors: innovation and adoption. Innovation drives breakthroughs in global competitiveness. Adoption ensures that these tools empower American workers and businesses, enabling the United States to become the world's leading adopter and exporter of AI.

Thankfully, President Trump has, largely, reversed Biden's misguided AI agenda. In fact, I think AI was a sleeper issue in this last election.

Americans wanted to see President Trump and Republicans and, indeed, all senators champion AI policies focused on innovation and adoption.

The contrast has been astounding. This year, there have been over $1 trillion of new AI projects including major investments in Texas like the CoreWeave data center in Plano and the $500 billion project Stargate in Abilene by OpenAI and Oracle and others.

Adopting a light touch regulatory style for AI will require Congress to work alongside the President just as Congress did with President Clinton. We need to advance legislation that promotes long-term AI growth and innovation.

That is why I will soon release a new bill that creates a regulatory sandbox for AI modeled on the approach taken by Congress and President Clinton at the dawn of the Internet that will remove barriers to AI adoption, prevent needless state overregulation, and allow the AI supply chain to rapidly grow here in the United States.

That is how we will accelerate economic growth, secure U.S. dominance in AI, and beat China.

And with that, I turn to Ranking Member Cantwell.

STATEMENT OF HON. MARIA CANTWELL,
U.S. SENATOR FROM WASHINGTON

Senator CANTWELL. Thank you, Mr. Chairman.

Thank you for this hearing, and welcome to the witnesses before us—Mr. Altman, Dr. Su, Mr. Intrator, and Mr. Smith.

It is a great pleasure to have all of you here, but it is an especially prideful moment for the Pacific Northwest to have Mr. Smith and Mr. Altman here, both representing an OpenAI approach.

By that I mean an approach where we want to win against China and a closed system by making sure that what is developed here in the United States and around the globe is an architecture where the United States wins and is open.

To do that we need to focus in winning on computing power, on algorithms, and on robust data sources. All of that will be key.

Personally, I believe a continued investment in NSF helps in all of those areas as a good public-private partnership with the industry that is represented here today.

I am so proud that we passed the CHIPS and Science Act, because the CHIPS and Science Act also set a foundation for investing in the United States of America and bringing more of the supply chain back to the United States of America to build on a future leadership that we already have, I believe, in the computing power.

But we also need to understand that we have to move forward on the CHIPS Act like the University of Washington $10 million grant on multi-design sets for chips, the very large-scale integrated designs I am sure that Dr. Su will tell us about today.

But the fact that the United States has to continue to lead on the future designs and the implementation of that also requires us to be very smart about data centers, about sources of electricity, and how we are going to build that supply that could be up to 12 percent of electricity demand in the very near future.

So how do we do that? I have noticed in each of your testimonies you all explain this, but I am also very proud that Microsoft has already signed an agreement with one company, Fusion Energy in Everett, Washington, for a power source supply—maybe Mr. Altman in his testimony will talk about this—but that they hope to get very near future energy source from that.

So, clearly, the United States leading on electricity and development so, Mr. Smith, very much appreciate in your testimony the accentuation on the fact that the United States of America needs hundreds of thousands of new electricians, something we should all want to get behind.

The fact that having electricity and the electricians and the data source centers here in the United States and in other places will be key.

While I want to see us move forward, as the Chairman said—we signed a letter saying we needed a broader support for export controls—I want to be clear.

Export controls are not a trade strategy. They are not a back pocket issue that the President of the United States whips out in trade negotiations.

We are going to move fast because we are going to set standards. I believe those standards should be encouraging very broad distribution of U.S.-manufactured and -made AI chips and technology, and that we are asking our partners overseas to comply with the rules that we establish, things like making sure that there is no circumvention of the supply that somehow gets into China's hands, making sure that we have access, and making sure that we can verify on that, and also making sure that U.S. data companies and cloud-based companies are allowed to be in that market.

We should not be going to markets overseas only to have them tell us that organizations with cloud services from the U.S. would not be allowed. This, I believe, would be a robust initiative on getting U.S. AI chips and U.S. AI open systems dominated around the globe.

Why do we need to move fast? We need to move fast because if we do not we are looking at another Huawei, another instance where the United States is behind and also saying we should tear out this system that now we do not like for lots of reasons and back door policies.

So I am all for winning. That is why we passed the CHIPS and Science Act. I am all for winning and that is why we have passed seven bills out of this committee last year that, kind of, got stuck in the lame duck.

I think the Chairman of the Committee was not ready to move forward in negotiations with the House and Senate on those seven

bills. But those bills, a bill between myself and Senator Young on the Institute for Standards—NIST standards—which I think we still need to do.

My colleague and I—Moran—on education and scholarships, small business, and the bill by my colleague here, Senators Klobuchar and Thune, which was also related to the NIST standards.

So we had an opportunity a year ago to move fast. We did not do it. So let us do this now. Let us get together and figure this out. The faster the United States moves now, I like this great Paul Romer quote, which was about collaboration is the next phase of innovation.

If we do not collaborate here, if we throw down on politics instead of getting the policy right, we will not move fast. Let us allow these people to do what they do best and let us make sure the United States has the right policies in place so that our OpenAI standard wins the day.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

I would now like to introduce our witnesses for today. Each of our witnesses and their companies represent critical parts of the AI infrastructure, hardware, and software supply chain.

Our first witness is Sam Altman, the Co-Founder and CEO of OpenAI. OpenAI is one of the world's most advanced AI companies, known best for its ChatGPT product.

Our second witness is Lisa Su, the Chair and CEO of Advanced Micro Devices—AMD. AMD develops high-performance processors, graphic chips, and AI accelerators that power artificial intelligence, and Dr. Su is also a Texan.

Our third witness today is Michael Intrator, the CEO and Co-Founder of CoreWeave, an AI hyperscaler. CoreWeave is the world's largest purpose built AI cloud platform.

And our final witness is Brad Smith, the Vice Chair and President of Microsoft. I believe everyone is familiar with his company.

Mr. Altman, you are recognized for your opening statement. If you could turn on the volume.

Mr. ALTMAN. Sorry about that.

The CHAIRMAN. And I do enjoy telling techies how to operate the tech.

Mr. ALTMAN. It is pretty embarrassing that I could not figure that out.

STATEMENT OF SAM ALTMAN, CO-FOUNDER AND CHIEF EXECUTIVE OFFICER, OPENAI

Mr. ALTMAN. Anyway, thank you, Chairman. Thank you, Ranking Member Cantwell. Thank you, all senators and fellow panelists. It is a real honor to be here.

I was here about two years ago and at that time ChatGPT had recently launched. It was a curiosity in the world. People were not sure what it was going to mean, what it was going to be used for.

Today, we have made significant progress. ChatGPT is used by more than 500 million people a week. I just saw yesterday that according to Similarweb it is now the fifth biggest website on the

Internet globally and growing very quickly, but most of all, it is being used in really important ways.

It is significantly increasing productivity. We hear scientists say they are two or three times more productive than they could be before.

We hear people that are getting medical advice or learning in ways they could not before and it is really—it is no longer this thing that was going to come in the future but it is here now and people are really using it. We are very proud to be one of the leaders of this.

We are very proud that America is leading in AI so significantly and I think that is critical. What Senator Cruz said about the importance of innovation in America and that we have the—what happened with the Internet we have happen again.

I believe this will be at least as big as the internet, maybe bigger. That needs to happen. For that to happen investment in infrastructure is critical.

I believe the next decade will be about abundant intelligence and abundant energy, making sure that those—that America leads in both of those, that we are able to usher in these dual revolutions that will change the world we live in I think in incredibly positive ways. It is critical.

I got to go to Abilene, Texas yesterday where we are building out what will be the largest AI training facility in the world. It is coming along beautifully. Super exciting to see. We need a lot more of that.

There is a whole sort of AI factory, like, a supply chain of energy chips, standing up data centers, building the racks and more.

We have got to do that really well in the U.S. so that we can continue to innovate, continue to lead, and continue to, sort of, shape this revolution.

Speaking of that, I was very inspired by what Chairman Cruz said so I would like to deviate from script here and tell a story. In my prepared written testimony I covered the basics.

So if it is OK I would love to tell you a story. I grew up in St. Louis and I was a computer nerd, and it was the time of the Internet boom and I thought it was the coolest thing ever.

We kind of lived in this beautiful, old brick house in this suburb of St. Louis and I lived in the attic, and I had this computer and I would stay up all night and I would learn to program, and I got to kind of use the Internet and it was, like, a crazy time of tons of innovation. All sorts of stuff was happening.

It was amazing and it was all happening here. All the Internet companies were in the U.S. I used a Mac that was built here. I used chips that were started, you know, near where I now live.

And I learned about computers. I thought it was the coolest thing ever, and I can draw a straight line from that experience to founding OpenAI and getting to work on companies like Helion.

The spirit of American innovation and support of entrepreneurship. I do not think the Internet could have happened anywhere else and if that did not happen I do not think the AI revolution would have happened here.

I am a child of the Internet revolution. I have the great honor to be one of the parents of the many parents of the AI revolution

and I think it is no accident that that is happening in America again and again and again.

But we need to make sure that we build our systems and that we set our policy in a way where that continues to happen.

I think this is magic. I do not want to live in Europe either. I think America is just an incredible and special thing, and it will not only be the place where the AI revolution happens but all the revolutions after.

I was home visiting St. Louis recently. Drove by our old house and I kind of, like—it was at night and I looked up and in that, like, top floor window the light was on and I thought, you know, hopefully there is some kid in there staying up late at night playing with ChatGPT, figuring out how he or she is going to start whatever company comes next and whatever the next thing is after AI will happen here, too.

That is, to me, the magic of this country. It is incredibly personally important and I hope it keeps going.

Thank you very much for having me.

[The prepared statement of Mr. Altman follows:]

PREPARED STATEMENT OF SAM ALTMAN, CO-FOUNDER AND CHIEF EXECUTIVE OFFICER, OPENAI

Thank you, Chairman Cruz, Ranking Member Cantwell, and Members of the Committee.

I'm Sam Altman, Chief Executive Officer of OpenAI. It is an honor to return to the Senate and share our view of where AI is today and where we see it going.

OpenAI is not a normal company and never will be.

Our mission is to ensure that artificial general intelligence—AGI—benefits all of humanity. AGI is a weakly defined term, but generally speaking we mean it to be a system that can tackle increasingly complex problems, at human level, in many fields. When we formed OpenAI more than 10 years ago, we stared at each other around a kitchen table, wondering how to get started. AI then was a niche tool for researchers, not the general public.

In 2016, Chairman Cruz convened his first AI hearing, and my co-founder, Greg Brockman, testified that AGI models were probably between 10 and 100 years away. Today, the science of AI has advanced so significantly that we are now confident that we'll reach that milestone during President Trump's time in office.

Throughout history, people have crafted tools to scale our abilities—and we believe AGI will be the most powerful tool ever created. It will enable people to build incredible things for each other and improve their quality of life.

But AGI's full potential won't be realized unless it's safe. The same capabilities that will enable AGI to support scientific breakthroughs and accelerate human progress will also create new risk areas. That's why we red-team relentlessly and lead the industry in transparency.

Ultimately, I believe the good will outweigh the bad by orders of magnitude, and that AGI will help bring us into what I call the Intelligence Age—an era when everyone's lives can be better than anyone's life today.

This future can be almost unimaginably bright, but only if we take concrete steps to ensure that an American-led version of AI, built on democratic values like freedom and transparency, prevails over an authoritarian one.

The stakes could not be higher—and Congress is right that the United States must lead the way.

At OpenAI, we're committed to the path of democratic AI, and we are humbled that ChatGPT is being used by more than 500 million people each week to create, discover, and achieve breakthroughs that were once out of reach.

America is a nation of innovators, and we want to supercharge people's ability to use our technology to make their lives better.

We want to open source very capable models.

We want to give our users a great deal of freedom in how they use our tools, and let them personalize ChatGPT to best meet their needs.

We want to build a brain for the world and make it super easy for people to use it, with common-sense restrictions to prevent harm.

And the truth is that AI is already changing the world for the better.

Scientists at the U.S. National Laboratories—including Oak Ridge National Laboratory, Los Alamos National Laboratory, Argonne National Laboratory, the Princeton Plasma Physics Laboratory, and the Pacific Northwest National Laboratory—are using our reasoning models to accelerate breakthroughs in areas like energy.

In Pennsylvania, ChatGPT is helping state employees do administrative tasks more quickly, freeing up more time to improve the delivery of public services.

And universities in states like Texas, North Carolina, and California are putting ChatGPT in the hands of students and educators to build an AI-ready workforce.

AI will be vitally important to ensuring that today's students are ready for tomorrow's jobs. In the US, more than one-third of college-aged young people use our models, mainly for learning and tutoring. Around the world, most ChatGPT users are under age 35.

We're proud to offer free access to a technology that is doing so much for so many people, but AI's biggest gains are still to come.

Our work at OpenAI suggests that as AI advances, progress accelerates and becomes increasingly affordable, as reflected in these three scaling principles:

Investing more in AI will continue to make it better and more capable. The intelligence of an AI model roughly equals the log of the resources used to train and run it. Until recently, scaling progress has primarily come from training compute and data, but we have shown how

to make intelligence scale from inference compute, as well. The scaling laws that predict these gains are incredibly precise over many orders of magnitude. It follows that further investment will lead to further gains, and further benefits to society: We believe that the socioeconomic value of linearly increasing intelligence is superexponential in nature.

The cost to use a given level of AI capability falls by about 10x every 12 months, and lower prices lead to much more use. We saw this in the change in token cost between GPT-4 in early 2023 and GPT–4o in mid-2024, where the price per token dropped about 150x in that time period. Moore's Law predicted that the number of transistors on a microchip would double roughly every two years; the decrease in the cost of using AI is even more dramatic.

The amount of time it takes to improve an AI model keeps decreasing. Put another way, AI models are catching up with human intelligence at an increasing rate. The typical time it takes for a computer to beat humans at a given benchmark has fallen from 20 years after the benchmark was introduced, to five years, and now to one to two years—and we see no reason why those advances will stop in the near future.

So what does that mean practically?

I believe we'll see many major advances over the next three years, but here are some examples.

In 2025, we will release AI-powered tools that can handle sophisticated software engineering, and AI agents that can handle real-world tasks like making doctor's appointments and helping to run a business. These agents will be super assistants who can collaborate with workers in every industry, doctors in all specialties, and scientists in every field of research.

In 2026, AI may unlock a new wave of scientific breakthroughs by designing experiments to tackle America's toughest challenges in climate, health, and national security.

And in 2027, AI-powered robotics could push AI-driven productivity gains into the physical world, handling routine tasks so people can spend more time on the work and activities they enjoy.

As AI systems become more capable, people will want to use them even more. Meeting that demand requires more chips, training data, energy, and supercomputers.

Infrastructure is destiny, and we need a lot more of it.

Earlier this year I joined President Trump and the CEOs of Oracle and SoftBank to announce the Stargate Project, a $500 billion dollar investment in American AI infrastructure.

Since launching Stargate, governments around the world have asked about bringing AI infrastructure to their countries and how we can ensure that democratic AI systems become the global standard.

In response, we're offering a new kind of partnership—OpenAI for Countries—to help these countries build up their data center capacity and ecosystems of AI startups and developers. In exchange, these countries would invest in the Stargate Project—and thus in continued US-led AI leadership and a global, growing network effect for democratic AI.

To close on a personal note, I grew up in St. Louis, part of a close-knit and competitive family that played 20 Questions to guess what we were having for dessert.

When I was eight, my parents bought me a Mac LC II. The computer was a literal dividing line in my life. There was the time before I had a computer, and there has been the time after. I believe that AI will play a similarly formative role for kids across the country, including my own.

I want to thank Chairman Cruz, Ranking Member Cantwell, and the members of this Committee for your continued leadership on AI. I appreciate the opportunity to testify today and look forward to answering your questions.

The CHAIRMAN. Thank you.

Dr. Su.

STATEMENT OF DR. LISA SU, CHIEF EXECUTIVE OFFICER AND CHAIR, ADVANCED MICRO DEVICES (AMD)

Ms. SU. Chairman Cruz, Ranking Member Cantwell, members of the Committee, it is a real honor to be here on such an important topic.

I am Chair and CEO of AMD. We are a U.S. headquartered semiconductor company founded 56 years ago and we build high-performance computing chips for the modern economy.

Every day billions of people rely on our products and services powered by our technologies but our chips are also extremely important to support the critical missions including powering defense systems and secure communications as well as enabling breakthrough scientific research.

I have to say our proudest moments, though, are when we see amazing public-private partnerships and our work in supercomputing is an example of that.

Through more than a decade of partnership with the Department of Energy, AMD now powers the two fastest supercomputers in the world, one that is housed at Oak Ridge National Labs that was put into place in 2021 and the other at Lawrence Livermore National Labs that was just recently put into commission late last year.

These systems are really critical from a national infrastructure standpoint and solve many, many large research issues as well as national security and scientific leadership.

Now, in terms of AI, you know, there is so much that has been stated about AI. I really want to thank Chairman Cruz and Ranking Member Cantwell for having this hearing. I think it is a wonderful opportunity to talk about how we win.

AI is truly the most transformative technology of our time. The United States leads today, but what I would like to say is it is a race. Leadership is absolutely not guaranteed. It is a global race that will shape the outcome of national security and economic prosperity for many decades to come.

Now, maintaining our lead actually requires excellence at every layer of the stack so I am really honored to be here with my panelists as well.

We have deep partnerships with Microsoft and OpenAI that demonstrate how you need silicon, you need software, you need systems and, really, the application layer to be successful.

Now, in terms of what to do, I thought about what would be the most important things to say today and I put them in five categories.

I think the first and probably the foremost is we must continue to run faster. This is a race and the race does not stand still. Nobody in the world stands still.

We lead today because of the bold decisions that we have made and because of the innovation economy that we have. But we need to continue to run faster and that means ensuring that we have computing available.

I think Sam's story about Abilene is an excellent example of how when you allow the computing infrastructure to expand at the rate and pace that the private sector wants, you actually make tremendous progress.

I would also like to mention the importance of open ecosystems. I think open ecosystems are really a cornerstone of U.S. leadership and that allows, you know, frankly, ideas to come from everywhere and every part of the innovation cycle, reducing barriers to entry and strengthening security as well as creating, frankly, a competitive marketplace for ideas.

Third, we are very happy to see the focus on a robust domestic supply chain. For us in the semiconductor world we used to not get so much attention.

Now we get a lot of attention thanks to the importance of chips, and the fact is we need more manufacturing in the U.S. The efforts so far have made good progress but there is a lot more that can be done and that should be done in public-private partnership.

Fourth, we must invest in talent. Frankly, the United States should be the best place to study AI, to work in AI, to really move forward all of the innovations that we need and I think, again, this can also be done in significant public-private partnership.

And then fifth, of course, in the area of export controls we must—we totally understand as an industry the importance of national security and that is, you know, without—that goes without saying as a U.S. company.

But we also want to ensure—as Chairman Cruz and Ranking Member Cantwell stated, it is important to have widespread adoption of U.S. technologies. We lead today because we have the best technology.

However, if we are not able to fully have our technology adopted in the rest of the world there will be other technologies that will come to play. They may not be as good as we are today but, frankly, usage really spurs innovation and this is something that we certainly need to work with in public-private partnership.

And I would, frankly, end by saying, you know, like Sam I had a computer when I was growing up. I grew up in New York. I am a little older than Sam so my first computer was a Commodore 64 and then I graduated to the Apple II. But the fact is this is the best place to do computing innovation in the world. We want it to stay that way with, really, a very rich and broad ecosystem.

So thank you again for the opportunity to be here today.

[The prepared statement of Ms. Su follows:]

PREPARED STATEMENT OF DR. LISA SU, CHAIR AND CEO,
ADVANCED MICRO DEVICES INC. (AMD)

Chairman Cruz, Ranking Member Cantwell, Members of the Committee, thank you for the opportunity to speak with you at such a consequential moment.

I am Chair and CEO of AMD, a U.S.-headquartered semiconductor company founded 56 years ago. We build high-performance computing chips that power the modern economy.

Every day, billions of people rely on products and services powered by AMD technologies. AMD chips also play a vital role advancing many of our Nation's most critical missions, from powering defense systems and secure communications to enabling breakthrough scientific research, medical innovations, and quantum computing.

Our work in supercomputing showcases the full strength of AMD's innovation and public impact. Through more than a decade of partnership with the Department of Energy, AMD now powers the world's two fastest supercomputers: Frontier, which went into operation at Oak Ridge National Labs in 2021, and El Capitan, which went into operation at Lawrence Livermore National Labs late last year. These systems are critical infrastructure for U.S. national security and scientific leadership, including the latest advances in drug discovery, medical research, climate research, hypersonic flight, and even training future generations of more capable AI models.

Today we are here to talk about AI. No technology today better demonstrates the power of high-performance computing than AI.

AI is the most transformative technology of our time. The United States leads today, but leadership is not guaranteed. This is a global race, and the outcome will shape economic growth, national security, and technological influence for decades to come.

Maintaining our lead requires excellence at every layer of the AI stack. AMD's collaborations with Microsoft and OpenAI demonstrate how industry leaders can work together across hardware, software, and systems to advance state-of-the-art AI.

Underneath every model, every breakthrough, and every application is massive amounts of computing power. If we want to lead in AI, we must lead in the infrastructure that powers it. That requires urgency across five national priorities.

First, we must keep running faster. America leads when it moves fast and thinks big. From semiconductors to the internet, speed has turned bold American ideas into global industries. In AI, speed requires accelerating chip and system innovations that deliver more performance with greater efficiency. It also means making AI compute infrastructure readily available across the industry. This will require rapidly building data centers at scale and powering them with reliable, affordable, and clean energy sources. Moving faster also means moving AI beyond the cloud. To ensure every American benefits, AI must be built into the devices we use every day and made as accessible and dependable as electricity. From vehicles and sensors to PCs and medical tools, bringing the power of AI to every enterprise and every American will enable faster decisions, smarter systems, and better services where they matter most. We have the technology, intellectual property, and talent to do that today, but it is a global race and we must keep accelerating our pace.

Second, we must champion open ecosystems. Open standards have long been a cornerstone of U.S. leadership. The same approach must guide our path with AI as well. Open ecosystems allow hardware, software, and models from different vendors to work together. This accelerates innovation, reduces barriers to entry, strengthens security through transparency, and creates healthier, more competitive markets.

Third, we must build a robust domestic supply chain for advanced semiconductor manufacturing and packaging. AI leadership depends on the ability to build complete, integrated systems. That means ensuring we have domestic capabilities in both wafer manufacturing at the most advanced nodes and next-generation packaging technologies as well as the advanced system capabilities needed to bring it all together. AMD is proud to be one of the first partners producing leading-edge chips at TSMC's new fab in Arizona. The domestic semiconductor manufacturing projects announced to date represent meaningful progress, but there is much more that we can do. This is an area where strong public-private partnerships are critical. The entire semiconductor industry is aligned on the need to work together and partner with the government to significantly scale U.S. chip production and advanced packaging capabilities here at home.

Fourth, we must invest in talent and ensure our national strategy for STEM education, workforce training, and immigration supports sustained AI leadership. The private sector can certainly do more, including expanding university partnerships, investing in reskilling programs, and developing the cross-disciplinary talent required for success. We should incentivize companies to increase their most critical AI R&D efforts here at home and ensure our immigration policies attract and retain the world's best AI talent. We should make America the absolute best place for AI talent in the world.

Fifth, we must balance the need for national security with the imperative to enable the widespread adoption of U.S. technologies. As the government considers policies like AI diffusion, it is important to remember that the U.S. leads in AI today and we want the rest of the world building on our platforms. If our international part-

ners cannot access U.S. platforms, they will adopt alternatives that may be less advanced today but will mature over time. Threading this needle requires closer collaboration between government and industry to ensure rules are clear, consistent, and aligned with both competitiveness and security.

This is a pivotal moment. A once-in-a-generation opportunity to secure U.S. leadership in AI and advanced computing. This is not just about developing a transformative technology. It's about shaping the future of our economy, safeguarding our national security, and enhancing our global competitiveness.

Now is the time to ensure the United States doesn't just keep up, but takes the decisive steps needed to cement our leadership.

Thank you again. I look forward to your questions.

The CHAIRMAN. And I had an Apple II as well with a shoe box of floppy disks and somehow I ended up taking a wrong turn and ending up in politics instead.

Mr. Intrator.

STATEMENT OF MICHAEL INTRATOR, CO-FOUNDER AND CHIEF EXECUTIVE OFFICER, COREWEAVE

Mr. INTRATOR. I started out with a VIC–20.

Chairman Cruz, Ranking Member Cantwell, and distinguished members of the Committee, thank you for the opportunity to testify today. I am honored to appear alongside my industry colleagues and partners.

My name is Michael Intrator. I am the Co-Founder and CEO of CoreWeave founded 7 years ago. CoreWeave started like many innovative ventures, humbly in a garage, experimenting, initially with graphics processing units, or GPUs, for cryptocurrency mining.

Recognizing the transformational potential, we pivoted to support powerful AI applications, dramatically scaling the vision and operation.

Today, CoreWeave stands at the forefront of America's AI infrastructure revolution, operating more than 30 data centers across 15 states. We manage more than 250,000 GPUs currently using 360 megawatts of power.

Over two short years our revenue has surged by 12,000 percent, reaching $1.9 billion in 2024. As a result of this progress, CoreWeave became a publicly traded company on March 28th of 2025.

CoreWeave's rapid growth is a testimony not only to the technology but also to the surging global demand for advanced AI infrastructure. Our infrastructure enables American businesses to rapidly translate AI aspirations into impactful economic realities.

By empowering companies to accelerate innovation we are fueling America's competitive edge while improving productivity and prosperity.

Modern AI requires specialized infrastructure, purpose built computing capabilities that surpass traditional cloud computing in scale and performance, today's general purpose cloud that was built to support and scale the complexity of AI workloads.

We cannot run a 21st century economy on the 20th century's infrastructure. AI workloads involve trillions of simultaneous calculations demanding unprecedented computing power, advanced cooling systems, cutting-edge chip technology, ultra high-speed networks and accelerated storage.

Since 2018 the computing power necessary for advanced AI models has multiplied approximately 100,000 fold. At CoreWeave our facilities symbolize America's great tradition of innovation.

Our data centers built, maintained, and staffed by skilled American workers embody how modern technology not only stimulates economic growth and enhances national security, but also improves humans' lives.

We are at a critical juncture in the global AI competition. The nation that leads in infrastructure will set the global economic agenda and shape human outcomes for decades.

Our largest competitor, China, recognizes the stakes and is spending significant resources to strengthen their position. I want to focus on four elements of policy that will help determine whether the U.S. secures its leadership role in the AI race.

First, strategic investment stability. AI infrastructure is deeply capital intensive and requires a significant level of coordination across industry stakeholders.

Stable predictable policy frameworks, secure supply chains, and regulatory environments that foster innovation are crucial. Policy makers must provide clear and consistent policy and regulations across all jurisdictions that enables long-term investment and rapid scaling of AI technology.

Second, energy infrastructure development. To support the rapid deployment of AI infrastructure America must ensure abundant and affordable supplies of energy. Careful reforms and permitting and regulatory process are necessary to accelerate infrastructure projects, facilitate more rapid construction, interconnections, and energy for data centers.

Third is global market access. Maintaining America's leadership also means ensuring our technology has fair access to global markets.

Export controls and trade agreements can be calibrated to both address national security risks and support global diffusion of American AI technology.

And, finally, public-private partnerships and workforce development. America's unique advantage in the AI race is enhanced by our powerful tradition of public-private partnership.

CoreWeave is proud to co-found the New Jersey AI hub with Microsoft, Princeton University, and the New Jersey economic development initiative.

Initiatives like this develop critical workforce skills, foster innovation, and ensure economies and communities are prepared for the AI-driven future.

America stands ready to lead the AI revolution, which will bring enormous benefits. It is a rare moment in time that we must meet.

If government, industry, and all affected parties work together the United States can win this race and seize the vast opportunity ahead of us.

Thank you again for the opportunity to testify. I look forward to answering your questions.

[The prepared statement of Mr. Intrator follows:]

PREPARED STATEMENT OF MICHAEL INTRATOR, CO-FOUNDER AND CHIEF EXECUTIVE OFFICER, COREWEAVE

Introduction

Chairman Cruz, Ranking Member Cantwell, and distinguished Members of the Committee, I want to thank you for the opportunity to provide testimony today on how we can ensure the United States remains the global leader in Artificial Intelligence (AI) innovation.

Today we're on the verge of the next great revolution of AI: a technology dramatically reshaping industries, innovation, and productivity at a massive scale through systems of unprecedented complexity. Millions of hours of training, billions of inference queries, trillions of model parameters, and continuous dynamic scaling are all driving an insatiable hunger for compute and energy that borders on exponential.

At CoreWeave, we are not only deploying the infrastructure that hosts some of the most massive and powerful AI models in existence, but also doing it at scale.

I appreciate the opportunity to describe CoreWeave's journey and our role in this historic race.

CoreWeave's Role

CoreWeave powers AI innovations by bridging the gap between AI ambition and execution. CoreWeave provides the cloud platform, purpose-built for AI, that delivers the speed, performance, and expertise needed to unleash AI's full potential.

To train their next generation of AI models, AI labs require compute resources. And to maintain their leadership position at the forefront of AI innovation, researchers demand the latest and most-performant computing infrastructure. They leverage these compute resources to run the trillions of operations that operate algorithms and process data to train the next generation of models.

The "Scaling Law"[1] has demonstrated that increasing the compute deployed against models translates to better performance. The relationship is exponential. Orders of

magnitude of increased compute are required to unlock incremental gains in model performance. For example, in 2018, one of the most popular and advanced generative AI models required a certain amount of compute to train. Just seven years later, in 2025, the amount of compute needed for the latest frontier models grew by about 100,000 times—an extraordinary increase.[2] Performance, usefulness, and real-world adoption has increased dramatically. This demonstrates that the limiting boundary of AI development is high-performance compute, delivered at scale and operated at peak efficiency.

To access the increased need for compute and to avoid being left behind, enterprises and labs are continuously demanding deployments of the latest generation chips at larger scales. In just the two short years between the most recent generations of Nvidia chips, training performance increased by 4x from Hopper to Grace Blackwell.[3]

CoreWeave enables AI labs, platforms, and enterprises to move the boundaries of compute forward. Our end-to-end cloud platform is purpose-built for the scale, performance, and expertise needed to power AI innovation and meet the demands of accelerated computing. We construct and power data centers, and provision high-performance computing infrastructure which enables enterprise and labs to access these essential resources. Our expertise is in managing a complex and fragile ecosystem across supply chain, energy, financing, and technology partnerships to build, optimize, and deploy our platform at scale.

As of December 2024, we operated in 32 data centers in the U.S. and Europe, deploying more than 250,000 GPUs utilizing 360MW of active power. We have now contracted for 1.3GW of power. Adequate, reliable supplies of power are essential to drive this revolution and for the U.S. to win this race.

This year, CoreWeave was the sole cloud to be ranked Platinum and as the #1 leader in AI cloud performance, as attributed by SemiAnalysis's Platinum ClusterMAX™ Rating.[4] And we have established a track record as among the first to market with the latest generations of hardware, such as Nvidia's most recent GB200 NVL72 chip, which leading labs, such as IBM, Mistral AI, and Cohere, are

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[1] Scaling laws *describe* how the performance of AI systems improve as the size of the training data, model parameters, or computational resources increases.

[2] Epoch AI, "*Training Compute of Frontier AI Models Grows by 4–5x per Year,*" May 28, 2024.

[3] Nvidia, "*NVIDIA GB200 NVL72: Powering the new era of computing.*"

[4] CoreWeave, "*CoreWeave Ranks as #1 AI Cloud, Backed by SemiAnalysis' Platinum ClusterMAX™ Rating,*" April 10, 2025.

already using to improve and accelerate their training jobs.[5] We also support OpenAI—our strategic deal of nearly $12B provides compute capacity for training and delivering its latest models at scale to its hundreds of millions of users around the world.[6]

CoreWeave is purpose-built for the demands of accelerated computing. We deliver this infrastructure with cutting-edge performance and scale, and provide the expertise with the infrastructure that AI needs today and in the future. And as a result, our customers are able to train earlier, build quicker, and get to market faster, which is critical for the U.S. to maintain its lead in AI. CoreWeave is the engine that will propel the U.S. forward in the AI race.

CoreWeave's History

CoreWeave began as many start-ups and great entrepreneurial companies do—in a garage with an idea, which was to try leveraging GPUs for crypto mining. CoreWeave's founders purchased their first GPU in 2016, which turned into hundreds, then thousands, and now hundreds of thousands. Over the course of the next few years, CoreWeave began looking for opportunities to use its fleet of GPUs for other high-performing use cases beyond crypto mining, such as visual effects (VFX), and then AI.

- In 2020, CoreWeave launched as the "world's first specialized cloud."
- In 2021, CoreWeave operated the largest Nvidia A40 fleet in North America.
- By 2022, the world began to realize that more compute was required to scale AI model training. CoreWeave began to scale even more rapidly.
- By 2023, the company had three data centers running more than 17,000 GPUs with approximately 10 megawatts (MWs) of active power.
- By 2024, CoreWeave had ten data centers running more than 53,000 GPUs with more than 70MW of active power.
- And, one year later, at the end of 2024, we had 32 data centers running more than 250,000 GPUs with approximately 360MW of active power.

CoreWeave became a publicly traded company on March 28, 2025.

This progress occurred in five short years. And that is the speed which is required to drive this technological revolution. Most recently, CoreWeave completed its acquisition of Weights & Biases, a leading AI developer platform. Our vision is that CoreWeave + Weights & Biases will deliver the leading AI Cloud Platform—purpose-built to develop, deploy, and iterate AI faster. Together, we will enable faster, more efficient AI development, empower AI developers to innovate quickly, provide seamless integrations for AI development, and support the world's most advanced AI innovators to unleash AI's full potential.

The Need for AI Infrastructure and Re-platforming

AI requires a fundamentally different computing infrastructure from the existing one. Training state-of-the-art models and running inference at scale requires trillions of simultaneous calculations across billions of parameters. To fulfill this requirement, high-performing compute infrastructure necessitates a more concentrated power footprint, increased cooling needs, the latest chips, high-throughput networking, accelerated storage, and more.

In contrast, the generalized clouds that serve the world today were not built to serve the specific requirements of AI. These cloud platforms were built for day-to-day web hosting, database management, and running SaaS applications—workloads that rely on simple, fixed-logic calculations and lightweight processing.

Operating compute at scale and at the intensity of AI is highly complex. There are significant inefficiencies associated with operating AI workloads ranging from hardware failures to scheduling optimal usage. A single 32,000 GPU cluster may require the deployment of approximately 600 miles of fiber cables and approximately 80,000 fiber connections, along with highly-specialized heat management capabilities to support high-power density. Each of these variables increases the number and complexity of possible failure points. When a cluster suffers a component failure (GPU, network, memory, cable, cooling, etc), it can adversely impact the entire cluster by reducing training performance, or even causing the entire project to fail.

The difficulty in managing large clusters leads to what we call the "AI Efficiency gap," which we evaluate based on Model FLOPs Utilization (MFU). This is a meas-

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[5] Nvidia, "*Thousands of NVIDIA Grace Blackwell GPUs Now Live at CoreWeave, Propelling Development for AI Pioneers,*" April 15, 2025.

[6] CoreWeave, "*CoreWeave Announces Agreement with OpenAI to Deliver AI Infrastructure,*" March 10, 2025.

ure of the observed throughput compared to system maximum if the system were operating at peak capacity. Typically, the complexity of managing AI infrastructure means that a majority of the compute capacity in GPUs can be lost to system inefficiencies, with empirical evidence suggesting observed levels of performance in the 35 percent to 45 percent range.

As a result, the world is undergoing a "re-platforming" from traditional generalized cloud computing infrastructure to AI cloud computing infrastructure. And to achieve this, cloud platforms are being fundamentally reimagined, with every layer of the technology stack being specifically optimized for AI workloads. This is the purpose-built computing infrastructure needed to support the scale and complexity of AI workloads.

CoreWeave's Cloud Platform

We have built our platform for the new requirements of AI cloud computing infrastructure.

CoreWeave's cloud platform is an integrated solution that is purpose-built for running AI workloads such as model training and inference at superior performance and efficiency. It includes infrastructure services, managed software services, and application software services, all of which are augmented by our proprietary Mission Control and observability software. This proprietary software enables the provisioning of infrastructure, the orchestration of workloads, and the monitoring of our customers' training and inference environments to ensure high availability and minimize downtime.

To unlock the full potential of AI infrastructure, CoreWeave helps to bridge the MFU "efficiency gap" between the observed 35–45 percent and the theoretical 100 percent, driving as much as 20 percent higher performance than public benchmarks.[7] To achieve this, performance optimizations are built into every layer of the platform to enhance distributed training throughput. And our ability to close this gap significantly enhances performance, improves model quality, accelerates development timelines, and reduces overall AI model costs.

What does this mean for the U.S.? As we improve our efficiency, and close this gap, the United States will maintain its edge in the global AI race, stimulating economic activity, and enhancing national security while improving the provision of essential services for all. This is what the race is all about.

U.S. Global Leadership in AI

We stand at a critical inflection point in the global AI race, representing a pivotal moment that will influence economic prosperity, national security, technological standards and how we provide essential services to all Americans. AI represents the next major evolution of technology with the potential to transform society. This is America's AI moment, and a strategic opportunity America cannot afford to miss.

Economic Prosperity: AI is projected to generate a cumulative global economic impact of $20 trillion, representing 3.5 percent of global GDP, by 2030.[8] The country that leads this transformation will capture a disproportionate share of this new economic frontier. If America maintains global leadership in AI, the productivity gains, new products, high-value jobs, and breakthroughs across industries from healthcare to manufacturing created by AI will help drive prosperity across the American economy benefitting all people.

National Security: As advanced AI capabilities become essential to modern defense including improvements to weapons systems and battlefield capabilities, intelligence, and cybersecurity systems, maintaining America's technological edge becomes inseparable from our national security. Falling behind is not an option when other countries are rapidly advancing their own AI capabilities with explicit aims to challenge American global economic and military leadership.

Shaping the Future of AI: The country that leads AI development will shape how this technology evolves globally. The standards, protocols, and ethical frameworks that will govern AI will reflect the values of whichever country wins this race.

The foundational AI infrastructure being built today will help determine where AI development occurs. Success in the global AI race will increasingly depend on purpose-built AI computing infrastructure, not just general-purpose systems deployed at scale. Nations that successfully "re-platform" gain compounding advantages in model capabilities and development speed.

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[7] CoreWeave, *"CoreWeave leads the Charge in AI Infrastructure Efficiency, with up to 20 percent Higher GPU Cluster Performance than Alternative Solutions,"* March 19, 2025.

[8] IDC, *"The Global Impact of Artificial Intelligence on the Economy and Jobs,"* September 2024.

CoreWeave is at the forefront of developing the purpose-built infrastructure that powers America's AI capabilities. Leading companies and AI labs such as IBM, Mistral, and Cohere rely on CoreWeave's infrastructure. Our success supports broader national objectives by ensuring the U.S. maintains the world's most advanced computing infrastructure which is required to drive AI.

Factors Critical to Continued U.S. Leadership in AI Infrastructure

America's leadership position in AI depends in part on maintaining its edge in the underlying infrastructure that drives it. Based on CoreWeave's experience building and operating AI computing infrastructure, I would like to highlight several critical areas that will determine if our Nation maintains its leadership position. Many of these areas focus on the critical elements of policy which will impact how this sector evolves.

Strategic Investment Stability

AI infrastructure investment requires a significant level of coordination across multiple industry and government stakeholders due to the scale and timeline of these projects, representing substantial capital commitments with years-long development and operational horizons. CoreWeave benefits from robust collaborations with leading chipmakers, original equipment manufacturers ("OEMs"), and software providers to supply us with infrastructure components and other products. The highly specialized infrastructure that is required to unlock the potential of AI is immensely challenging to build and operate, especially at scale. This requires: (i) tens of thousands of GPUs, (ii) thousands of miles of high-speed networking cables, (iii) hundreds of thousands of interconnects coming together to create "superclusters" for training and serving AI models, and (iv) hundreds of MWs of power and substantial amounts of storage.

To sustain U.S. leadership in AI, it is important for U.S. AI cloud computing companies to maintain access to a reliable supply chain necessary to access all of the components necessary to develop and run the cutting-edge AI infrastructure. Acquiring these necessary high-performance components to power AI workloads requires managing a complex global supply chain and maintaining robust supply chain relationships. Continued engagement with leading global suppliers and strategic partners is vital to ensuring the continued operation, expansion, and rapid deployment of U.S. AI infrastructure and to uphold U.S. competitiveness. Predictable policy is essential for this.

Significant private sector investment and development has helped the United States establish an early and important lead in AI infrastructure. The U.S. accounts for roughly 40 percent of the global market for data center capacity, with six of the top ten markets.[9]

The importance of AI and U.S. leadership is not lost on our competitors. Intensifying global competition for AI infrastructure demands that this initial lead must be carefully and actively maintained. The European Union launched its AI Continent Action Plan in April setting out ambitious goals to triple data center capacity across member states in the next five to seven years. The EU also announced a €20 billion investment into five gigafactories–massive high performance computing facilities equipped with approximately 100,000 state-of-the-art AI chips—and reforms related to permitting, energy issues and water usage.[10] China has made its ambitions regarding AI clear through coordinated national strategies and streamlined deployment timelines that can compress years into months in their effort to shrink America's current AI lead.

Countries around the world are aggressively pursuing coordinated AI strategies, implementing policies which subsidize infrastructure, and accelerate deployment timelines. In this high-stakes environment, the capacity of American companies to build AI infrastructure swiftly and with assurance will be a decisive factor in the AI race and determine whether the United States retains its leadership position.

Sustained American leadership in AI infrastructure faces potential headwinds from multiple sources of uncertainty. These include volatility in the global supply chain for critical components, such as advanced semiconductors and networking equipment which can disrupt deployment timelines. These fluctuations can lead to delays or unanticipated cost overruns, adversely affecting American companies' ability to rapidly scale AI capabilities.

Changes in regulation at both the Federal and state levels introduce substantial uncertainty for leading businesses making investment decisions. Changes in export

[9] Cushman & Wakefield Research, "*2024 Global Data Center Market Comparison.*"

[10] European Commission, "The AI Continent Action Plan," April 9, 2025, *https://digital-strategy.ec.europa.eu/en/library/ai-continent-action-plan.*

controls, energy policies, the potential need to add gigawatts of power to meet increased demand, and the emerging landscape of AI-specific regulations at different levels of government also affect the pace and scope of infrastructure deployment. The lack of regulatory clarity can deter investment and slow down the innovation cycle. Additionally, American companies will be affected by the rules and institutions being developed around the world both in individual nations and in important forums in which key competitors participate that will govern the use of AI. As the world's dominant economic player and technological leader, it is important for the U.S. government to drive the rules which shape the future playing field for American companies.

Finally, the potential for a fragmented regulatory framework, with differing requirements from state to state and potentially at the Federal level, poses a unique challenge. For instance, inconsistent definitions of key terms which define various AI activities across jurisdictions could force companies to navigate a complex web of compliance regimes for fundamentally similar activities. These types of policies would require participants in the AI infrastructure to consider designing alternative products and strategies to do business in different jurisdictions. This regulatory patchwork would lead to increased costs, operational inefficiencies, and ultimately, a competitive disadvantage for American companies in the global AI race. These uncertainties disproportionately affect newer entrants like CoreWeave and other specialized providers, potentially stifling the very innovation that drives American leadership in this critical sector.

To ensure the United States remains at the forefront of AI, American companies must lead AI infrastructure development. This requires a coordinated policy strategy to mitigate key uncertainties, many of which this section touches upon, maintain appropriate oversight, and create a stable, predictable policy environment that fosters investment, continued growth and innovation.

Energy and Infrastructure Development: Powering AI Leadership

The race to build AI infrastructure is fundamentally tied to the Nation's ability to continue to develop a new generation of data centers that drive innovation, to bring them online and ensure there is sufficient electricity to power them. This will be affected by the processes and permitting systems that are used to develop data centers and to develop adequate, reliable supplies of new power generation and the interconnection and transmission systems capable of delivering it at pace and scale.

The dual challenges of adding new power supplies and streamlining infrastructure development, are not merely logistical hurdles, but critical factors that will determine whether America can maintain its global AI leadership. Failure to address these challenges effectively risks ceding ground to international competitors, particularly China, who are aggressively pursuing their own AI ambitions.

Energy considerations are critical to the development and operation of AI infrastructure. After a prolonged period of relatively flat electricity consumption, according to analysis, the U.S. is now experiencing a significant and accelerating increase in power demand. This surge is driven by several concurrent trends, including the onshoring of new manufacturing facilities, the widespread electrification of transportation and heating, and the growth in data centers.

AI computation is energy-intensive. Training large language models, running complex simulations, and deploying AI applications all require significant amounts of power. Widespread AI adoption will further increase this demand, even as companies continue to innovate and improve efficiency. According to a report released by the U.S. Department of Energy, data centers consumed approximately 4.4 percent of total U.S. electricity in 2023. This figure is projected to rise in the coming years, potentially consuming between 6.7 percent and 12 percent of total U.S. electricity by 2028.[11] This projected increase underscores the urgent need for policymakers at all levels of government to put policies in place that will enable the development of new power supplies and the infrastructure to deliver it. Given that these projects can cost in the hundreds of millions of dollars and years to implement, there is no time to lose in getting started.

The implications for global AI leadership are clear and consequential. Regions that can provide abundant, reliable, and cost-effective energy will attract billions of dollars of AI infrastructure investment. Conversely, energy constraints, whether in the form of limited supply, unreliable delivery, policy uncertainty, or prohibitive costs, can and will push development and the associated investment elsewhere.

CoreWeave's site selection consideration for data centers illustrates these priorities:

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[11] "2024 United States Data Center Energy Usage Report," Lawrence Berkeley National Laboratory, December 2024.

- Availability of abundant, reliable power, and where available, non-emitting sources
- Competitive rates
- Diverse energy sources
- Pathways for capacity expansion
- Efficient permitting processes that provide timeline certainty

However, obtaining the necessary approvals to build both energy infrastructure and data centers is often a critical bottleneck. Every month of delay represents lost ground in a field where the pace of innovation is measured in weeks, not years.

In particular, it is challenging to develop energy projects. Securing the necessary approvals and permits can take a significant amount of time. Inefficiencies in the permitting process can significantly impact both energy availability and whether attractive sites for data center development can move forward. The variability in permitting timelines across jurisdictions and the potential for multiple, sequential review processes and litigation can increase the time required to develop a project leading to delay or potentially stopping projects.

There will be challenges in streamlining the permitting and regulatory processes required to develop the energy and data center infrastructure necessary for the U.S. to maintain its leadership in AI. Goals in streamlining these processes include:

- Maintaining and growing a balanced portfolio of generation powered by diverse energy sources that can meet increasing demand to ensure availability and reliability at reasonable costs
- Expanding and modernizing the Nation's transmission systems
- Providing developers of data center capacity and associated infrastructure with predictable timelines and reduced wait times for feasibility studies, interconnections, and builds
- Streamlining permitting processes while maintaining appropriate oversight

CoreWeave understands that the processes put in place to achieve these important objectives need to consider the views of key players that will make these investments and the communities in which these facilities are located.

We hope efforts to streamline the permitting process to enable the addition of new sources of generation and the transmission infrastructure to deliver it will receive attention by this Congress.[12]

We recognize that this issue will not be resolved solely at the Federal level. All levels of government have a role to play in addressing the challenges in adding the necessary infrastructure to meet energy requirements. A coordinated effort amongst federal, state, and local government, industry, and other affected parties is required to address these interrelated challenges which include creating efficient, transparent processes that allow infrastructure to be built at the pace and scale that technological advancement requires and for the U.S. to maintain its dominant position in AI.

Global Diffusion of the American AI Stack

Global market access is a pivotal factor in determining which nation will lead in the AI domain. Export controls and trade agreements can be designed to achieve multiple objectives: they can facilitate legitimate market access for American businesses while also mitigating potential national security risks. However, controls that are not calibrated can inadvertently bolster foreign competitors by incentivizing AI development and deployment outside of the U.S., and competitors filling the void left by U.S. firms. This could result in the loss of technological expertise and economic benefits.

To bolster American AI leadership, export controls and international agreements should consider:

- *Precision Targeting of National Security Risks:* Controls should be focused on technologies, entities and nations that pose genuine and demonstrable threats to national security, with clear and specific parameters.
- *Supporting American Technological Leadership:* Restrictions imposed on U.S. technologies and where they can be exported should consider negative impacts on the ability of U.S. companies to compete in global markets. This includes

[12] CoreWeave is a member of the Data Center Coalition. DCC's AI Action Plan submission includes additional discussion related to permitting and energy infrastructure, available *here.* [*https://static1.squarespace.com/static/63a4849eab1c756a1d3e97b1/t/67d84a70db36cf08e2a329cb/1742228107114/DCC+Comments+-+RFI+AI+Action+Plan.pdf*]

considering the potential for retaliatory measures from other nations and the risk of creating a 'chilling effect' on investment and innovation.

- *Strategic Alignment with Allies:* Close coordination with like-minded international partners is essential to ensure the effectiveness of export controls and prevent the fragmentation of the global AI market. Aligning with allies can also foster the expansion of a collaborative, secure, and trustworthy AI ecosystem.

These considerations are crucial in shaping the future landscape of AI innovation. A well-calibrated approach will ensure that the next generation of AI development is anchored in the United States, leveraging American infrastructure and expertise.

Conversely, controls could inadvertently have the effect of limiting opportunities for the export of U.S. technology and expertise, with adverse impacts. A strategy that carefully differentiates between markets, tailors export restrictions to mitigating specific risks, and fosters international cooperation, can effectively protect national security while simultaneously enhancing America's ability to lead and shape the global AI diffusion race.

Public-Private Partnerships Accelerating American Innovation

A unique American advantage in the AI race is our ability to forge effective partnerships between government, industry, academia and elements of civil society. These collaborations combine the agility, ingenuity, expertise and resources of the private sector with the long-term vision of the public sector and the basic and applied research capabilities of academic and research institutions. This approach helps foster an innovation ecosystem that is difficult for competitors to replicate.

CoreWeave is proud to be a founding partner of the New Jersey AI Hub, along with Microsoft, Princeton University, and the New Jersey Economic Development Authority. This AI Hub will focus on research and development efforts, applications of AI in several industry sectors, and AI workforce development and education.[13]

CoreWeave is deeply committed to supporting AI education and research, and public-private collaborative partnerships. Similar partnerships across the country could further accelerate America's AI capabilities, and we encourage policymakers to explore this model of collaboration. These types of partnerships also accelerate AI and data center workforce development in the US. Worker shortages in the data center industry are becoming commonplace as the skills gap widens. Data center employers have struggled to find enough trained workers. Half or 50 percent of surveyed data center managers in 2020 reported having difficulty finding skilled workers to fill positions, and 71 percent continued to report being concerned about finding qualified staff in 2023.[14] A skilled and trained workforce is vital for the stability and expansion of AI data centers—which rely on specialized data center technicians, network and electrical engineers, cybersecurity professionals, and project managers. CoreWeave supports efforts to develop a domestic workforce comprised of the skilled workers required to meet the growing AI demand and to accelerate AI innovation while creating the skilled good-paying jobs of the future.

Looking Forward: Ensuring Continued American Leadership in AI

The United States has built a remarkable lead in artificial intelligence through our unique combination of innovative and entrepreneurial private companies, world-class research institutions, a talented workforce, and a policy environment that fosters dynamic growth. This advantage is especially pronounced in AI infrastructure, where companies like CoreWeave have established global technological leadership in this critical layer of the AI stack.

However, the conditions that have enabled this position must be actively maintained while being flexible in order to adjust to new technological developments and political considerations. Countries around the world rightfully recognize the strategic importance of AI and are making coordinated efforts to build AI infrastructure. The decisions we make now will help determine whether America can maintain AI leadership in the years to come.

The current moment demands a thoughtful, transparent, and predictable approach that maintains our competitive edge, and seizes future opportunities while addressing legitimate concerns. As we consider policy options to address this dynamic sector, we should be attentive to how different approaches affect the entire AI ecosystem, from established players to new entrants, from model developers to infrastructure providers like CoreWeave.

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[13] Governor Phil Murphy, "Governor Murphy, Princeton University, Microsoft & CoreWeave Cut Ribbon on Major Artificial Intelligence Hub," March 27, 2025, *https://www.nj.gov/governor/news/news/562025/approved/20250327a.shtml.*

[14] The White House, "*AI Talent Report,*" January 14, 2025

In order to further America's lead in AI, we encourage the Federal Government to consider policies that:

- Foster a predictable investment environment through the implementation of nationally consistent regulatory frameworks for areas most critical to strengthen competitiveness and drive innovation.
- Ensure that there are adequate, reliable supplies of power at the lowest possible cost through policies which enhance the ability to add generation and transmission to power next-generation AI infrastructure. Careful reforms of existing permitting and regulatory processes that enable affected parties to participate in the process are needed for this to occur.
- Maintain global competitiveness and strengthen U.S. industry through strategically calibrated export policies that protect national security while supporting the diffusion of the American AI stack.
- Strengthen public-private partnerships, like the New Jersey AI Hub, that accelerate innovation across research, industry, and government.

CoreWeave appreciates the Committee's leadership on these critical issues and we look forward to working with the Committee as it develops policies enabling the U.S. to maintain its leadership in the AI race.

The CHAIRMAN. Thank you.
Mr. Smith.

STATEMENT OF BRAD SMITH, VICE CHAIR AND PRESIDENT, MICROSOFT CORPORATION

Mr. SMITH. Chairman Cruz, Ranking Member Cantwell, members of the Committee, thank you for the opportunity to be here today. Let me just build on what my three colleagues have said and offer a few thoughts.

The first is I just wanted to refer to the chart on this easel that shows the AI tech stack that was also in my written testimony. It makes a simple but, I think, important point—we are all in this together.

If the United States is going to succeed in leading the world in AI it requires infrastructure. It requires success at the platform level. It requires people who create applications.

Interestingly, we at Microsoft get to work with all three of these leaders and their companies. Our success, each of our success, depends on each other's success, and what is true of the four of us is true when you look across the country and around the world at open source developers, people who are building power plants, electricians and pipe fitters who are going to work every single day.

So what do we need from the Congress and the country in order to succeed? I think it is three things. I described them in my written testimony.

First, as Chairman Cruz said, we need innovation. Innovation will go faster with, as Sam said, more infrastructure, faster permitting, more electricians.

We need more innovation fueled, as Ranking Member Cantwell said, by support from our universities and the Federal agencies that support basic research across the country, one of this country's crown jewels.

We also need, as Chairman Cruz said, faster adoption, what people refer to as AI diffusion—the ability to put AI to work across every part of the American economy to boost productivity, to boost economic growth, to enable people to innovate in their work, and

the number-one ingredient for that history shows time and time again is skilling, investing in education.

And, finally, we need to export. If America is going to lead the world we need to connect with the world. We need to remember—I believe always—that as a country only 4 and a half percent of the world's people live in the United States of America.

Our global leadership relies on our ability to serve the world with the right approach to export controls and always, especially in technology, in our ability to sustain the trust of the rest of the world.

Ultimately, I think people who take the time—if they take the time to watch or read about this hearing may wonder what is this all about—what are we at this table trying to do? What do these two letters, AI, really mean to them?

Are we who are working in this industry trying to build machines that are better than people or are we trying to build machines that will help people become better?

Emphatically, it is and needs to be the latter. Are we trying to build machines that will outperform people in all the jobs that they do today or are we trying to build machines that will help people pursue better jobs and even more interesting careers in the future?

Indisputably, it needs to be the second, not the first, and I believe that is what we are and can do together.

As somebody who has now spent almost 32 years in this industry there are two things that always strike me. The first probably will not surprise you.

Never underestimate what technology can do, how quickly it can move, what it can accomplish. But the second is one that I think is too seldom discussed even though every day it stares us in the face.

Never estimate what people can do. Never underestimate human ambition. Never underestimate what a person can do if given a better technology tool and the ability to learn how to put it to use.

That is the story of this industry. It is the story of the country. It is, as you heard, the story of Sam Altman. Not everybody becomes a Sam Altman or a Satya Nadella or a Bill Gates but everybody deserves the opportunity to try.

Tonight across America, whether it is the attic of a house or the basement or just an everyday bedroom there are kids with computers, with phones, with access to the Internet and now the ability to put AI to work.

Let us invest in their education. Let us invest in the skills that the American public needs. Let us then invest in creating the future that the American public deserves.

Thank you.

[The prepared statement of Mr. Smith follows:]

PREPARED STATEMENT OF BRAD SMITH, VICE CHAIR AND PRESIDENT, MICROSOFT CORPORATION

Chairman Cruz, Ranking Member Cantwell, and Members of the Committee,

Thank you for the opportunity to testify on the critical issue of artificial intelligence. I am Brad Smith, the Vice Chair and President of Microsoft Corporation.

AI has the potential to become the most useful tool for people ever invented. Like the general purpose technologies that preceded it, such as electricity, machine tools, and digital computing, AI will impact every part of our economy. It will shape not

just how we work and live, but how we compete, prosper, and stay secure as a nation between now and the middle of this century.

The notice for this hearing aptly refers to an "AI race." I would like to talk today about what is needed to win this race.

The AI race involves both technology and economics. It requires both innovation and diffusion. It is both a sprint and a marathon. The country can win a lap but lose the race if it fails to bring together all the ingredients needed for success.

It is a race that no company or country can win by itself.

To win the AI race, the United States will need to support the private sector at every layer of the AI tech stack. The nation will need to partner with American allies and friends around the world.

In my testimony today, I will focus on three strategic priorities where this Congress and the Federal government will make a difference.

First, the country must win the AI innovation race. This will require massive datacenters and AI infrastructure that need Federal support to expand and modernize the electrical grid on which they depend. The country must recruit and train skilled labor like electricians and pipefitters that are in short supply. We all must summon the best of our researchers at national labs and universities, supported by Federal basic research programs and partnerships that have become the envy of the world. We will need to continue to excel in moving innovative ideas from academic labs into companies and new products. And we will need to support AI developers with open and broad access to public data.

Second, the Nation must win the AI diffusion race. This will require that we promote broad AI adoption that will enable productivity growth across every sector of the economy. More than anything, this requires new initiatives to promote the AI skilling of the American workforce. This will involve basic AI fluency in our schools and new AI training programs in our community colleges. It will also include advanced AI education that will represent the next generation of computer science degrees, organizational skills that will be mastered in the country's business schools, and new courses in the nation's law schools. When combined, these will enable companies, non-profits, and government agencies alike to put AI to effective use. Governments at the federal, state, and local levels can then help accelerate this diffusion by adopting AI services to improve the effectiveness and efficiency of the services they provide to the public.

Third, the United States must export AI to American allies and friends. No company or country is so powerful that it can master the future of AI without friends. The United States and China are competing not only to innovate but to spread their respective technologies to other countries. This part of the race likely will be won by the fastest first mover. The United States needs a smart export control strategy that protects our national security while assuring other countries that they will have reliable and sustained access to critical American AI components and services. Perhaps as much as anything, this requires that we collectively sustain international trust in our products, our companies, and the country itself.

AI as a General Purpose Technology

Economists sometimes put technologies into two categories, general purpose technologies and single-purpose tools. Most things in the world are single-purpose tools, like a smoke detector or a lawn mower. They do one thing very well. But over the course of history, certain so-called general purpose technologies impact and sometimes even redefine almost every sector of the economy. Electricity is the prototypical example, because when you think about it, electricity changed the way every economic sector works.

The key to mastering the future of AI starts in part by understanding the role technology has played in the past. The past three centuries have brought the world three industrial revolutions, each driven by these general purpose technologies. First, it was iron working in the United Kingdom, starting in the 1700s. And then it was electricity and machine tools in the 1800s, when the United States overtook the United Kingdom by putting these technologies to work more broadly than any other country. And then there was the third industrial revolution during the last 50 years, driven by computer chips and software.

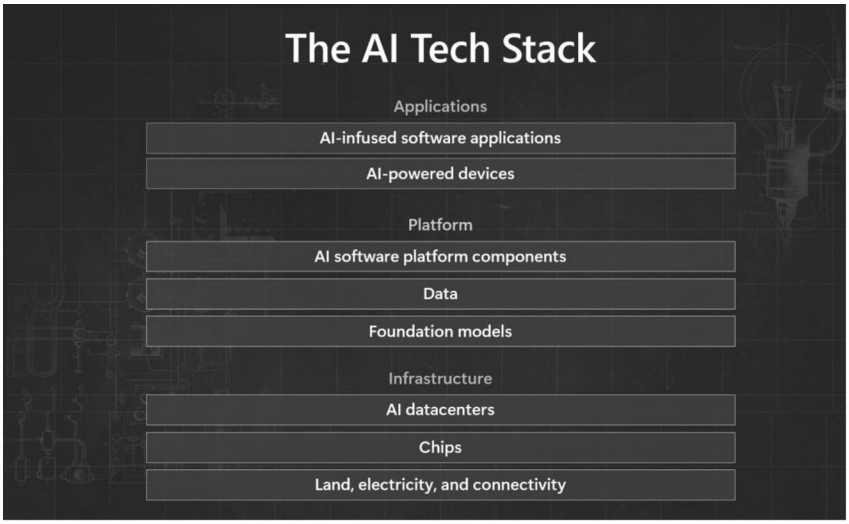
Without question, being a global leader in advancing a general purpose technology gives a country a major edge. But one lesson of history is that the countries that benefit the most and advance the fastest are not necessarily the countries where the technology is invented. Rather, it's where the technology is diffused—or adopted—the most quickly and broadly. This is for good reason. If a technology improves productivity and changes every part of an economy, then the country that uses it the most broadly and quickly will benefit the most.

This both frames and defines the AI opportunity and challenge for the United States. As a nation, we need to focus both on advancing innovation and driving diffusion, both domestically and as a leading American export.

THE AI TECH STACK

The key to driving both innovation and diffusion is to recognize that AI, like all general purpose technologies, is built on what we in the industry call a tech stack—a stack of technologies that are used together. This is true for every great general purpose technology. You can see this, for example, if we go back in time and think about electricity. Thomas Edison first succeeded in 1878 in using electricity to light a lightbulb. But the illumination of lights across a city quickly required the construction of power plants, the fuel to run them, the creation of an electrical grid, the standardization of circuits, and a wide range of electrical appliances beyond the lightbulb itself. In short, a tech stack for electricity.

Artificial intelligence similarly is built on an AI tech stack. Fundamentally, it is divided into three layers, infrastructure, the platform layer, and applications. You can see this illustrated below.



The infrastructure layer is massive. Microsoft is spending more than $80 billion this Fiscal Year on the capital investment needed for this layer, with more than half this amount being spent in the United States. This goes to buying land, investing in electricity and broadband connectivity, procuring chips like GPUs, and installing liquid cooling. These lead to the construction of datacenters—or often datacenter campuses with many buildings with potentially hundreds of thousands of computers. This infrastructure supports both the training of new AI models and their deployment, so they can be used for AI-based services around the world.

On top of this infrastructure, there is the platform layer. The heart of this layer consists of AI foundation models, including frontier models created by companies like OpenAI, as well as open source and other models from a wide variety of other firms—including Anthropic, Google, Mistral, DeepSeek, and Microsoft itself. The platform layer relies on data to train and ground models. And it includes a new generation of software-based AI platform services that are used to help build AI applications.

Ultimately, both the infrastructure and platform layers support the applications layer. These are devices and software applications that use AI to deliver better services to people. ChatGPT and Microsoft's Copilot are both examples of AI applications. One of the amazing things about the applications layer is it's not just companies—large or small or established or startup—that are creating AI applications. It's everybody. It's researchers using new AI-infused applications to change drug discovery. It's non-profits changing the way they deliver services. It's teachers using AI as a tool to improve the way they prepare material for a classroom. It's governments making everything from the filing of a tax return to the renewal of a driver's license easier and more efficient.

To build a new AI economy, it's critical to get all three of these layers working and to get a flywheel turning across the ecosystem. It's essential to build the infrastructure layer so people can develop and deploy the models at the platform layer. It's essential to use the AI models so that people will build the applications on top of them. And it's essential for customers to adopt the applications, so the market can grow, and drive increased investment to expand the infrastructure further. The process repeats itself. This is how a new economy is born.

Success Requires an Entire Ecosystem

The flywheel effect makes clear that success requires not only national progress at one layer of the tech stack, but at every layer. That is what the private sector currently is pursuing in the United States better than in any other country. And it's what this Congress and the Executive Branch can help support with a strategy that promotes both AI innovation and diffusion up and down this stack.

National AI leadership requires not only success by a few companies, but by many. Today's panel, involving leading firms such as OpenAI, AMD, CoreWeave, and Microsoft, reflects important slices of the new AI economy. The AI economy requires a multifaceted and integrated ecosystem that includes "Big Tech" and "Little Tech," startups and more established firms, open source and proprietary developers, suppliers and customers, firms that create data and firms that consume it, all working together. Governments as both regulators and leading AI adopters have critical roles to play.

Commentators sometimes focus on the tensions between different participants in this tech ecosystem. These deserve attention. What's often overlooked is that the different participants also depend on each other. And this means that the different contributors to the AI ecosystem all need to be healthy.

A large technology company like Microsoft has a unique opportunity—and responsibility—to partner with and support the participants at every level of the tech stack. We strive to advance not just innovation but an economic architecture, business models, and responsible practices that will help grow the AI market on a long-term basis. Not just for the United States, but the country's friends and allies.

Winning the Innovation Race

Although the AI economy is being built mostly by the private sector, government policies and initiatives need to play a critical role. This starts with work needed to help fuel innovation. A few areas deserve particular attention in this hearing.

Power the growth of datacenters

Just as you can't have reliable electricity in your home without a powerplant, you can't have AI without datacenters and AI infrastructure. And these datacenters require a vast supply chain to construct and large amounts of electricity to operate.

America's advanced economy relies on 50-year-old infrastructure that cannot meet the increasing electricity demands driven by AI, reshoring of manufacturing, and increased electrification. The United States will need to invest in more transmission and energy resources, onshore our supply chains, and modernize our electric grid to support forecasted increases in electrical loads. Microsoft is investing in these areas itself.

We urge the Federal government to streamline the Federal permitting process to accelerate growth in all these areas. The current Federal permitting processes often involve multiple agencies and complex, unpredictable, multi-year reviews. This hinders progress. The Federal government should take immediate steps to establish reliable, reasonable, and transparent timelines for permitting decisions. This can also be done by standardizing Federal permitting processes and designating a lead agency to shepherd the permits through the process. Further, the permitting agencies should utilize AI and digital tools to improve timelines and transparency for applicants and ensure the permitting agencies have quick access to information to assist them in their review and decision-making process.

We were pleased to see President Trump's recent Executive Order, "Updating Permitting Technology for the 21st Century," directing agencies to make maximum use of technology in the environmental review and permitting process. The Congress should also look to the Federal-State Modern Grid Deployment Initiative as a proven program that can be leveraged to deliver results.

This is just the start of what is needed to modernize and expand America's energy grid. We need to recognize that new investments in the grid are just as important today as they were a century ago, when the United States led the world in private and public sector support for electricity.

Grow the AI Infrastructure workforce

Perhaps the single biggest challenge for data center expansion in the United States is a national shortage of people—including skilled electricians and pipefitters. Electricians, for example, are essential to datacenter construction, installing a complex system of electrical panels, transformers and backup power systems. We have hired thousands of electricians across the country, including in Arizona, Georgia, Virginia, Washington, and Wisconsin. But the United States doesn't have enough electricians to fill the growing demand. We estimate that over the next decade, the United States will need to recruit and train half a million new electricians to meet the country's growing electricity needs. We need a national strategy to ensure we meet this opportunity for American workers.

These are good jobs that will provide great long-term careers for people across the country. We recommend making existing Federal education and training funds, as well as tax incentives, available to scale up these opportunities. These could include targeting current Federal apprenticeship investments in regions that have identified major AI infrastructure initiatives and supporting existing training centers to quickly increase the number of registered apprenticeships focused on electricians.

We commend President Trump's recent Executive Order, "Preparing Americans for High-Paying Skilled Trade Jobs of the Future," for highlighting the importance of skilled trades in the building of AI infrastructure and for paving the way to meet this moment. As Federal agencies work to implement the order, it will be critical that industry forecasters and union training centers work together to maximize impact.

Ultimately, we need new steps at every level of government and in communities across the country. For example, we need to do more as a nation to revitalize the industrial arts and shop classes in American high schools. This should be a priority for local school boards and state governments. Similarly, the nation's community colleges will need to do more to support a national initiative to help train a new generation of skilled labor, including electricians and pipefitters.

Invest in AI research and development

To uphold America's position as a global scientific leader, it is imperative to enhance Federal investment in fundamental scientific research. The United States boasts a storied history of employing public-private partnerships. The decisions made decades ago to publicly fund research infrastructure and provide financial support to talented scientists and entrepreneurs paved a pathway to American technological leadership. Through federal, state and local government initiatives, investments were made in regional economies and programs, betting on the ingenuity of the American people. Notable incubators of the 20th century—such as Bell Labs and the network of Federal national laboratories—were the result of deliberate efforts to unite industry, government, and academia to propel scientific advancement. We must deploy a similar strategy today for AI and quantum technologies. Investments in these areas are critical to advancing the development of innovative technological solutions that address complex global challenges.

To outcompete nations like China, which have significantly boosted their research and development (R&D) investments, the United States must accelerate strategic investments in scientific research for future technologies. Experts predict China will continue to invest substantial resources in next-generation technologies such as AI, advanced manufacturing, clean energy, quantum computing, and semiconductors over the next decade.

Since the Second World War, America's technological innovation has been driven by R&D based on two critical ingredients that the rest of the world has both studied and envied. The first is sustained support for basic research. While a few tech companies invest substantial sums in basic research, as we do through Microsoft Research (MSR), most world-leading basic research is pursued by academics at American universities, often based on funding from the National Science Foundation and other Federal agencies. Driven by curiosity rather than a profit motive, this research often leads to unexpected but profound discoveries that are published publicly.

The second ingredient is a sustained commitment to investments in product development by companies of all sizes. The United States, more than any other country, has mastered the process of moving new ideas quickly from universities to the private sector. This success rests on healthy investments in both R and D, recognizing that basic research is often publicly funded and typically in universities, while product development is robustly and privately funded through companies. It's the combination of the two that makes American R&D so successful.

In 2019, President Trump approved an executive order designed to strengthen America's lead in artificial intelligence. It rightly focused on Federal investments in

AI research and making Federal data and computing resources more accessible. Six years later, the President and Congress should expand on these efforts to support advancing America's AI leadership. More funding for basic research at the National Science Foundation and through our universities is one good place to start.

Ensure public data is open and accessible

Data is the fuel that powers artificial intelligence. The quality, quantity, and accessibility of data directly determines the strength and sophistication of AI models. While the Internet has been a major source of training data, the Federal government remains one of the largest untapped sources of high-quality and high-volume data. Yet today, many of these datasets are either inaccessible or not usable for AI development.

By making government data readily available for AI training, the United States can significantly accelerate the advancement of AI capabilities, driving innovation and discovery. Opening access to these datasets would allow for the analysis of themes, patterns, and insights across broad datasets, propelling the country to the forefront of global AI development.

Importantly, accessible public data levels the playing field. It empowers not only large companies but startups, academic institutions, and nonprofits to train and refine AI models. This fosters a more competitive and inclusive AI ecosystem, where innovation is driven by ideas and ingenuity—not just proprietary data.

In comparison, countries like China and the United Kingdom are already investing heavily in their data resources, recognizing the economic and strategic value of national-scale data management. China's comprehensive system to manage datasets as a strategic resource and the UK's National Data Library underscore a growing global trend of treating data as a common good for economic competitiveness.

WINNING THE AI DIFFUSION RACE

History teaches us that the true impact of a general purpose technology is not measured solely by the caliber of its leading inventions, but by how quickly, widely, and effectively these are adopted across society. But the reality is that technology diffusion takes time, investment, partnerships, and sound public policy.

The history of electricity offers an important insight for AI. Once Thomas Edison proved in 1878 that electricity could power a lightbulb, why would anyone choose to sit at night in a room illuminated by a candle or kerosene? Yet tonight, almost 150 years later, more than 700 million people on the planet still live without electricity in their homes. Diffusion requires not only great technology, but sound economics.

The economics of tech diffusion start with skilling. Countries need to invest in the skills needed to use new technology, both as individuals and across organizations. It is easy to underestimate both the role that skilling plays and the need for public policy to support it. But in each industrial revolution, the country that best harnessed the leading general purpose technology of its time was the Nation that skilled its population the most quickly and broadly.

Skill the American workforce

In the new AI economy, Americans of all backgrounds will need critical AI skills to compete. To meet the totality of the skilling challenge, the country must pursue a new national goal to make AI skilling accessible and useful for every American. This will require a very broad range of partnerships and new policy ideas, spanning across geographic, organizational, economic, and political divides.

President Trump's recent executive orders focused on AI education and the workforce provide critical steps towards a national skilling strategy for AI. The "Advancing Artificial Intelligence Education for American Youth" EO establishes a clear policy to promote AI literacy by responsibly integrating AI into education for teachers and students. By fostering this early exposure, the Nation's youth will be better positioned for AI-enabled work. Congress can also consider leveraging existing Federal funding to the Nation's school districts to encourage AI learning and literacy in K–12 education.

Businesses and non-profits have important roles to play. At Microsoft, we are seeking to do our part to meet this skilling challenge. In 2025 alone, we are on a path to train 2.5 million Americans in basic AI skills. We're partnering with the National Future Farmers of America (FFA) to train educators in every state to integrate AI into the agricultural classroom through our Farm Beats for Students program. We are partnering with the American Federation of Teachers (AFT), the largest organization representing the Nation's educators in America, to deliver a co-developed training program to 10,000 AFT members. And we're partnering with the

State of New Jersey, Princeton University, and CoreWeave on an AI Hub in New Jersey that will include support for AI education in local community colleges.

When it comes to AI skilling, the most important thing we need to do is recognize that this is a critical field that is ripe for attention, learning, partnership, and innovation. It will have a huge impact on broadening access to this technology across our economy and society. Generative AI is a new and young technology. So is our knowledge of the full extent of need in terms of AI skilling programs and support. This is a first-class priority that deserves as much attention and support as innovation in AI technology itself.

Encourage AI adoption

The Federal Government also will play a critical role in AI diffusion by using AI itself. There are opportunities across the government to use AI to improve the quality and efficiency of public services for citizens.

It's encouraging to see the recent OMB publication of M-Memos focused on Federal government use and procurement of AI. Both memos emphasized the importance of removing barriers to innovation, maximizing the use of domestically developed AI products, and encouraging AI leaders within the Federal government to facilitate responsible AI adoption.

We're seeing activity in the states as well. We partnered with the Texas Department of Transportation to launch a six-week pilot program aimed at boosting productivity and improving decision-making across various departments. The program saw strong results with 97 percent of participants using the AI digital assistant during the pilot, 68 percent have integrated it into their daily workflow, and participants reporting saving an average of 12 hours a week on routine tasks.

EXPORTING AMERICAN AI

The ability to export our AI is essential to sustaining our global competitiveness and ensuring that our technological progress benefits not only our nation, but also our allies and partners around the world. Building on recent AI diplomacy efforts, the United States offers a compelling and trusted value proposition in the global technology landscape.

American tech companies, including Microsoft, are making unprecedented investments in AI infrastructure around the world. Microsoft alone is building AI infrastructure in more than forty countries, including regions where China has focused its investments. We urgently need a national policy that provides the right balance of export controls and trade support for these investments.

While the U.S. government rightly has focused on protecting sensitive AI components in secure datacenters through export controls, an even more important element of AI competition will involve a race between the United States and China to spread their respective technologies to other countries. Given the nature of technology markets and their potential network effects, this race between the United States and China for international influence likely will be won by the fastest first mover. The United States needs a smart international strategy to rapidly support American AI around the world.

This fundamental lesson emerges from the past twenty years of telecommunications equipment exports. Initially, American and European companies such as Lucent, Alcatel, Ericsson, and Nokia built innovative products that defined international standards. But as Huawei invested in innovation and China's government subsidized sales of its products, especially across the developing world, adoption of these Chinese products outpaced the competition and became the backbone of numerous countries' telecommunications networks. This created the technology foundation for what later became an important issue for the Trump Administration in 2020, as it grappled with the presence of Huawei's 5G products and their implications for national and cybersecurity.

Early signs suggest the Government of China is interested in replicating its successful telecommunications strategy. China is starting to offer developing countries subsidized access to scarce chips, and it's promising to build local AI datacenters. The Chinese wisely recognize that if a country standardizes on China's AI platform, it likely will continue to rely on that platform in the future.

International partnerships will be critical. This is why Microsoft has partnered with entities like the UAE's G42 and investment funds like Blackrock and MGX, aiming to raise up to $100 billion for AI infrastructure and supply chains. American tech companies and private capital markets are forging stronger ties with key nations and sovereign investors in the Middle East, surpassing previous efforts to counter Chinese subsidies in telecommunications and reflecting our commitment to innovation and cooperation. While China's government may subsidize its technology

adoption in developing regions, it will struggle to match the scale and impact of America's private sector investments.

Pragmatic American export control policies are essential, balancing security protections with the ability to expand rapidly. Protecting national security by preventing adversaries from acquiring advanced AI technology is crucial. Rules should include qualitative standards for secure datacenter deployments to prevent chip diversion to China and ensure advanced AI services are safeguarded. We support this type of approach.

However, we have expressed our concerns about the quantitative caps imposed on GPU shipments by the interim final AI Diffusion Rule issued in January. These place key American allies and partners in a Tier Two category, imposing limits on AI datacenter expansion. This includes countries like Switzerland, Poland, Greece, Singapore, India, Indonesia, Israel, the UAE, and Saudi Arabia. Customers in these countries now fear restricted access to American AI technology—potentially benefitting China's AI sector by turning to alternatives.

The Trump administration has an opportunity to revise the rule, eliminating quantitative caps and retaining qualitative standards. This approach ensures American allies and partners remain confident in accessing American AI products.

Ultimately, we need to recognize that countries around the world will use American AI only if they can trust it. This creates responsibilities for American companies to develop and deploy AI infrastructure and products in a responsible manner that meets local needs. And it requires that countries have confidence in sustained and uninterrupted access to critical AI components and services. The United States has long built a reputation for trustworthy technology that China has been unable to match. But this reputation, like everything that truly matters, requires constant attention and care.

STATEMENT OF HON. TIM SHEEHY, U.S. SENATOR FROM MONTANA

Senator SHEEHY [presiding]. Thank you, witnesses, for your testimony and I will start off with the first round of questions and move down dais to our Ranking Member here.

Thank you for your testimony. It certainly makes me sleep better at night worried about Terminator and Skynet coming after us, knowing that you guys are behind the wheel.

But in five words or less, starting with you, Mr. Smith, what are the first—what are the five words you need to see from our government to make sure we win this AI race?

Mr. SMITH. More electricians. That is two words.

[Laughter.]

Mr. SMITH. Broader AI education.

Senator SHEEHY. And no using ChatGPT as a phone a friend.

Mr. INTRATOR. Thank you. I would say that we need to focus on streamlining the ability to build large things.

Ms. SU. Policies to help us run faster in the innovation race.

Mr. ALTMAN. Allow supply chain. Sensible policy.

Senator SHEEHY. That was good. So what I hear there is something pretty similar to the races we have won before—nuclear energy, for example.

You know, the Germans and Austrians really led the innovation around that but we won the race because we put a massive government effort, collaborating with our universities and others to win that race.

Space—you know, the Soviets put the first satellite up, put the first man in space, but we won the space race because we adopted a framework to ensure that we won. Aviation, automobiles, et cetera.

So what I hear from you is you do need support from our government but you also need the government to stay out of your way so you can innovate and win this race.

How do we incentivize companies to do business here in America to make sure we win this race in America and America leads not just China but other nonstate actors, too?

I mean, I think that the scariest thing about AI from a capability standpoint is it does not have to be a state actor to win this race. It is not like nuclear energy. It is not like space technology. A nonstate actor could just as easily win this race and wield more power than anyone else.

So how do we encourage innovators' investment to happen here in America to ensure we win this race?

Mr. Altman, do you want to start?

Mr. ALTMAN. We were honored to announce back in January, Project Stargate, a $500 billion investment in United States infrastructure. That is now well underway, as I mentioned, getting to see it yesterday in Abilene. The first site was incredible.

We need a lot more of that. We need certainty on the ability to build out this entire supply chain, build the data centers, permit the electricity. We would love to bring chip production here, network production here, server rack production here.

And I think the world does want to invest. We have a lot of global investment flowing into the U.S. to do this. We also want to make sure that other countries are able to build with our technology, use our models, and sort of, like, be in our orbit and, you know, use U.S. diffusion of technology here.

So that is really important. We need to make sure that the highest skilled researchers that want to come work at U.S. companies can come here and do that. We need to make sure that companies like OpenAI and others have legal clarity on how we are going to operate.

Of course, there will be rules. Of course, there need to be some guardrails. This is a very impactful technology. But we need to be able to be competitive globally. We need to be able to train.

We need to be able to understand how we are going to offer services and sort of where the rules of the road are going to be, so clarity there. And I think an approach like the internet, which did lead to flourishing of this country in a very big way, we need that again.

Senator SHEEHY. Dr. Su.

Ms. SU. I would add I think computing is a foundation to all of this. We want to have more compute built in the U.S. by U.S. companies and ensure that we have a great environment for that. We want to ensure that our technology around the world is also used broadly and in the right ways.

So I think the conversation about export controls and rules should just be simple, easy to follow, easy to enforce, and enable U.S. AI platforms to be the foundation.

And then, certainly, the comments around bringing manufacturing back home and ensuring that we have the right talent base are all extremely important elements of that.

Senator SHEEHY. Are companies weighing doing business in AI in America versus China? Are the companies making that side by side comparison?

Ms. SU. I think if you look across the world there are countries and companies that will ask those questions. You know, if it is hard to obtain U.S. technology—although U.S. technology is the best, if it is hard to obtain then there is a hunger for AI and they will choose what is available and if China is available that will certainly be a outcome that we would not like to see.

Senator SHEEHY. Well, I think I hear the words infrastructure, electricians, universities, regulatory framework, and I think those are things we can help with.

I hear words like innovation and talent and I say—I hear Dr. Su, run faster. Those are not things—the government cannot manufacture talent. We cannot make you run faster.

But we can give you the tools to do that and I think it is time that we create a framework so that you have the tools you need to win this race because you are going to be the ones that win it, not us.

Thank you for your testimony.

Ranking Member Cantwell.

Senator CANTWELL. Thank you, Mr. Chairman. I would like to continue that same theme generally about competitiveness. Do we need NIST to set standards?

If you could just yes or no and just go down the line.

Mr. ALTMAN. I do not think we need it. It can be helpful.

Ms. SU. Yes.

Mr. INTRATOR. Yes.

Mr. SMITH. Yes.

Senator CANTWELL. OK. So in the context of what we are talking about here, we are really just talking—I do not know, Mr. Smith or Mr. Intrator or Dr. Su, any.

The issue here is if we want to move fast we want to create just like with electricity the standards by which we want to move fast.

Here, I would just call it code for code is what we want, right? We want NIST to do something in the standard setting that will allow us to move much faster. Is that right?

Either Mr. Smith or Mr. Intrator.

Mr. SMITH. What I would say is this.

First of all, NIST is where standards go to be adopted but it is not necessarily where they first go to be created. So we have got what——

Senator CANTWELL. Right. Thank you for that clarity. We are talking about a industry IEEE, you know, lots of different organizations, industry input, and then they are adopted.

So yes, let us clarify that. Let us clarify that.

Mr. SMITH. Yes. I think that is the way it works.

Senator CANTWELL. Yes. But you think we need to do that, particularly if the United States wants to lead?

Mr. SMITH. We will need industry standards. We will need American adoption of standards. And you are right, we will need U.S. efforts to really ensure that the world buys into these standards.

Senator CANTWELL. OK. Mr. Intrator.

Mr. INTRATOR. I think it is important that when you are working with standards what that allows for is a common vocabulary which allows for acceleration.

And so to the extent that we can step into that role and establish touch points where everyone can agree on specific things that will lead to an acceleration both domestically and abroad.

Senator CANTWELL. And I do not know if, you know, drilling down more on what you think those are but in general, you know, when I think about the Internet and HTTP or HTML or any of the—TCPIP—we are talking about things that allowed us to move faster and getting those standards established helped us do that.

On the export issue, Mr. Intrator, the issue of cloud sources should not be left out. If we say let us go with Malaysia, Malaysia is going to tell us that they can certify that there is no, you know, diversion of these ships to—you know, to China and we basically have a way that we can make sure that this is understood and monitored then we also want access, right? We want access by U.S. companies.

Mr. INTRATOR. Yes. I think Lisa's point was excellent, right? At the end of the day, the world wants to be able to build and deploy artificial intelligence in a very broad way and if we—you know, nature abhors a vacuum.

If we do not step into that role other technology will step in that role. If it is suboptimal so be it. It is better to have something that is suboptimal than have nothing and so that is what——

Senator CANTWELL. Well, we do not want a reoccurrence of a Huawei that develops faster and then has a government back door and then we all have to raise opposition. I am for a tech NATO.

I am for the five most sophisticated democracies and tech nations setting the rules of the road and saying, this is who you should buy from. Do not buy from anybody else who has a government back door. Not a good idea.

So that is how we get leverage. You know, I am not so hot on the President's tariff agenda for this very reason because we are not building the alliances.

We are creating the enemies, and what I want to do is get the supply chain here, get the semiconductor flow here, lower the cost, and go as fast as we can.

Mr. INTRATOR. Yes, I agree with that. I do not think that that is—I do not think anybody is not going to agree with that, right? I think that is an excellent objective.

I just think that what will happen beyond the five NATO companies is that there will be a demand for artificial intelligence and they will proceed with what they can proceed with.

Senator CANTWELL. Dr. Su, what is your view of this about how we win, how we protect our objectives, but we are more aggressive on the export strategy?

Ms. SU. Well, I think there is a clear recognition that we need an export strategy and so having—you know, having this conversation is very important, and from our perspective the idea is to ensure that our allies—and, frankly, I use allies in the very broadest sense—get access to the great American technology that we have with the appropriate controls in place, and I think you can do both.

To your earlier comment, Ranking Member Cantwell, about the need to have U.S. technologies in those countries I think those countries are actually very interested in doing that because we do

have the best technology today, and using that to really build this broad AI ecosystem is really our opportunity.

Senator CANTWELL. I agree. Thank you so much.

Senator SHEEHY. The senior senator from Ohio.

STATEMENT OF HON. BERNIE MORENO,
U.S. SENATOR FROM OHIO

Senator MORENO. Thank you, Chairman Sheehy. Make sure Senator Cruz heard that one.

So, first of all, thank you for being here and taking the time. If I could just real quickly just confirm that I have heard what you said pretty unanimously, which is we need dramatically more power generation in this country. Is that correct?

All right. So, Dr. Su, you just recently did a partnership with TSMC to manufacture your chips here in America. Thank you. I think it is a little bit long overdue. I wish you had—we had done more of that earlier.

Are those semiconductor fabs high energy users?

Ms. SU. Thank you, Senator.

We are very pleased with our efforts together with the government on bringing more manufacturing back to the United States.

To your question, certainly, semiconductor manufacturing plants are high energy users and we do need more power for both manufacturing as well as for data centers, as you mentioned.

Senator MORENO. And without chips this just does not work. Like, if we do not have the highest performance chips made here in the United States this is not going to happen here, correct?

Ms. SU. We absolutely need the highest performing chips and we also need the entire ecosystem for chip manufacturing. So wafers are one piece but there are many other pieces as well.

Senator MORENO. And are those chips powered by solar power and windmills?

Ms. SU. Today they are not but I think there are opportunities to certainly do that.

Senator MORENO. So do you think it is outrageous that last year because of the policies of the Biden administration that 90 percent of new power generation in this country was windmills and solar panels and we absolutely kneecapped American energy?

We have a thousand years of natural gas sitting in Pennsylvania, Ohio, and West Virginia, and yet 90 percent of power generation in this country last year was solar panels and windmills. Does that make this country more competitive or less competitive?

Anybody can jump into that one that wants to answer that.

Mr. SMITH. Let me say two things. One, you are right, we need more electricity. I think our industry, it is worth remembering, is only going to account for 15 percent of the total additional electricity the country is going to need.

We are going to need electricity from a variety of sources. Today in the United States 56 percent of our electricity comes from carbon. Forty-four percent comes from carbon-free energy, meaning nuclear wind, or solar. We need a broad based approach and we need a diversity of sources.

Senator MORENO. And, again, 90 percent was energy that is not affordable, it is not abundant, and it is not reliable.

Let me just shift gears. Mr. Altman, thank you for, first of all, creating your platform in an open basis and agreeing to stick to the principles of nonprofit status. I think that is very important.

Do you think that the Internet age did a good job between the beginning of the 1990s through the 2000s of protecting children?

Mr. ALTMAN. I would say not particularly.

Senator MORENO. Yes. And you are a new father, correct?

Mr. ALTMAN. Yes.

Senator MORENO. Congratulations.

Mr. ALTMAN. Thank you very much.

Senator MORENO. He is doing well?

Mr. ALTMAN. He is. It is the most amazing thing ever.

Senator MORENO. Yes. I do not think you want your best—your child's best friend to be an AI bot.

Mr. ALTMAN. I do not.

Senator MORENO. So what can we do? How can we work together to protect children?

Mr. ALTMAN. We have talked a lot about some of the things we are doing here. We are trying to learn the lessons of the previous generation and, you know, that is kind of the way it goes. People make mistakes and you do it better next time.

One thing we say a lot internally is we want to treat our adult users like adults. We want to give them a lot of flexibility.

We want to let them use the service with a lot of freedom, and for children there needs to be a much higher level of protection, which means the service will not do things that they might want.

Now, we are still early so sometimes people say, oh, you are being too strict on the rules and it is just we cannot perfectly, like, tell this.

But if we could draw a line and if we knew for sure when a user was a child or an adult we would allow adults to be much more permissive and we would have tighter rules for children.

Senator MORENO. So I think what I would ask is if you could have your team commit to having your teams work with our teams to make certain that we put together the right framework early on I think is the best way we can move forward, because we do not want to overregulate but we cannot repeat the mistakes of the Internet and social media era where children got harmed.

Mr. ALTMAN. We would be delighted to work with you all. I think it is super important.

Senator MORENO. Thank you.

Mr. ALTMAN. Can I say one more thing about what you said?

Senator MORENO. Of course.

Mr. ALTMAN. This idea of AI and social relationships I think this is a new thing that we need to pay a lot of attention to.

People are relying on AI more and more for life advice, sort of, emotional support, that kind of thing. It is a newer thing in recent months, but I—and I do not think it is all bad, but I think we have to, like, understand it and watch it very carefully.

Senator MORENO. Thank you, and thank you for that commitment. It is very appreciated. I have talked to your team already. Good people.

Mr. ALTMAN. Great.

Senator MORENO. Mr. Intrator, real quickly, can you talk about the intersection between the importance of a robust stablecoin ecosystem here in America and how that has a future with payments and how AI will factor into that? Because I do not think people see how this fits into the broader puzzle.

Mr. INTRATOR. So thank you for the question.

And we did start out as a crypto-based company hobby that kind of got away from us a little bit.

Look, I think that stablecoins, crypto, AI, they share certain DNA in common which is that they are attempts to build into a future where new technology will make things better for society and there is a huge potential for us to use stablecoins, crypto, and AI in a combination for better outcomes.

Senator MORENO. All right. Thank you.

And that was the quickest coup since 1959.

[Laughter.]

The CHAIRMAN [presiding]. Senator Klobuchar.

STATEMENT OF HON. AMY KLOBUCHAR,
U.S. SENATOR FROM MINNESOTA

Senator KLOBUCHAR. Thank you very much, Senator Cruz.

A lot of exciting things with AI, especially from a state like mine that is home to the Mayo Clinic with the potential to unleash scientific research while we have mapped the human genome and we have rare diseases that can be solved.

So there is a lot of positive but we all know, as you have all expressed, there are challenges that we need to get at with permitting reform. I am a big believer in that. energy development.

Thank you, Mr. Smith, for mentioning this with wind and solar and the potential for more fusion and nuclear, but wind and solar the price going down dramatically in the last few years and to get there we are going to have to do a lot better.

I think David Brooks put it the best when he said, "I found it incredibly hard to write about AI because it is literally unknowable whether this technology is leading us to heaven or hell".

We want it to lead us to heaven and I think we do that by making sure we have some rules of the road in place so it does not get stymied or set backward because of scams or because of use by people who want to do us harm.

As mentioned by Senator Cantwell, Senator Thune and I have teamed up on legislation to set up basic guardrails for the riskiest nondefense applications of AI.

Mr. Altman, do you agree that a risk-based approach to regulation is the best way to place necessary guardrails for AI without stifling innovation?

Mr. ALTMAN. I do. That makes a lot of sense to me.

Senator KLOBUCHAR. OK, thanks. And did you figure that out in your attic?

Mr. ALTMAN. No, that was a more recent discovery.

Senator KLOBUCHAR. Thank you. Very good. Just want to make sure.

Our bill directs, Mr. Smith, the Commerce Department to develop ways of educating consumers on how to safely use AI sys-

tems. Do you agree that consumers need to be more educated? This was one of your answers to your five words so I assume you do.

Mr. SMITH. Yes, and I think it is incumbent upon us as companies and across the business community to contribute to that education as well.

Senator KLOBUCHAR. OK, very good.

Back to Mr. Altman. Americans rely on AI, as we know, increasingly on some high impact problems. To make them be able to trust that we need to make sure that we can trust the model output.

The *New York Times* recently reported earlier this week that AI hallucinations—a new word to me—where models generate incorrect or misleading results are getting worse. That is their words.

What standards or metrics does OpenAI use to evaluate the quality of its training data and model outputs for correctness?

Mr. ALTMAN. On the whole, AI hallucinations are getting much better. We have not solved the problem entirely yet, but we have made pretty remarkable progress over the last few years.

When we first launched ChatGPT it would hallucinate things all the time. This idea of robustness, being sure you can trust the information, we have made huge progress there. We cite sources.

The models have gotten much smarter. A lot of people use these systems all the time and we were worried that if it was not 100.0 percent accurate, which is still a challenge with these systems, it would cause a bunch of problems.

But users are smart. People understand, you know, what these systems are good at, when to use them, when not, and as that robustness increases, which it which it will continue to do, people will use it for more and more things.

But we have made—as an industry we have made pretty remarkable progress in that direction over the last couple of years.

Senator KLOBUCHAR. I know we will be watching that. Another challenge that has been—we have seen, and Senator Cruz worked and I worked on a bill together for quite a while and that is the Take It Down Act, and that is that we are increasingly seeing Internet activity where kids looking for a boyfriend or a girlfriend, maybe they put out a real picture of themselves.

It ends up being distributed at their school or they somehow they—someone tries to scam them for financial gain, or it is AI, as we have increasingly seen where it is not even someone's photos but someone puts a fake body on there and we have had about over 20 suicides in one year of young people because they felt like their life was ruined because this was—they were going to be exposed in this way.

So this bill we passed and through the Senate and the House. The First Lady supported it and it is headed to the President's desk. Could you talk about how we can build models that can better detect harmful deep fakes, Mr. Smith?

Mr. SMITH. Yes. I mean, we are doing that. OpenAI is doing that. A number of us are and I think the goal is to first identify content that is generated by AI and then often it is to identify what kind of content is harmful, and I think we have made a lot of strides in our ability to do both of those things.

There is a lot of work that is going on across the private sector and in partnership with groups like NCMEC to then collaboratively identify that kind of content so it can be taken down.

We have been doing this in some ways for 25 years since the Internet and we are going to need to do more of it.

Senator KLOBUCHAR. And on the issue—last question, Mr. Chair. Since the last one was about your bill I figured it is OK. The newspapers, and you testified before the Senate Judiciary Committee, Mr. Smith, about the bill.

Senator Kennedy and I still think that there is an issue here about negotiating content rates. We have seen some action recently in Canada and other places.

Can you talk about those evolving—the dynamics with AI developers and what is happening here to make sure that content providers and journalists get paid for their work?

Mr. SMITH. Yes, it is a complicated topic but I will just say a couple of things.

First, I think we should all want to see newspapers in some form flourish across the country including, say, rural counties that increasingly have become news deserts. Newspapers have disappeared.

Second, and it has been the issue that we discussed in the Judiciary Committee, there should be an opportunity for newspapers to get together and negotiate collectively. We have supported that. That will enable them to basically do better.

Third, every time there is new technology there is a new generation of a copyright debate. That is taking place now. Some of it will probably be decided by Congress, some by the courts.

A lot of it is also being addressed through collaborative action, and we should hope for all of these things to, I will just say, strike a balance. We want people to make a living creating content and we want AI to advance by having access to data.

Senator KLOBUCHAR. OK, thanks. I will ask other questions on the record. Thank you, Mr. Chair.

The CHAIRMAN. Thank you.

You know, Senator Klobuchar asked whether AI will lead us to heaven or hell. It reminded me of a famous observation by Yale Law Professor Grant Gilmore that in heaven there is no law and the lion will lie down with the lamb. In Hell there is nothing but law and due process is meticulously observed.

Let me ask you this, and this is to each of the four witnesses. In the race for AI who is winning, America or China? If the answer is America how close is China to us, and what do we do to make sure the answer remains America will win?

Mr. Altman, we will start with you.

Mr. ALTMAN. It is our belief that the American models, including some models from our company OpenAI and Google and others are the best models in the world.

It is very hard to say how far ahead we are but I would say not a huge amount of time, and I think to continue that leadership position and the influence that comes with that and all of the incredible benefits of the world using American technology products and services, the things that my colleagues have spoken about here, the need to win in infrastructure, sensible regulation that does not

slow us down, the sort of spirit of innovation and entrepreneurship that I think is a uniquely American thing in the world, none of this is rocket science.

We just need to keep doing the things that have worked for so long and not make a silly mistake.

The CHAIRMAN. Dr. Su.

Ms. SU. I will answer in the realm of chips. I would say America is ahead in chips today. We have the best AI accelerators in the world.

I think China, although they have restrictions, given their ability to use advanced technologies, the one thing that is very important for us all to remember is there are multiple ways to do things. You know, having the best chips is great, but even if you do not have the best chips you can get a lot done.

So I think this conversation about how far behind China is they are certainly catching up because there are many ways to do things.

I think relative to what we can do I will continue to say really ensure that our spirit of innovation is allowed to work and that is having very supportive government policies to do that, having very consistent policies and allowing us to do what we do best, which is innovate at every layer of the stack.

The CHAIRMAN. Mr. Intrator.

Mr. INTRATOR. So I will speak to it from the physical infrastructure and software stack to deliver that.

America is ahead, but it is the Achilles heel from the perspective of the ability, as I started to—better? Sorry about that.

So the ability to build very large solutions to the computing infrastructure component of this is an area that we are going to struggle with from a permitting and building large projects to be able to deliver the power to allow those building artificial intelligence to continue to move as fast as they can in the race that we are in.

The CHAIRMAN. Mr. Smith.

Mr. SMITH. I think the United States has a lead today in what is a close race and a race that will likely remain close.

The number-one factor that will define whether the United States or China wins this race is whose technology is most broadly adopted in the rest of the world.

This is a global market and it will be defined as technology markets typically are by network effects. Eighteen percent of the people of the world live in China. Four percent live in the United States. Seventy-eight percent live somewhere else.

The lesson from Huawei and 5G is whoever gets there first will be difficult to supplant. We need to export with the right kinds of controls. We need to win the trust of the rest of the world.

We need to have the financial architecture that gets not only to the countries that are industrialized but the nations, say, across Africa where typically China and Huawei have done so well.

The CHAIRMAN. So some of my colleagues have made reference to standards as something that is desirable, and I will say standards is often code word for regulations and, indeed, the EU stifling standards concerning the Internet is what killed tech in Europe.

We are seeing now state legislatures mimicking the EU such as California's S.B. 1047 which, thankfully, was overwhelmingly defeated but would have created essentially a California DMV for AI model registration.

How harmful would it be to winning the race for AI if America goes down the road of the EU and creates a heavy handed prior approval government regulatory process for AI?

Mr. ALTMAN. I think that would be disastrous. To give a more specific answer to your previous question, which I think touches on why it would be so bad, there are three key inputs to these AI systems.

There is compute, all the infrastructure we are talking about, there is algorithms that we all do research on, and there is data.

If you do not have any one of those you cannot succeed in making the best models and, as Brad said, the way for America to influence the world here is to have the technology that people most want to use and most adopt.

The world uses iPhones and Google and Microsoft products, and that is wonderful. Like, that is how we have our influence. We do not want that to stop happening. So systems that stop us on any of these areas, you know, if we have rules about what data we can train on that are not competitive with the rest of the world then things can fall apart.

If we are not able to build the infrastructure and particularly if we are not able to manufacture the chips in this country the rules can fall apart. If we cannot build the products that people want that naturally win in the market—and I think people do want to use American products.

We can make them the best. But if we are prevented from doing that people will use a better product made from somebody else that does not have the sort of—you know, that is not stymied in the same way.

So it is—I am nervous about standards being set too early. I am totally fine, you know, at the position that some of my colleagues took that standards, once the industry figures out what they should be, it is fine for them to be adopted by a government body and sort of made more official.

But I believe the industry is moving quickly toward figuring out the right protocols and standards here and we need the space to innovate and to move quickly.

The CHAIRMAN. So if each of you could briefly answer that question because my time has expired. So I want to be respectful of that.

Ms. SU. I agree with the comments that Sam put up.

Mr. SMITH. I agree, and I would just say and I think the point you are making is we have to be very careful not to have these preapproval requirements including at state levels because that would really slow innovation in the country.

Mr. INTRATOR. I think that a patchwork of regulatory overlays will cause friction in the ability to build and extend what we are doing.

The CHAIRMAN. Thank you.

Senator Curtis? Schatz?

Senator Schatz? Apologies.

STATEMENT OF HON. BRIAN SCHATZ,
U.S. SENATOR FROM HAWAII

Senator SCHATZ. No problem, Chairman.

Thank you for being here. I just want to follow up on the Chairman's question and a sort of—maybe an emerging consensus on the Committee.

OK. I do not think there is anybody even on this side of the dais that is proposing a sort of European style preapproval.

I think there are some people who would like to do nothing at all in the regulatory space but I think most people understand that some guardrails—those are the words that you use, Mr. Altman—rules and guardrails are necessary.

Are you saying that self-regulation is sufficient at the current moment?

Mr. ALTMAN. No. I think some policy is good. I think it is easy for it to go too far, and as I have learned more about how the world works I am more afraid that it could go too far and have really bad consequences.

But people want to use products that are generally safe. You know, when you get on an airplane you kind of do not think about doing the safety testing yourself.

You are, like, this is—well, maybe this is a bad time to use the airplane example but you kind of like want to just trust that you can get on an——

Senator SCHATZ. It is an excellent time to use the airplane example. But I think your point is exactly right is that, look, there is a race but we need to understand what we are racing for, right?

And it also has to do with American values. It is not just a sort of commercial race so we can edge out our near peer competitor both in the public sector and the private sector. We are trying to win a race so that American values prevail internationally.

Mr. Smith, I want to move on to another topic. It seems to me that on the consumer side that one of the most basic rights of a user on the Internet is to understand what they are looking at or listening to and whether or not it was created solely by a person, a person using an AI, or automatically generated using AI.

Do you think a labeling regime—not a prohibition on the use of AI but just the disclosure, especially as it relates to images, music, creativity—do you think a label would be helpful for consumers?

Mr. SMITH. Generally, yes, and I think that is what we in the industry have been working to create. I think you are right to make the distinction and focus especially on, say, images, video, audio files.

There is a standard called C2PA that we and a number of companies now have been advancing. It has content credentials. It enables people to know where something was created, who created it, and I think—you are right—to know whether it was created by a person, by AI, or a person with the help of, say, AI.

Senator SCHATZ. I just want to use sort of common language, not the language that all of you use or that we have all learned to use.

When you talk about the data as one of the three elements that makes a model work, data really is intellectual property. It is human innovation, human creativity, and I do think we may have a disagreement—and I agree with Senator Klobuchar about the

need to understand that these models have been trained on data but what we are really talking about is human achievement all the way up to now.

And I have a deep worry—look, I am actually an optimist in the energy space and the public service space, certainly in health innovation. There are a lot of really exciting opportunities here.

But we got to pay people for their knowledge and I am concerned that these models are going to be so successful in spitting out what appears to be knowledge that we are going to, on the back end, not pay people for all of the inputs and we will have a sort of stalling out of these models.

And you talked about a tension but I am trying to figure out what the tension really is other than you would like to pay as little as possible for these inputs.

Go ahead, Mr. Smith.

Mr. SMITH. Well, you had me until the last sentence.

Senator SCHATZ. I know.

Mr. SMITH. Look, we create intellectual property. We respect intellectual property. So we are emphatically of the view that intellectual property and the creation of it should be rewarded.

Ultimately, intellectual property laws are always about drawing the line. It is really the line that you refer to. In copyright, there is expression that is protected. If you write a book and somebody copies it then you are entitled to be paid.

But there are ideas. If someone reads your book, if someone remembers that Shakespeare wrote a story about two teenagers who fell in love——

Senator SCHATZ. Sure. Then that is fair use.

Mr. SMITH [continuing]. Then that is fair use. That is why this country and Congress created it.

Senator SCHATZ. OK. That is where the tension is.

Mr. SMITH. That is what we need to focus on.

Senator SCHATZ. With your permission, Chairman, I want to ask one final question.

The CHAIRMAN. Proceed.

Senator SCHATZ. Thank you. I am actually quite excited about the prospect that in 20 years people are going to say, remember when you had to wait on the phone to talk to Kaiser Permanente or the VA?

So I just—maybe Mr. Altman and Mr. Smith, I want you to—you know, a buddy of mine used to say, paint a picture and paint me in it.

OK. For the government actually delivering services I want you to describe what an AI agent or AI can do to kind of reduce those pain points that we accept as a fact of life in interacting with the government.

It seems to me so much of what makes us irritated with the government is the lack of sorting data that exists somewhere but we cannot get access to it.

So just very quickly, you have 15 seconds each for some cheerleading.

Mr. ALTMAN. I can imagine a future where the U.S. Government offers a AI-powered service that makes it really easy to use all government services to get great health care, to get great education.

You have this thing in your pocket and if you have any medical problem you get an answer if you need to, you know, like, appeal something on some process you are having with the government or file your taxes or whatever. You just do it instantly. You have an agent in your pocket fully integrated with the U.S. Government and life is easy.

Senator SCHATZ. Anything to add?

Mr. SMITH. Remember when you had to stand in line to renew your driver's license? Remember when you did not know how to report a pothole that needed to be repaired on your street?

Remember when you had a fender bender in a car and you had to fill out all these forms and talk to all these people to get insurance coverage?

Now you can do it all with one AI system. You can use your phone and, by the way, you can do this today in Abu Dhabi. We need to bring it to America.

Senator SCHATZ. Thank you.

Senator YOUNG [presiding]. Senator Budd.

STATEMENT OF HON. TED BUDD,
U.S. SENATOR FROM NORTH CAROLINA

Senator BUDD. Thank you, Chairman.

Again, thank you all for being here. I have enjoyed various conversations with each of you.

The ability for the U.S. to deploy new energy generation capacity and upgrade its grid it is in many ways the key to the race against China.

Energy is how we can win and it is also how we can lose. Permitting in this country takes too long. China's command and control system means that they will not fail to deploy the energy needed to achieve the scale necessary to develop the most advanced models which will drive all the benefit of AI.

So I am glad to be working with Senator Lummis on the FREE Act, which would set up a permit by rule structure which would let large projects meet comprehensive standards at the front end instead of dragged out on a case by case process.

We all want to protect the environment and we all want to maintain U.S. economic and technological leadership.

So, Mr. Intrator, what has CoreWeave's experience been in contracting power and are you concerned that the current permitting system can make it harder for the U.S. to achieve capital investment in the scale needed to win this AI race?

Mr. INTRATOR. So, as you said, access to power, access to scale power is certainly one of the keys to our ability to win this race. There are others but it is one that I spend a lot of time thinking about.

I separated the comment into access to power and access to scale power because I do think that we are moving toward a period of this race where the size, the magnitude of the infrastructure that is being required to move our artificial intelligence—the labs that are building it, the companies that are building it—forward at the velocity that is necessary is going to be a specific challenge that really requires a lot of thought.

We have a huge part of our organization focused on not just getting access to power but getting access to the size and scale of power that is going to be able to build the infrastructure, you know, at the scale of Abilene or close to it in order to, you know, allow this to move forward.

It is tough, right, and it will get harder as we move through time because the existing infrastructure that does have opportunities it has some level of elasticity, is going to be consumed, and once that is consumed you are going to get down to kind of a first principle how do we get power online now, and that is really going to be challenging within the regulatory environment as it currently is configured.

Senator BUDD. Thank you.

Mr. Smith, a similar question. How is Microsoft trying to secure power for its data centers? I mean, we read about that in the news recently but what does Federal policy need to focus on to make sure that we do not lose this race because we cannot get enough energy?

Mr. SMITH. Well, we invest to bring more electricity generation onto the grid and then to bring it through the grid to our data centers. We probably have more permitting applications in more countries than quite possibly any company on the planet.

Last time I looked at it, it was 872 applications in more than 40 countries. The number-one challenge in the United States when it comes to permitting, interestingly enough, is not local. It is not state. It is the Federal wetlands permit that is administered by the Army Corps of Engineers.

We can typically get our local and state permits done in about six to 9 months. The national—the wetlands permit is taking often 18 to 24 months.

Both the outgoing Biden administration and the incoming Trump administration have focused on this, but if we could just solve that we could accelerate a lot here in this country.

Senator BUDD. Very helpful. Thank you.

Mr. Altman, much has been made about the Chinese open source models like DeepSeek. We spoke about that a month or two ago.

A concern that I have is that accessible Chinese models promoted by the Chinese Communist Party might be an attractive option for AI application developers to build on top of, particularly in developing world economies.

So how important is U.S. leadership in either open source or closed AI models?

Mr. ALTMAN. I think it is quite important to lead in both. We realize that OpenAI can do more to help here so we are going to release an open source model that we believe will be the leading model this summer because we want people to build on the U.S. stack in terms of closed source models.

A lot of the world uses our technology and the technology of our colleagues. We think we are in good shape there.

Senator BUDD. So how could Federal policy further help encourage the AI ecosystem to be developed right here in the U.S.?

Mr. ALTMAN. Well, you touched on a great point with energy. I think it is hard to overstate how important energy is to the future here. You know, eventually chips, network gear, that will be made

by robots and we will make that very efficient and we will make that cheaper and cheaper.

But an electron is an electron. Eventually, the cost of intelligence, the cost of AI, will converge to the cost of energy and it will be how much you can have. The abundance of it will be limited by the abundance of energy.

So in terms of long-term strategic investments for the U.S. to make I cannot think of anything more important than energy. You know, chips and all the other infrastructure also but energy is where this—I think this ends up.

Senator BUDD. Thank you. Chairman?

Senator YOUNG. Senator Kim.

STATEMENT OF HON. ANDY KIM,
U.S. SENATOR FROM NEW JERSEY

Senator KIM. Thank you.

Mr. Smith, I think I would like to start with you because I thought your point about what exactly is the race, right—you know, we keep talking about the race, and you framed it in a particular way saying that it is about adoption in the rest of the world, the 78 percent.

I guess I just wanted to ask you to tease that out some more in terms of understanding what role we could play in Congress, in government, in terms of trying to accelerate and champion that AI adoption internationally?

Mr. SMITH. I think there is two things. The first is it just shines light on the importance of getting it right for export controls, which is the AI diffusion rule that is being discussed right now, and I think what it shows is we want to have, I believe, as a country the kinds of national security controls that ensure that, say, chips do not get diverted to China or get accessed by the wrong users, say, in China for the wrong reasons.

And that is something that people have drafted in the Department of Commerce. At the same time, we need, I believe, to say get rid of the quantitative caps that were created for all of these tier two countries because what they did was send a message to 120 nations that they could not necessarily count on us to provide the AI they want and need.

And just think about it. I mean, if this is a critical part of your country's infrastructure how can you make a bet on suppliers if you are not confident that they will be able to fulfill your needs?

So I think you in Congress and the Senate can help the White House and the Department of Commerce get this right.

Senator KIM. Mr. Altman, I wanted your thoughts on this. Is that the right framing of the race? Is it about the adoption internationally in terms of other countries? I guess I am trying to think through it.

Like, part of what you just said in your previous response was that we want other nations to be able to build upon the U.S. AI stack. Is that the right framework? Is that what we are thinking about?

Or is it more about the consumer? Is it more about getting the rest of the world and the 78 percent of the population to adopt AI applications that are U.S.? Or is it interrelated?

Mr. ALTMAN. I think it is heavily interrelated. To me, the stack is, you know, from the chips at the bottom to the applications on the top, and we want the whole world on the U.S. stack. We want them to use U.S. chips. We want them to use services like ChatGPT.

Senator KIM. Does having other nations building on the infrastructure component of the stack—does that more or less than guarantee or at least have a high likelihood that then the consumers in that country will be using our products and applications? Is that the sort of theory of the case?

Mr. ALTMAN. It probably does make it marginally more likely. But I also think the—if someone is using a stack that we do not trust to train models, like, who knows what it is going to do?

Who knows what sort of back doors would be possible? Who knows what sort of, you know, data corruption issues could be possible?

I think the AI stack is increasingly going to be a jointly designed system from the chip all the way up to the end consumer product and, you know, lots of stuff in between.

I think separating that will not work that well in practice and we should not want to. Like, again, I think this point—this is a very critical point that the leverage and the power the U.S. gets from having iPhones be the mobile device people most want and, you know, Google being the search engine that people most want around the world is huge.

We talk maybe less about how much people want to use chips and other infrastructure developed here but I think it is no less important, and we should aim to have the entire U.S. stack be adopted by as much of the world as possible.

Senator KIM. Yes. I mean, when we are looking at—you know, you are talking about our investment into models and building of that nature.

How are we doing in terms of development of the application—the AI tools and applications, though, that are trying to embed in people's lives?

You know, not necessarily just the overarching models but do you feel like we are putting the level of intensity that we need to in terms of that type of development?

Mr. ALTMAN. ChatGPT is the most adopted AI service in the world—not just in the United States but in the world—by a quite significant margin.

We are very proud that people like it and we need to keep pushing on that. I think it is important for all the reasons you just discussed.

There are many other U.S. companies building incredible products and services that are also getting globally adopted. This is what the U.S. does best.

Senator KIM. Dr. Su, I want to just ask one last point to you. Over and over again each of you is talking about talent as this incredible power but also could be a bottleneck to us.

How are we doing when it comes to development of talent in this country? If you were to give us a grade what would you grade us at in terms of our development right now?

Ms. SU. Thank you, Senator, for the question. Look, I think the smartest engineers are in the United States. We have a great base of talent.

But what I will say is we need more. We need more hardware developers, software developers, application developers.

Senator KIM. How wide is that delta? If we are talking about this as a race, as you did, you know, is that a space where we have a larger amount of delta or is that a place where it is closing rapidly, too?

Ms. SU. Well, I think we do have a very talented overall talent base but we also have the desire to have the best and that includes not only, you know, U.S. nationals but also having the best international students.

Senator KIM. Drawing the talent from——

Ms. SU. That is right. I think high-skilled immigration is one of those areas where we want the best people in the world to be doing their work in the United States.

And, Senator, if I can just add something to your previous point about the cycle and what race we are trying to win.

You know, technology is one of those things where you can have a very vicious positive cycle. So, in other words, when we lead and more people adopt that means more developers that make our technology better.

That increases our lead. So that is what we want is to have our leadership just increase over time.

Senator YOUNG. Senator Schmitt.

STATEMENT OF HON. ERIC SCHMITT,
U.S. SENATOR FROM MISSOURI

Senator SCHMITT. Thank you, Mr. Chairman.

Mr. Altman, I will start with you. I really enjoyed and was inspired by your story with the light on in the home you grew up in in St. Louis and you talked about the spirit of innovation. That is the Spirit of St. Louis.

As a fellow St. Louis native that is a good story to hear, and we just look forward to more investment in St. Louis from your company. That would be great, too. So I will put a plug in for that.

But I do want to ask you specifically, there is a lot made of sort of the comparison between the United States and the regulatory environment and what exists in Europe.

What specifically—and I will open this up too—what specifically has gone wrong in Europe that we can draw some conclusions from?

Mr. ALTMAN. First of all, we would love to figure out how to invest more in St. Louis. I would love an excuse to get to go home more often.

I will point out one example that I think is just very painful to users. When we launch a new feature or a major new model we have what is now considered a little bit of like an in joke where we say we have this great new thing not available in the EU and a handful of other countries because they have this long process before a model can go out.

And there will be, I believe, great models and services that are quite safe and robust that we will be unable to offer in other regu-

latory regimes, and if you are trying to be competitive in this new world and if you are consistently some number of months behind what other people in other countries get access to, that is an example that is extremely painful to users.

Senator SCHMITT. And you mentioned sort of your observation that the AI stack may make it more vertically integrated. So how does that work then?

Because right now the best estimates, I suppose, right, is that—I do not know, with China is 2 months to 6 months behind maybe on large language models. Hopefully, some of the advances we are seeing in the U.S. maybe there is a degree of separation. It is hard to know exactly, right, with DeepSeek.

But then you get down to the chips and that advantage is more like a couple of years probably, something like that.

So if that is where we are headed does that increase the U.S.' advantage, in your view, or does that sort of allow China to catch up quicker as we get more vertically integrated?

Mr. ALTMAN. I think there are a lot of things that can increase U.S. leadership. But we touched on this earlier—I think it is so important. There will be great chips made around the world. There will be great models trained around the world.

If the United States companies can win on products and the—sort of all of the positive feedback loops that come from how you can improve this once, you know, real users are using your products in their daily lives for their hardest tasks, that is something special that is not so easy to catch up with just by doing good chips and good models.

So making sure that the U.S. can win at the product level here. Obviously, I am, like, talking my book a little bit, but I really do believe it—is quite important, and that is in addition to all of the chips algorithm or the infrastructure algorithms and data. I think this is a new area where the U.S. is really winning and has a very strong compounding effect.

Senator SCHMITT. Mr. Intrator—did I pronounce that correctly, by the way?

Mr. INTRATOR. Yes.

Senator SCHMITT. OK, thank you.

I want to turn a little bit, sort of staying on this regulatory environment, one of the things I think that is most concerning that is coming out of Europe is this sort of censorship regime that exists not just online but in real life.

But, certainly, it is happening online. I mean, people are being arrested for things that they say online, and one of the concerns I have with AI, I suppose, is that if we end up with a place where it is somehow policing, quote/unquote, "misinformation" and, you know, I think even in NIST's most recent voluntary standards one of the risks to be on the lookout for was the spread of misinformation.

So the point of the question is how do we make sure that—I think part of what is going wrong in Europe is it is a sort of a—it is funneling information and, in my view, whether I agree with the point of view or not it ought to be out there. People can make their own decisions. You combat speech you do not agree with not by censoring it but by—with more speech.

What are some lessons to be learned there and make sure that does not happen here?

Mr. INTRATOR. So Europe is moving forward with its regulatory regime in a European way, and from our seat where we have to make these enormous capital investments one of the things about the approach that Europe is taking that we are deeply concerned about every day is the balkanization to use—of how they go about allowing information to flow and how they go about regulating it, how they go about with each component of their union having its own set of rules, which will be tremendously challenging in Europe as time goes on because it is really hard to make the magnitude of investments that we—where we are——

Senator SCHMITT. Beyond that, though, jurisdictionally I am talking about content now.

Mr. INTRATOR. So we are not—the role of our company is really kind of below that, you know—and, you know, Sam and, you know, Microsoft you are going to get a lot more attention paid to the content level because of the role that they play in the stack. It is not really where we are primarily focused. We are really focused on the investment side of it.

Senator SCHMITT. Yes. If any of you would like to—Sam, if you—or, Mr. Altman, if you would like to respond to that I would like to get some answer.

Mr. ALTMAN. I think—well, first of all, I strongly agree that people getting, you know, like, put in jail for stuff they say online is very—not American and not what we should be doing.

AI is quite different than social media, at least in its current evolution. People are using these tools in this sort of one on one way instead of this massive thing online.

So I think it is easy to make too many analogies but it is a little bit dangerous to try to talk about AI and the things we are going to face here in the same way that we did for social media. But our stance is that we need to give adult users a lot of freedom to use AI in the way that they want to use it and to trust them to be responsible with the tool.

And I know there is increasing pressure in other places around the world and some in the U.S. to not do that but I think this is, like—this is a tool and we need to make it a powerful and capable tool.

We will, of course, put some guardrails and very wide bounds but I think we need to give a lot of freedom here.

Senator SCHMITT. Yes. I am out of time but there is a lot more questions there that we will follow up with.

Thank you, Madam Chair.

Senator CANTWELL [presiding]. Thank you. Thank you.

Senator Hickenlooper.

STATEMENT OF HON. JOHN HICKENLOOPER, U.S. SENATOR FROM COLORADO

Senator HICKENLOOPER. I appreciate that line of questioning. I was ready for you to continue as well. I could have given you a minute or two.

Mr. Smith, Microsoft has a long and deep history in transforming workplaces all over the world through software, from Windows op-

erating system to its office applications like PowerPoint, Excel, and now the AI-powered Copilot application.

In software development, life cycles seem to be becoming increasingly shorter, updates becoming more frequent.

What are the internal processes that Microsoft follows to evaluate Copilot's accuracy and performance before it was released and what kind of independent review teams other than Microsoft's own product developers are involved in that? Who do you bring in to help with that?

Mr. SMITH. Well, first of all, since most of what we are talking about here when you are talking about our Copilot's start with models that are developed at OpenAI, I would say OpenAI has its internal process.

There is then a joint—what is called the DSB, a Deployment Safety Board, where we decide together whether something is safe to deploy, as the name implies.

We then at the applications level have our own internal Deployment Safety Board. We have a variety of engineering tools that we use to assess these features. We test these features.

We have red teams, meaning sort of competing teams that often go to work to sort of attack the features, and then ultimately the product is released when those tests are completed and the results are satisfactory.

Senator HICKENLOOPER. I like that. Well, let me go over to Mr. Altman. Obviously, you all have a natural incentive to ensure that the products are high quality and safe.

But the field is so competitive and, you know, in applied research and with rigorous testing these constant improvements really are fundamental steps to the performance of a model.

So risk assessments are that key tool, and I am a big believer in evidence-based technical standards. I have been accused of being the only real scientist who has published peer-reviewed papers in the Senate.

So, Mr. Altman, do you believe that under appropriate circumstances independent evaluations based on standards performed by qualified evaluators and done voluntarily could help validate the testing that you are performing internally and in conjunction with peer companies?

Mr. ALTMAN. Thank you, Senator, and I think it is awesome that you are—have published peer-reviewed papers and would love to see more of that.

Senator HICKENLOOPER. I was—on the Maslow's triangle of science I was near the bottom. I was a geologist. So that is not high up in that——

Mr. ALTMAN. Geology is great.

Yes, I think what you say is very important. It is an important part of our process today. External testing helps us find things that we may have missed internally and—we are very proud of our safety record on the whole, not that we—you know, we have not been perfect and we are continuing to learn new things, but I think we do have a process that is leading toward models that the public generally thinks are safe and robust to use, and we have developed a lot of techniques to be able to continue to deliver that.

But external testers and red teamers are a critical part of that process and I think they have helped us find many things in the models to improve.

Senator HICKENLOOPER. Mr. Smith, would you add anything to that?

Mr. SMITH. No.

Senator HICKENLOOPER. OK. Got it. Someone giving testimony who does not have something to add—it is a moment of scientific reflection.

Dr. Su, the bipartisan CHIPS and Science Act, an historic effort to try and maintain U.S. leadership in emerging technologies like semiconductors but others as well, as the technology arms race continues globally, and you were talking about this, AMD plays a key role in delivering state-of-the-art designs, the best for the new chips that are going to power our electronics and the devices that are going to allow AI to become global.

As scientists work around the clock to develop new breakthroughs and to try to increase and improve performance but at the same time shorten R&D timelines, what do you see as the next frontier of chip technology in terms of energy efficiency and how can—and that is not just based on the Chinese competitors but how can we work together to improve direct to chip cooling for high-performance computing?

Ms. SU. Well, thank you for the question, Senator.

I would say, look, there is a tremendous amount of innovation that is going on in the semiconductor sector today. The CHIPS and Science Act was certainly helpful in raising the profile of chips in the United States.

Relative to, you know, what are we doing to go faster and build better and more power efficient chips, frankly, we are using AI extensively through our chip development cycles and it does allow us to augment what are typically very long cycles, many years—you know, several years for us to develop chips.

We can shorten the time and also improve the efficiency, and there are lots and lots of great new technologies in terms of cooling technologies that are super important for us to build the large-scale systems that we talked about earlier today. So thank you for the question.

Senator HICKENLOOPER. All right. I am out of time. I will yield back to the Chair. Thank you all.

The CHAIRMAN [presiding]. And, Senator Hickenlooper, I will say as a Texan whose parents were in the oil and gas business I think geologists are awesome.

Senator HICKENLOOPER. We have a consensus.

The CHAIRMAN. Senator Curtis.

STATEMENT OF HON. JOHN CURTIS,
U.S. SENATOR FROM UTAH

Senator CURTIS. Thank you, Mr. Chairman. It is a delight to be here.

Mr. Altman, you started kind of a one-upmanship on computers and I will just tell you in 1985 the month you were born I was attending a class at Brigham Young University and carried in a laptop and was almost kicked out.

Mr. ALTMAN. What laptop?

Senator CURTIS. It was a TRS 80——

Mr. ALTMAN. Oh, awesome.

Senator CURTIS.—made by Radio Shack. I upgraded the memory from 40K to 80K. Ran on four AA batteries and———

Mr. ALTMAN. That is incredible.

Senator CURTIS. Yes. So I am very envious of your generation. Let me start with you, if I would.

I think, you know, Utah would aspire to lead out with data centers and advanced technologies. Could you just address for states and Utah specifically what it is that makes them attractive to projects like Stargate?

Mr. ALTMAN. Yes, and I know that we are having productive discussions about some potential sites in Utah. Power cooling, fast permitting process, labor force that can build these things—the electricians, the construction workers, the entire stack.

A state that wants to, like, partner with us to move quickly. Texas really has been unbelievable on this. I think that would be a good thing for other states to study but we would be excited to try to figure something out.

Senator CURTIS. Thank you. I think I could speak for our state leaders. We would be excited as well. But as you know, this also brings challenges and one of those challenges are the demands for energy, and what are your thoughts on how we protect rate payers and kind of put a little bit of a firewall between them?

Mr. ALTMAN. I mean, I think the best way is just much more supply, more generation. You know, like, I think if you make it easy to reasonably profitably create a lot of additional generative capacity the market will do that.

That will not only not drive up rates because of the AI workload—hopefully it will drive it down for everything.

And we have talked a lot about the importance of energy to AI. Energy is just really important to quality of life. One of the things that seems to me the most consistent throughout history is every time the cost of energy falls the quality of life goes up, and so doing a lot to make energy cheaper in the short term—I think this probably looks like more natural gas, although there are some applications where I think solar can really help in the medium term.

I hope it is advanced nuclear fission and fusion. More energy is important well beyond AI. You know, in some sense we have these dual revolutions going of AI and energy, the ability to have new ideas and the ability to get them done, to make them happen in the physical world where we all live. Like, these are kind of the limiting reagents of prosperity and let us have a lot more.

Senator CURTIS. Thank you.

Mr. Smith, we have talked about how significant power was—is to the success here. What role do you think Microsoft and other tech leaders have in developing energy and particularly the right type of energy?

Mr. SMITH. I think we have a tremendous responsibility to contribute to the solution and I think Sam helped with his list.

I would highlight two things, and I just would, I guess, illustrate it with what we do everywhere but most recently with a major site in southeastern Wisconsin. We went from zero, basically, to becom-

ing the largest industrial user of electricity in the state—roughly, 400 megawatts.

And so we worked with the local utility. We made the investment to help and really enable them to expand their electricity generation.

Now, that electricity then needed to be delivered from their power plant through the grid to our data center. We went to the Public Utilities Commission and we proposed a rate increase on ourselves because we thought it was important that we pay for that improvement to the grid so that the neighbors, so to speak, would not have to.

And I think what it really illustrates is the collaborative partnerships that are needed to provide the capital, to do the construction, to improve the grid, and to be, I think, very sensitive to the community as a whole.

Senator CURTIS. Thank you.

Mr. Altman, let me come back to you. I was a small business owner. I have a special spot in my heart for small business owners.

Can we talk a little bit about ChatGPT and how that might assist small business owners? And let me paint a little broader picture. We have heard a lot about other tools that are, perhaps, out of favor, particularly with the U.S. Government, that are very helpful for small businesses.

But I do not know if small businesses are fully understanding the platform that you have and how they might use it for marketing, for data research, and ways to help their small business be successful.

Mr. ALTMAN. One of—there were all these moments as ChatGPT was beginning to take off where we would be, like, oh, we may have, like, a hit on our hands.

There is, like, that is—someone is using it for this and this and that, you know, strangers talking about it. You see someone using it in a coffee shop.

But one of the ones that really sticks out for me is pretty quickly after ChatGPT launched, like, in the first six months, say, I was in an Uber and the driver was making conversation.

He is, like, have you heard of this thing called ChatGPT? It is amazing. And I was, like, yes. Like, what do you think about it?

And he was using it to run basically his entire small business. He was, like, I had—he ran a Laundromat and he was, like, I had all these problems, you know, like, could not find good people to write my ads, could not get, like, legal documents reviewed, could not, like, answer customer support e-mails.

And he was, like, a mega early adopter but he was one of these people that was using AI to, like, make a small business work and that was—we talked about that story a lot at the time but it is nice to reflect on it again now.

We have now heard that at scale from a lot of people, but that was one of those moments early on we were, like, oh, this is maybe going to work.

Senator CURTIS. So and I am out of time but just to mark this is more than just something that helps proofread e-mails, right? And you do not need to comment because I am out of time, but I think we would all agree with that.

Mr. ALTMAN. It is.

Senator CURTIS. And look forward to seeing these applications move forward.

Mr. Chairman, I yield my time.

The CHAIRMAN. Senator Duckworth.

STATEMENT OF HON. TAMMY DUCKWORTH,
U.S. SENATOR FROM ILLINOIS

Senator DUCKWORTH. Thank you, Mr. Chairman. I thank you, the panel, for all of you being here today.

I want to begin by talking about the importance of partnerships between the private sector and our National Laboratories in maintaining United States leadership in AI.

Illinois is the proud home of two crown jewels of the National Laboratories, Fermilab, America's premier particle physics and accelerator laboratory, and Argonne National Laboratory, home to the Aurora supercomputer that will accelerate breakthroughs in AI, cancer research, and fundamental physics.

There is nothing more important than sustaining and amplifying investments in our Nation's incredible network of National Labs.

Yet, Donald Trump and Elon Musk, with the support of some Republicans in Congress, are plotting to take a chainsaw to the vital research initiatives being carried out across our country.

This is a self-sabotaging attack, plain and simple, and if allowed to proceed Trump and Musk will inflict lasting harm on our innovative capabilities and capacity that our enemies could only dream of achieving.

Does anyone truly have confidence that had DOGE been around decades ago they would not have cut the project that created the Internet as an example of wasteful publicly funded research and development?

So my question to any member of the panel is the following. Can you explain the importance of the National Labs system to maintaining our research edge and discuss any partnerships you have established or are currently pursuing, especially those threatened by massive cuts to the National Labs' research?

Mr. ALTMAN. We partner with the National Labs so maybe I could take a first cut of this.

Senator DUCKWORTH. Please.

Mr. ALTMAN. Also, Senator, I would love to get to visit Fermilab someday. That would be, like, unreal.

Senator DUCKWORTH. That was my next question. You are welcome.

Mr. ALTMAN. That would be a real life highlight. That would be very cool.

There are many wonderful things that AI is going to do for the world but the one that I am personally most excited about is the impact AI will have on scientific discovery. I believe that new scientific discovery is the most important input to the world getting better and people's quality of life getting better over time.

It is hard to overstate where we would be if—where we are because of scientific advancement and where we would be without it. So we are thrilled to get to partner with the National Labs on this.

I think science has not been as efficient as it can be, and we are also thrilled to hear from scientists that they are, you know, multiples more effective than they used to be and I think that AI tools will mean we can accomplish at some point a decade worth of scientific progress in a year for the same cost or even less.

This will be one of the most important contributions, in my opinion, that AI makes to the world. And it is no longer theoretical. Like, the National Labs are a great example.

It is the only partnership where we have given a copy of our model weights to another organization. It is a very deep and important partnership to us and I expect that that will really bear fruit.

Senator DUCKWORTH. Thank you. Anybody else on the panel?

Mr. SMITH. Yes, I think you highlight a very important issue. This country has 17 National Labs administered by the Department of Energy and about 85 to 90 research universities, and together they are the fabric of much of scientific discovery and have been since the Manhattan Project in World War II.

We in the tech sector, we at Microsoft, work with most, almost all of them, and there is a particular cycle of innovation that the United States has mastered. You have curiosity-driven research in these institutions and then the advances move out of those institutions into startups and into larger companies.

And what I always find interesting, as I meet with officials around the world they have studied this. They seek to emulate it, and I always worry that in the United States we run the risk of taking it for granted.

We should never take this for granted. It is the foundation for the country's technological leadership.

Senator DUCKWORTH. Very much so.

Dr. Su.

Ms. SU. I just wanted to add to that. We are also very large supporters of the public-private partnerships with the National Labs.

I think the National Labs have, you know, in a way always tried to look ahead of the curve and, you know, that is a great place for us to invest.

We think they are a key piece. We have partnered with all of the National Labs as well, you know, over the last decade and that continues to be a place where I think there can be significant public-private partnership.

Senator DUCKWORTH. Thank you. Mr. Intrator.

Mr. INTRATOR. I just think it would be really interesting to come to these AI factories and to walk or travel through these institutions and identify all the different pieces of the science that leads back and was ultimately driven and founded on something that came out of those institutions. It is amazing, actually.

Senator DUCKWORTH. Thank you. And would any of the remaining three of you like to come to a lab in Illinois, either Fermi or Argonne? I will give you personal tours.

[Laughter.]

Senator DUCKWORTH. All right. All four of you. It is done.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Young.

STATEMENT OF HON. TODD YOUNG,
U.S. SENATOR FROM INDIANA

Senator YOUNG. Thank you, Mr. Chairman, for holding this important hearing on winning the AI race. It is good to see our panelists here.

One of the things that I like to underscore whenever I talk about this issue is we are not just discussing a race to create jobs, not just discussing a race to figure out how to eke out more growth from our economy, although that is important.

Not just trying to identify how humans can flourish more, especially Americans, through application of AI solutions to our daily lives in various ways.

But this is an issue of national and economic security. I want folks at home to get that. I know all our panelists are highly conversant and knowledgeable about that.

In my discussions with you and many others I have heard we need to work with like-minded partners and allies to win this race, and it is only going to be done collectively.

I have heard here today from a number of you that this race is in part about getting market share, diffusion of our AI models and solutions into other countries.

It is through that means for me to, perhaps, elaborate on your thoughts that we can see that our own values are advanced.

These models presumably they will be embedded with our values related to privacy and transparency and property rights and freedom of speech and religion, not the values of the Chinese Communist Party on each of those various fronts.

And then if we can establish digital trade rules, digital cross-border agreements on digital trade with these other countries, we could conceivably erect higher barriers to entry for models that do not come embedded with our standards, models of, say, the Chinese Communist Party has given sanction to.

So there is a geopolitical national security overlay to this entire conversation, which is why I think the Chairman's emphasis on not overly constraining innovation or deployment is very important.

But it is also why I think it is important that we be thinking about how to work with other countries in their standards development.

And so that is that is where I want to begin asking questions. I will start with Mr. Smith.

If the United States does not adopt some standards through some entity, whether it is NIST or another Federal entity or federally sanctioned entity, then won't other nations go ahead and feel the need to adopt their standards without any consultation with the United States?

Mr. SMITH. I think it is a really important point you make and it is the lesson from the evolution of privacy law. The United States did not adopt a national privacy law.

Europe did twice, and most American companies of any size today apply across the United States work that complies with European privacy law. It is just more efficient.

So I think the United States needs to be in the game internationally to influence the rest of the world, and you cannot be in the game if you do nothing. You must do something.

So you take Senator Cruz's idea—a lightweight approach——

Senator YOUNG. Yes.

Mr. SMITH.—and then you build support around it.

Senator YOUNG. So just to unpack that—and I will stick with Mr. Smith with apologies to everyone else because my time is limited—would it be easier to shape the standards of other large economy countries that share most of our values if we already have a set of standards adopted?

Mr. SMITH. Generally, yes. I think we always have to be careful because if you go too soon you go before the standards have really come together. But you have got to have some kind of model that you can show the rest of the world and win support for.

Senator YOUNG. And then presumably standards could be harmonized, right? They are not set in—and chiseled onto a tablet, so to speak, right?

Mr. SMITH. That is indispensable. I mean, if our technology is going to go around the world we need a set of laws or regulations that, in effect, create that basis for reciprocity and interoperability.

Senator YOUNG. OK. I only have 25 seconds left. Are there any violent objections to Mr. Smith's position? Because that seems eminently reasonable to me.

Seems consistent with the light touch approach but it also shows a certain sense of urgency that the United States needs to act.

The last thing I will say in my remaining 10 seconds is that I am planning on introducing legislation today called the AI Public Awareness and Education Campaign Act with several of my colleagues and our aim is to have a whole of government approach to foster greater awareness of AI literacy and grow STEM opportunities to create the next generation of our workforce, and looking forward to moving that forward.

So it will be available for public review, critique, even accolades and, Mr. Chairman, I yield back.

The CHAIRMAN. Thank you.

Senator Blunt Rochester,

STATEMENT OF HON. LISA BLUNT ROCHESTER, U.S. SENATOR FROM DELAWARE

Senator Blunt Rochester: Thank you, Chairman Cruz, and thank you so much to the witnesses. This is such an important hearing. Five minutes will not suffice for me. I will be submitting some questions for the record.

I notice that for Mr. Altman and Mr. Smith when the question of paint me a picture of the future came up there was—you actually leaned up in your chair. There was a level of excitement, and that is how I am about the future.

When I came into the House of Representatives in 2017 I started a Future of Work bipartisan caucus because I had a concern that, number one, there were certain groups of people that were going to be left behind but there—also as a country that we could be left behind.

And I started—I had an event where we had everyone walk into the room and use a word cloud and tell me what you think of when you hear the future of work. The biggest word coming in the door was fear. The biggest word walking out the door was opportunity.

And so, to me, this conversation is so vital to think about the opportunities but also making sure that we are watching out for ethics, watching out for scams, watching out that technology does not take over the human.

And so I am just grateful for the conversation and, Mr. Altman, I listened to an interview about—that you gave with Lester Holt maybe a year or so ago and you talked in that interview about how OpenAI—it was not initially even about making a product.

It was not about the money. And so I know you are incorporated in Delaware and I understand you have been working with our attorney general during the previously proposed legislation to transition to a for profit—not legislation but to transition to for profit—and this Monday, OpenAI decided to apply to become a public benefit corporation instead and to have the PBC govern your nonprofit arm.

What went into this decision and what considerations influenced the timing of the organizational change?

Mr. ALTMAN. So we never—thank you for the question, Senator, and the chance to explain this. It is a complicated thing that I think has gotten misrepresented. So this is a wonderful forum to talk about it.

We never planned to have the nonprofit convert into anything. The nonprofit was always going to be the nonprofit, and we also planned for a PBC from the very beginning.

There were a bunch of other considerations about is it the PBC board that would control the nonprofit somehow or, you know, how our capital structure was going to work that there was a lot of speculation on most of it, inaccurate in the press.

But our plan has always been to have a robust nonprofit. We hope our nonprofit will be one of the best, maybe someday the best resourced nonprofit in the world, and a PBC with the same mission that would make it possible for us to raise the capital needed to deliver these tools and services at the quality level and availability level that people want to use them at but still stick to our mission, which we have been proud over the last almost decade of our progress toward.

So we had a lot of productive conversations with a lot of stakeholders and a lot of lawyers and a lot of regulators about the best way to do this.

It took longer than we thought it was going to. You know, I would have guessed that we would have been talking about this last year. But now we have a proposal that people seem pretty excited about and we are trying to now advance.

Senator BLUNT ROCHESTER. And, Dr. Su, your company primarily operates in the physical hardware portion of the AI stack.

I have a bill with Senators Cantwell and Blackburn called the "Promoting Resilient Supply Chains Act", which authorizes the Department of Commerce to strengthen American supply chains for critical industries and emerging technologies.

Dr. Su and others, semiconductor and chips manufacturing is critical to advancing the advancement of AI but we are facing these global supply chain constraints.

What specific policies—and I know you mentioned policies as well for supply chains—would we need to adopt to help American

companies overcome the supply chain issues and compete in international with our rivals?

Ms. SU. Thank you, Senator, for the question.

There is no question the semiconductor supply chain and overall supply chains are really critical for us to win the AI race. I think from a semiconductor standpoint the efforts that have been made to move manufacturing back to the United States have been positive.

I think they are a start. There is a lot more that we can do, and one of the most important aspects of it is really to think about it end to end.

There are so many steps to go from beginning to end in a semiconductor supply chain including advanced wafers, including packaging, including the back ends and system tests.

All of those avenues need to have a footprint in the United States, and then we have many allies around the world which are, you know, very excellent partners as part of the global resiliency in the supply chain and we would like to see those partnerships continue to flourish.

Senator BLUNT ROCHESTER. Last question, if I can.

Mr. Smith, how do you see the interdependence between the AI stack sections creating either vulnerabilities or opportunities in the AI supply chain?

Mr. SMITH. I think they create more opportunities than vulnerabilities because it enables companies to do what they do best and that we can work together.

And the world today has an integrated supply chain for anything that you buy. We just do not think about it when we go to the grocery store.

I think one of the strengths of the tech sector is that we have—I will call it a string of pearls, great companies in very—in every layer of the stack and we are going to need, frankly, more great companies, especially at the applications layer, and that it is how we work together.

Senator BLUNT ROCHESTER. Thank you so much. I am out of time but we will be following up with questions for the record as well as individually. Thank you, and I yield back.

Senator LUMMIS [presiding]. Mr. Moran.

STATEMENT OF HON. JERRY MORAN, U.S. SENATOR FROM KANSAS

Senator MORAN. Chairman Lummis, thank you very much.

Mr. Smith mentioned data privacy, which has been a topic of mine for a long time, and we have been unsuccessful in legislation being adopted. But I still have the goal of making certain that consumers have control over their own data.

And I was going to ask you, Mr. Altman, how can we provide consumers with more control over how their data is used by AI companies while preserving the utility of the AI system? So how do you get more privacy and still get the benefits?

Mr. ALTMAN. So there is all of the standard privacy controls that companies like ours and others build and should, but there is a new area that I would love to flag for your consideration, which is people are sharing more information with AI systems than I think

they have with previous generations of technology, and the maximum utility of these systems happens when the model can get very personalized to you.

So this is a wonderful thing and we should find a way to enable it, but the fact that these AI systems will get to know you over the course of your life so well I think presents a new challenge and level of importance for how we think about privacy in the world of AI—how we are going to think about guaranteeing people privacy when they talk to an AI system about whatever is happening in their lives—how we make sure that when one system connects to another it shares the appropriate information and does not share other information and that users are in control of that.

I believe this will become one of the most important issues with AI in the coming years as people come to integrate this technology more into their lives, and I think it is a great area for you all to think about and take quite seriously.

Senator MORAN. We do. We just do not have any success in finding the conclusions. But thank you for the encouragement.

I chair a Commerce, Justice, Science Appropriations Subcommittee that funds the Department of Justice and it plays a significant role in cybersecurity of our country.

I just came in from a budget hearing with the FBI Director Dr. Patel in which we covered cybersecurity threats.

AI can—and I think this is true—AI can be used on both sides of a cybersecurity attack and it can be used to automate phishing, malware creation. But machine learning can also increase our ability to detect and respond to cyber threats.

What should Congress think about allocation of Federal resources for cybersecurity and what should we consider when it comes to AI?

Mr. SMITH. I would say that AI, as you said, is both an offensive weapon and a defensive shield when it comes to cybersecurity, and as with many other things the front line of this the last few years has been in Ukraine because Russia has such a sophisticated cyberattack capability.

And, you know, what we have found is a company that has been involved in supporting Ukraine since literally the moment that war began is that AI is a game changer.

We have intercepted attacks against Ukraine faster than a human could detect them and we block those attacks from taking place.

So you deploy AI into—call it the front line of the products themselves. We have to recognize that it is ultimately the people who defend not just countries but companies and governments, the chief information security officers, or the CISOs.

So we have created what is called a cybersecurity copilot that basically automates for those individuals much of the workflow that takes their time so that they can be more effective and efficient.

When it comes to Federal appropriations I think that, to put it simply, the U.S. Government must remain at the forefront of having for itself the cybersecurity capabilities that it needs to defend the government and every day—I mean, we are in government agencies today during this hearing, you know, pushing Chinese out

of agencies and the like, and this will happen every day of every year from now to probably eternity.

So we must keep the U.S. Government well funded in this space and I think we also need our intelligence agencies and especially the NSA to be well funded so they can remain at the forefront when it comes to global leadership in this field.

Senator MORAN. Thank you for your observations and encouragement.

My final question—rural areas, a place I come from, often lack high-speed broadband, and since many AI tools rely upon connectivity I am concerned that many parts of the country and many parts of Kansas may not be able to access the benefits that AI will bring to business, schools, health care, et cetera.

What can the Federal Government do to be supportive of development and availability of on device or low broadband width AI systems that do not rely on constant connectivity?

Mr. ALTMAN. I am generally pretty excited about what AI will do here because you can offload so much of the processing to the cloud and then ship a relatively small amount of data.

If you think about, you know, ChatGPT as text comes in there is, like, a brain that thinks about it really hard and some text comes back, we can support people in low connectivity areas quite well with the same quality of service.

Separately to that, I think getting great connectivity everywhere is important but in the specific area of AI I think we can actually address that gap quite well.

Senator MORAN. That is good to know.

Thank you very much.

Senator LUMMIS. Mr. Luján.

STATEMENT OF HON. BEN RAY LUJÁN,
U.S. SENATOR FROM NEW MEXICO

Senator LUJÁN. Thank you, Madam Chair.

And, first, I want to begin by recognizing and thanking Mr. Altman and Mr. Smith for your organizations' ongoing involvement in the NIST USAI Safety Institute, as well as Dr. Su and Mr. Altman for your ongoing partnerships with our National Laboratories.

Now, Dr. Su and Mr. Altman, can you explain how your partnership with the National Labs support scientific research? You explained this to a question that was asked by Senator Duckworth as well but if you could just touch on that quickly.

Mr. ALTMAN. Our latest models, like, 2003 are good at scientific reasoning and so scientists are able to use these to help them review literature, come up with new ideas, propose experiments, analyze data in a way that the previous generations of models just could not.

We have had the National Labs and other scientists spend time with previous models and they say, oh, this is, you know, kind of cool. It is interesting. It is not transforming things.

These new models are the first time we are hearing from scientists at the National Labs and elsewhere that this is a legitimate game changer to their research output.

Senator LUJÁN. I appreciate that. Dr. Su?

Ms. SU. Yes, I would add the same. I think our partnerships with the National Labs have seen just tremendous opportunity. We have large-scale compute across the National Labs and the ability to really develop new applications that take advantage of, let us call it traditional high-performance computing, together with the new AI model capability that we just talked about is, I think, a great opportunity to substantially move forward the ability for scientific discovery.

Senator LUJÁN. To both of you, again, can you explain why Federal investment in foundational research and standards bodies are crucial to your companies?

Mr. ALTMAN. I think standards can help increase the rate of innovation, but it is important that the industry figure out what they should be first. I think a bad standard can really set things back and we have seen many examples of that in history.

I do think there is a new protocol to discover here at the level of importance of HTP. This is just one example. There is many other things, too.

I believe the industry will figure that out through some fits and starts and then I think officially adopting that can be helpful.

Senator LUJÁN. Dr. Su.

Ms. SU. I believe public-private partnerships really enable us to think, let us call it, ahead of the curve. So there are lots of things that we do in industry and we do them very, very well.

However, the beauty of the National Labs and Federal research is it does allow let us call it a bit more bluesky research, and I think that is a very, you know, positive add.

So I think the key is how we can make sure that, you know, one Federal dollar goes much, much further than that with a private investment on top of that.

Senator LUJÁN. Yesterday I reintroduced a piece of legislation called the "Test AI Act", which has bipartisan support, which would simply improve the Federal Government's capacity to test and evaluate in this area as well. So very much appreciate both your responses.

But this is just one of many steps I would argue that is needed to ensure that the United States stays ahead. Now, despite strong support across the country including from industry leaders here today President Trump is annihilating budgets for basic research, and there are questions abound by so many.

I will argue that this will destroy our Nation's competitive advantage. I simply just call on all my colleagues that we look at the investments to the National Science Foundation, National Institutes of Health, and Department of Energy, Office of Science.

Let us work together. If there is questions that we have let us find ways to address those. But let us ensure that these investments are making a positive difference so that we have more successes and more hearings celebrating what we are celebrating today.

Now, beyond your partnership with the Federal Government I would like to know more about how you partner with local communities when building out centers.

Data centers put a strain on energy and water resources. However, unlike other businesses they do not introduce many long-term jobs and economic benefits necessarily.

So, Mr. Smith, how many engineers do you have dedicated to model or hardware optimization to reduce energy use, and when you build a Center what initiatives do you have in place to reduce water use?

Mr. SMITH. I do not know off the top of my head the number of engineers we have working on optimization but I would be happy to track down an answer and get it to you.

Water use is a huge priority especially, you know, in data centers, for example, in the southwestern United States and other countries around the world where water is in short supply.

If you look at our data centers today they run on liquid cooling. It is a closed loop system. The liquid is a combination of, frankly, water and other chemicals but basically once it starts running almost all of the water is recycled. So the amount of water that we consume is typically far, far smaller than what most people would estimate.

We also have a commitment to water replenishment. Our goal is to be water positive, meaning that we are providing more water to the community than we are consuming.

So, for example, across the United States today we have more than 90 water replenishment projects including one that focuses on the San Juan River in your state of New Mexico, which focuses on water security for the river.

So I think it is a good example of how we can play a responsible role in addressing an issue that is of growing importance.

Senator LUJÁN. I appreciate it.

Mr. Intrator, same question.

Mr. INTRATOR. Yes, I cannot answer the question of how many engineers we have focused on it but I will say that the ability to extract more computational power out of a given megawatt is of paramount importance to my company, to all of us in this room, and we spend an enormous amount of time integrating the most bleeding-edge technology, which is a step function more efficient in terms of its computational output than the legacy technology has historically done.

You know, so moving to liquid cooling has just been an incredible improvement in efficiency and, ultimately, we face this problem from, you know, within a given data center, within a given power envelope. How much can we move the computational resources forward, and that is really an important part of what we do.

Senator LUJÁN. I appreciate it.

Mr. Chairman, I have other questions I will submit into the record.

Mr. Moran did ask one question. Mr. Altman, you responded to it. But can you all just answer yes or no, is it important to ensure that in order for AI to reach its full prominence that people across the country should be able to connect to fast, affordable internet?

Dr. Su.

Ms. SU. Yes.

Mr. INTRATOR. Yes.

Mr. SMITH. Yes.

Senator LUJÁN. Thank you. Appreciate it. I yield back. Thank you.

The CHAIRMAN [presiding]. Thank you.

Senator Lummis.

STATEMENT OF HON. CYNTHIA LUMMIS,
U.S. SENATOR FROM WYOMING

Senator LUMMIS. Thank you, Mr. Chairman, and thank you all for coming today.

I really have been amazed at the outstanding progress that continues to be made in this field and I am already seeing people in Wyoming that are using ChatGPT or Claude to improve their businesses, whether it is health care or mining or oil and gas or education, ranching, even. I am just really excited about what this opportunity brings to America.

Now, as I see it, the world has presented us with two paths. On one hand, the EU has chosen to regulate first and ask questions later. The GDPR is already limiting European access to the most capable AI models.

On the other hand, China appears to be fast tracking AI development, standing up large amounts of energy very quickly in an attempt to outcompete America.

So, I would like to ask a few questions about how we can make sure we get the full benefit of this technology and accelerate its development.

So first question, over the past year we have seen many states including California and Texas consider their own AI frameworks, each one significantly burdensome in their own right. At the same time, our lead against China is shrinking to about only 6 months.

So, first of all, Mr. Altman, could you please sketch out what the world could look like if the U.S. were to have a patchwork regulatory framework and how that could impact our competitiveness?

Mr. ALTMAN. I think it would be quite bad. I think it is very difficult to imagine us figuring out how to comply with 50 different sets of regulation and in many of these states there have been dozens of different bills proposed that I understand several of which could be passed. That will slow us down at the time where I do not think it is in anyone's interest for us to slow down.

One Federal framework that is light touch that we can understand and that lets us, you know, move with the speed that this moment calls for seems important and fine, but the sort of every state takes a different approach here I think would be quite burdensome and significantly impair our ability to do what we need to do and, hopefully, you all want us to do, too.

Senator LUMMIS. Does anyone disagree with Mr. Altman's assessment of a patchwork?

Thank you. I have some questions about the infrastructure that is going to be necessary to lead and compete in AI so my next questions are for our infrastructure providers, Mr. Smith and Mr.—is it Intrator?

Mr. INTRATOR. That is correct.

Senator LUMMIS. Intrator. Thank you. Could you elaborate on how current permitting processes have impacted your ability to

rapidly deploy AI infrastructure? The more specific you can be the better.

Mr. INTRATOR. So a quick comment on the patchwork and then I will dive in here. The investment that we are making on the infrastructure side is enormous, and the idea that you can make an investment that could then become trapped in a jurisdiction that has a particular type of regulation that would not allow you to make full use of it is really very, very suboptimal and makes the decisionmaking around infrastructure challenging.

As far as the permitting goes, whenever this topic comes up the discussion around permitting is excruciating and it is excruciating from the ability to quickly build and to build large, and I think that is kind of from the data center forward without even beginning the discussion from the data center back through the energy infrastructure that is necessary to be able to power these large investments at the scale that make them of relevance to moving artificial intelligence forward. I am happy to spend more time kind of digging into more details but probably do that directly.

Senator LUMMIS. OK. And I will look forward to that conversation because I am worried about Wyoming's very clean natural gas being something your industry is concerned about because President Trump likes natural gas but President Biden did not.

And if you build huge data centers and another President comes along who is anti-natural gas that is a concern for you as you are deciding how to deploy capital.

Mr. Smith, do you agree?

Mr. SMITH. Generally, I do. I mean, I would say we need consistency across administrations in this country. We need to find more opportunities for bipartisan agreement, and I will just highlight that in Cheyenne where we have long had a data center complex, you know, we do have backup generators that run on natural gas. So there are a variety of ways for us to put different energy supplies to good use.

Senator LUMMIS. Are you exploring small modular nuclear?

Mr. SMITH. Yes, including with people in Wyoming.

Senator LUMMIS. Thank you.

Mr. Altman, I am pleased to hear you are releasing an open—oh, my time is up. Excuse me. It goes so fast.

Mr. ALTMAN. I would love to talk to you about it another time. We are very excited about it, too.

Senator LUMMIS. Yes, thank you. I yield back.

The CHAIRMAN. Thank you.

Senator Rosen.

STATEMENT OF HON. JACKY ROSEN, U.S. SENATOR FROM NEVADA

Senator ROSEN. Thank you, Chairman Cruz. So I am ready to push the button and, anyway, time does go by very fast. Thank you for having this hearing.

I really believe in the promise of AI. So exciting, and we have to ask the right questions in order to promote its growth on one hand, and how can explore and create these new possibilities and pathways and also how do we protect ourselves from bad actors or outcomes as best as we can know at the time.

And, Mr. Altman, thank you for spending some time with me yesterday. I look forward to continuing to work with you on this.

So I want to start a little bit today at DeepSeek, an adversarial AI, because in February I introduced bipartisan legislation with Senator Husted to prohibit using DeepSeek on government devices, and earlier this week Senator Cassidy and I introduced a bill that would expand those prohibitions to include Federal contractors.

So, Mr. Smith, what should our approach be to AI models that are developed in or by adversarial countries like the PRC?

Should we be concerned about our adversaries co-opting AI to promote a particular ideology, collect sensitive U.S. data, and how are you combating this threat?

Mr. SMITH. Well, I think you can take the DeepSeek example and it illustrates it well, and I think it is just worth thinking about the fact that DeepSeek produced two things. They have a model that is an open source model and they have an application, the DeepSeek app.

At Microsoft we do not allow our employees to use the DeepSeek app. We did not put the DeepSeek app in our app store because of the kinds of concerns that you mentioned, namely, data going back to China and the app creating the kinds of content that I think people would say were associated with Chinese propaganda.

At the same time, because the model itself is an open source model it was possible for us to go in it, analyze it, and change the code in the model, which we and other people have the permission to do to remove the harmful side effects.

And so I think we have to always think about the different aspects of the technology. I will say put security first and then go forward from there.

Senator ROSEN. Thank you. I think we all know that data is the real power in our current world. He or she or whomever owns the data really can control a lot of what we do.

But I want to move on and speak with you, Mr. Altman, about AI and anti-Semitism a little bit because earlier this year ADL released a report showing that several major generative AI models have perpetuated dangerous anti-Semitic stereo tropes and, sadly, conspiracy theories.

So, Mr. Altman, what steps is industry taking to ensure that AI models do not perpetuate anti-Semitism? Will you consider collaborating with civil society to create kind of a standard benchmark for AI related to anti-Semitism, use it as a form of evaluation, and then maybe we could use those for other forms of hate as well?

Mr. ALTMAN. Of course, we do collaborate with civil society on this topic and we are excited to continue to do so.

We want our users to have freedom to use models in the way they want, but we also do not want them to be damaging to sort of the fabric of society or particular groups.

There will always be some debate and the question of free speech in the context of AI is novel and I think it is different than what we faced before.

We really do view these as tools for users one-on-one but, of course, we are not here to, you know, make horrible anti-Semitic products.

Senator ROSEN. Thank you. I want to move on to—Senator Luján talked about data center energy use, water use, something we are all really concerned about. I want to put on top of that a little bit about data center security, add that to the mix.

So last Congress I actually got a bill passed into law, my bipartisan "Federal Data Center Enhancement Act". It establishes cybersecurity and resiliency standards for Federal data centers.

And so to Mr. Smith, or—I am sorry, Dr. Su. Thank you.

Dr. Su, I want to ask you a little bit about hardware. Are there ways the hardware like the chips AMD designs, new chips that we are hoping to think about—I know my career as a software developer we just know things have gotten smarter, faster, and they just—the cooler they can be the better we can compute.

So how can we make our chips cooler? How can we make our data centers, our computing power, more secure? And I know interoperability is sometimes a factor. But can you talk about this a little bit?

Ms. SU. Sure. Thank you for the question, Senator.

Look, I think all of those things are extremely important, as you said. So in our part of the energy efficiency, you know, power constraints that we have from a chip standpoint, you know, our job is to continue to make our chips more and more efficient every year.

We have seen, you know, 30 times improvement over the last few years and we will continue to focus, you know, in that area.

And then to your comments about, you know, security and ensuring that our chips are secure and people are not somehow breaking into them, those are also very high priorities in our overall development cycle for future generation chips as well.

Senator ROSEN. Thank you. I look forward to working with all of you again on these important issues.

Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Sullivan.

STATEMENT OF HON. DAN SULLIVAN,
U.S. SENATOR FROM ALASKA

Senator SULLIVAN. Thank you, Mr. Chairman. I want to thank the witnesses for the testimony today. I appreciate the Chairman calling this hearing, and I agree with Senator Cruz's opening statement about this is a matter of national economic and national security in terms of our race, however you want to call it—competition with China.

So I know this topic has been pressed but I want to just get—I want to dig down a little bit deeper. Do you agree with that, all of you?

I am just going to ask some quick questions, that this is a huge issue of national security, economic security, relative to China, and we as America need to win in that regard. Very important.

Everybody nodding their head. And then I know that it had been touched, but is the consensus among the witnesses that we are ahead right now but as a kind of tentative lead?

What would be—very quickly we will start with you, Mr. Altman. What is your assessment on that? I know you have already talked about it. I just want to set the context for some of the questions.

Mr. ALTMAN. Yes, I believe we are leading the world right now. I believe we will continue to do so. We want to make AI in the United States and we want the whole world to get the benefit from that.

I think that is the strongest thing for the United States. I think it is also the right thing to do for all the people of the world.

And I really appreciate you all being with here—with us here today because I think we will need your help, and everything you are saying or almost everything you are saying sounds great.

Senator SULLIVAN. So as I ask this question I will ask if you guys think we are ahead, but then the key things when you say we need your help what would—very succinctly, sometimes we are not so smart up here—what would the key things be that you would need from the U.S. Government to help us maintain that lead and dominate this space, which is what I think we need to do?

Mr. Altman, again, to you real quick on that.

Mr. ALTMAN. We have talked a little about infrastructure but I think we cannot overstate how important that is, and the ability to have that whole supply chain or as much of it as possible in the United States.

The previous technological revolutions have also been about infrastructure and the supply chain, but AI is different in terms of the magnitude of resources that we need.

So projects like Stargate that we are doing in the U.S., things like bringing chip manufacturing, certainly, chip design to the U.S., permitting power quickly. Like, these are critical. If we do not get this right I do not think anything else we do can help.

On the model creation side, we have talked about the need for certainty in our ability to train and to have fair footing with the rest of the world to make sure we can remain competitive.

The ability to offer products under a reasonable, fair, light touch regulatory framework where we can go win in the market, because the products will be so key to the sort of feedback loops and making them better and better, and the ability to deploy them quickly and win at the product level in addition to the model and infrastructure and data area is really quite important.

The ability to bring the most talented people in the world here, the most talented researchers. We have a ton in the United States. There are more out in the world. We should try to get them all here, improving models here. I think those are some of the specifics.

Senator SULLIVAN. Good. That is very helpful.

Let me ask, Mr. Smith, two other ones that I want to touch on. I agree fully with Senator Lummis.

I am sure Senator Cruz has the same view. One of our comparative advantages over China, in my view, has to be energy—all of the above energy.

Hopefully, you have seen in Alaska we have a very large-scale LNG project that I think we are going to get off the ground here we have been working on for a long time.

We will have a hundred years supply of natural gas. So we want you guys all to come up to Alaska with your data centers. We have got cold weather. We got a lot of cold weather. We got gas. We got land. We got water. We got it all.

Mr. ALTMAN. That is very compelling.

Senator SULLIVAN. So, yes, come on up. When this project is done, 100-year gas supply. A little colder than Texas.

So two questions that relate to our comparative advantage, Mr. Smith, and then any others who want to jump in.

Energy—do we think that is? I think it is. And then second it is, I think, somewhat of a disadvantage. It frustrates me. Maybe you guys do not see this.

We have had American finance companies, venture capital firms, banks, others, that, remarkably, all the opportunities we have in America are helping fund some of these projects in China.

I have been a real staunch opponent of Americans who have opportunities to invest in other places investing in Chinese AI, Chinese quantum, because we all know they are going to use that to help make their military more lethal. I mean, that is what they do.

I was reading recently about this Benchmark Capital. I do not know these guys but they evidently did a $75 million round for some—an AI company in China. Is that another problem as well, Mr. Smith?

Advantage energy problem—American companies financing our competition?

Mr. SMITH. I would connect three things: energy, people and access to capital. The U.S. has huge resources in energy, but never underestimate the ability of China to build a lot of electrical power plants, maybe more and faster than any other country.

So we are better off going into that with the mindset that we have to keep up and not take anything for granted. But then I would say the number-one comparative advantage of the United States throughout the 50 years that have defined digital technology has been bringing the world's best people to our country and giving them access to venture capital, and we should continue to burnish both of those.

And I think you are right to ask where else is venture capital going. I will just say this. If we can keep bringing the best people to the United States and if we can keep educating the best people in the United States, I believe the money will be here to enable them to succeed.

But let us make sure we are continuing to bring the best people in the world and giving them the opportunity to build great companies here in the United States.

Senator SULLIVAN. And American venture capital funds funding Chinese AI, is that in our national interest?

Mr. SMITH. I think there is a really good question about whether it is and I recognize that you all are quite rightly focused on that.

I will just keep saying, bring the people here. They will have access to the money and we will outcompete the world.

Senator SULLIVAN. Great. Thank you. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Markey.

STATEMENT OF HON. EDWARD MARKEY,
U.S. SENATOR FROM MASSACHUSETTS

Senator MARKEY. Thank you, Mr. Chairman, very much.

I would like to talk about the environmental impact of artificial intelligence. Artificial intelligence can help us combat climate change by improving weather forecasts and enabling us to better predict power supply and demand. But designing and training and deploying AI models also poses real risks for our environment.

The massive data centers that are critical for AI development requires substantial amounts of electricity, putting stress on the grid and potentially raising costs for consumers.

These data centers also generate significant heat. Cooling them requires huge volumes of water, often in regions already facing droughts because of climate change, and some data centers have onsite backup diesel generators, which can cause respiratory and cardiovascular issues and can increase the risk of cancer for the surrounding community.

The truth is, we know too little about both the environmental costs and benefits of AI.

Mr. Smith, do you agree that it would be helpful for the government to conduct a comprehensive study on environmental impact of artificial intelligence?

Mr. SMITH. Generally, yes. One study was just completed last December and I think it is worth updating periodically.

Senator MARKEY. Do you think it would be helpful for the government to convene stakeholders including from industry and academia to help better measure AI's environmental impact?

Mr. SMITH. I think as well as many other things that need to be measured. Yes, I think there is a role to be played.

Senator MARKEY. Mr. Altman, do you agree that the Federal Government should help with studying and measuring the environmental impact of AI?

Mr. ALTMAN. I think studying and measuring is usually a good thing. I do think that the conversation about the environmental impact on—of AI and the relative challenges and benefits has gotten somewhat out of whack.

I am hopeful that AI—you know, we have been trying to address climate environmental challenges unsuccessfully or not successfully enough for a long time. I think we need help.

I think AI can help us do that. We have proposed or we are in the process of building a 10-gigawatt facility and we have got another——

Senator MARKEY. My question is should the Federal Government be on an ongoing basis studying the impact of AI?

Mr. ALTMAN. Sure, and I think you should use AI to help.

Senator MARKEY. So that is why this Congress introduced the "Artificial Intelligence Environmental Impact Act" to study both the positive and negative consequences of AI.

As the technology continues to develop, as models become more efficient, and as we build out the infrastructure, we need to do it.

Yes, AI might find—may find a cure for cancer. It may, but AI also could help to contribute to a climate disaster. That is also equally true.

So we need to just keep both of those things right on the table, especially as the Trump administration is ignoring the fact that last year 94 percent of all new installed electrical generation capacity in the United States was wind, solar, and battery, and Trump

has said he is going to destroy all incentives for continuation of that.

That is something you have to weigh in on to make sure he does not do that. So I look forward to working with you on that.

Now I want to turn to AI's impact on disadvantaged communities. After all, we are not just talking about using artificial intelligence to write e-mails or plan grocery lists.

We are talking about technology used to calculate a family's mortgage, screen an individual's job application, and determine a senior's medical care.

When used in these situations it is absolutely essential that AI-powered algorithms are free from bias and discrimination. So let us start with a simple question.

Mr. Smith, can algorithms be biased and cause discrimination?

Mr. SMITH. They can, which is why we test to avoid that outcome.

Senator MARKEY. Same question, Mr. Altman. Can algorithms be biased and cause discrimination?

Mr. ALTMAN. Of course.

Senator MARKEY. Of course. Mr. Altman, does OpenAI work to guard against such bias and discrimination in ChatGPT?

Mr. ALTMAN. Of course.

Senator MARKEY. Of course. So I am glad to hear that because you recently stated that the government should not implement privacy regulations on AI but instead, quote, "respond very quickly as the problems emerge," and I am very deeply worried about that approach.

We do not need to wait and see if poorly tested and trained algorithms will harm marginalized communities. Artificial intelligence is already supercharging the bias and discrimination prevalent in our society. Biased and discriminatory algorithms mean black and brown families are less likely to obtain a mortgage.

It means people with disabilities are less likely to be recommended for a job opening and it means women are less likely to receive scholarships for higher education.

These are real harms that are happening right now. It is Congress' job to address these existing problems that come with the rapid development and deployment of AI and it is why I am the proud author of the "AI Civil Rights Act" which would ensure that companies review and eliminate bias and discrimination in their algorithms before developing and deploying them.

It has to happen simultaneously, and it will hold companies accountable when their algorithms cause harms against marginalized population.

I will be fighting to ensure AI does not stand for accelerating inequality in our Nation. All of the protections we have in the real world should be moved to the virtual world because the same discrimination—again, women, black, brown, communities with disabilities, LGBTQ community—are going to move online and we have to build in the protections against that bias right up front, because otherwise those same discriminatory practices will just migrate immediately and the responsibility of the industry will be to work with Congress to make sure we put those protections on the books.

Thank you, Mr. Chairman.
The CHAIRMAN. Thank you.
Senator Peters.

STATEMENT OF HON. GARY PETERS,
U.S. SENATOR FROM MICHIGAN

Senator PETERS. Thank you, Mr. Chairman, and thanks to all our witnesses. Thank you for being here.

It is an incredibly important topic and we appreciate your expertise.

As we are looking at making sure that the United States is the world leader in AI, certainly, we have been talking about supply chains and infrastructure and all of those aspects.

But one area that I want to particularly focus on is workforce and people to make sure that we have the talent there. That is why I authored the "AI Scholarship for Service Act" and the "AI Training Act".

Both of those were signed into law in 2022. Earlier this year I introduced my "AI and Critical Technology Workforce Framework Act" to continue the effort along those lines, and love to work with each of you as we look at other legislation necessary to make sure we have got the workforce trained to take advantage of this amazing technology.

I do want to do a shout out to the University of Michigan that actually became the first university in the world to provide generative AI tools for their entire student body to prepare them for the workforce of tomorrow. So I want to talk a little bit about the workforce.

Mr. Altman, when met last year in my office and had a great conversation you said that upwards of 70 percent of jobs could be eliminated by AI and you acknowledge the possible social disruption of this.

If that is happening we have to prepare for it. We are not going to stand in the way of the incredible opportunities here but if this is, indeed, going to occur, we have got to be thinking pretty deeply about how that will be managed and make sure that everybody can benefit from AI, not just a select few that benefit.

So talk to me about how you believe leaders in your industry can help mitigate job losses or deal with what could—as you described it last year, major social disruption?

Mr. ALTMAN. The thing that I think is different this time than previous technological revolutions is the potential speed. Technological revolutions have impacted jobs and the economy for a long time.

Some jobs go away. Some new jobs get created. Many jobs just get more efficient and people are able to do more and earn more money and create more and that is great.

Over some period of time society can adapt to a huge amount of job change, and you can look at the last couple of centuries and see how much that has happened.

I do not know. I do not think anyone knows exactly how fast this is going to go, but it feels like it could be pretty fast.

The most important thing or one of the most important things, I think, we can do is to put tools in the hands of people early. We have a principle that we call "iterative deployment".

We want people to be getting used to this technology as it is developed. We have been doing this now for almost five years since our first product launch.

As society and this technology co-evolve putting great, capable tools in the hands of a lot of people and letting them figure out the new things that they are going to do and create for each other and come up with and provide sort of value back to the world on top of this new building block we have and the sort of scaffolding of society that is, I think, the best thing we can do as OpenAI and as our industry to be—sort of help smooth this transition.

Senator PETERS. The idea we want to get to the point where AI is not displacing work but actually enhancing work, that people are more productive and doing things that we probably cannot even imagine what people will do. If we would look a hundred years ago we have jobs that no one——

Mr. ALTMAN. You cannot imagine, and I do not think we can imagine the jobs on the other side of this. But even if you look today at what is happening with programming, which I will pick because it is sort of my background and near and dear to my heart, what it means to be a programmer and an effective programmer in May 2025 is very different than what it meant last time I was here in May 2023.

These tools have really changed what a programmer is capable of, the amount of code and software that the world is going to get.

And it is not like people do not hire software engineers anymore. They work in a different way and they are way more productive.

Senator PETERS. Right. Right.

Dr. Su, we certainly talk a lot about open source AI but most of the conversation has been about software. However, making technology open and able to work together matters at every level, as you know, from chips that power the devices to the servers that are running behind the scenes.

So my question for you is, what are the benefits of open standards and system interoperability at the hardware level, not the software level, and what are the implications for innovation, national security, as well as resilience in the supply chain?

Ms. SU. Thank you for the question, Senator.

I think there are an incredible number of advantages to having an open ecosystem at the hardware and the software and the application level.

The idea is, you know, there is no one organization or one group that has all the good ideas and so enabling the ecosystem to work together so that you can choose the best solution at every level and then also optimization across a broad set of constituents is a good thing.

I think it is also very good from a security standpoint to ensure that, you know, again, there are many choices so that we are not dependent on a single ecosystem. So, you know, we continue to be very forward thinking in open standards as well as open ecosystems.

Senator PETERS. So your model is an open model. I understand Nvidia is a closed model. Is there—what are the advantages and disadvantages? What should we be thinking about?

Ms. SU. I think the major advantage in an open model, and that is something that we very much support, is the idea that we can have innovation come from many different parties and, you know, whether that is hardware innovation so on the different chips or that is system innovation on putting all these things together.

And, you know, our goal is to make sure that we always have the best of the best and there are many different ways—many different parties that can contribute to that and that is why we are very forward leaning in terms of open ecosystems.

Senator PETERS. Great. Thank you. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Fetterman.

STATEMENT OF HON. JOHN FETTERMAN,
U.S. SENATOR FROM PENNSYLVANIA

Senator FETTERMAN. Thank you, Mr. Chairman. Hello.

Mr. Smith, I am a big supporter of energy. For me energy security is national security and, of course, you know, renewables is about that. But, of course, other things as well, too—fossil. But also that also includes nuclear, of course. Nuclear is important.

And now then there is that kind of energy transition. My focus is also that I want to make sure that rate payers in Pennsylvania really are not hit too hard for throughout all of this.

Now, the *Washington Post* reported that increasing electricity demand for the data centers is going to raise up residential power bills, perhaps, as much by 20 percent.

Now, to me, that is really a concern for me and certainly for Pennsylvania families. Now, the data center, you know, has important jobs during construction and doing those things and that is a great thing, of course.

But they are not, I guess, long term. But the rate—those rates might last longer for that.

And now, I have been very—tracking the plan to reopen TMI. I mean, I had my own personal story is I had to grab my hamster and evacuate, you know, in that—during the meltdown in 1979.

You might consume—you might assume that I was anti-nuclear and that is not—it is a—I actually am very supportive of nuclear because that is an important part of the stack. If you really want to have—address climate change you cannot turn your back on nuclear, in my opinion.

But I know that is the power nuke—Microsoft's data center so now—and I really appreciate that. But if I am saying, now, if you are able to commit that the power purchase agreement, you know, it is not going to raise electricity for Pennsylvania families.

Mr. SMITH. No, I think you raise a critical point. We have two principles that we follow when we are constructing these data centers.

Number one, we will invest to bring onto the grid an amount of electricity that equals the amount of electricity that we will use so that we are not tapping a constricted supply.

Number two, we will manage all of this in a way that ensures that our activity does not raise the price of electricity to the community.

And so I was describing earlier how if there is improvements that need to be made to the grid, as there often are, we will go to the utility commission. We will propose a change in the rate that we are charged so that we can pay for that improvement.

I just think it is a fact of life because I think you highlight something critical. There are a lot of jobs when the construction takes place. There are jobs afterwards but they are not as many.

One will wear out the welcome quickly if we tax, in effect, the neighborhood by asking everyone to pay more for their electricity because we have arrived. We get it. We know we have to be a good and responsible member of the neighborhood.

Senator FETTERMAN. Now, you know, one of the perks of being a senator is that—for me, anyway, I get an opportunity to meet people that have much more impressive kinds of jobs or careers that I have led.

And, now, Mr. Altman, now, this is going to—I am going to count this as a highlight.

Recently, like, I know the work that you have done you are really one of the people that are moving AI and now it is an opportunity. I was excited to meet you.

And now, people—you know, people ask me it is, like, if you are going to talk about AI and now I get to ask you, I mean, like, the literal—the expert.

You know, some people are worried about AI or whatever and I am, like, you know, what about the singularity so, you know, the people like that.

If you would address that, please.

Mr. ALTMAN. Thank you, Senator, for the kind words and for normalizing hoodies in more spaces. I love to see that.

I am incredibly excited about the rate of progress but I also am cautious, and I would say, like, I do not know—I feel small next to it or something. I think this is beyond something that we all fully yet understand where it is going to go.

This is, I believe, among the biggest—maybe still trying to be the biggest technological revolutions humanity will have ever produced and I feel privileged to be here. I feel curious and interested in what is going to happen.

But I do think things are going to change quite substantially. I think humans have a wonderful ability to adapt and things that seem amazing will become the new normal very quickly. We will figure out how to use these tools to just do things we could never do before and I think it will be quite extraordinary.

But these are going to be tools that are capable of things that we cannot quite wrap our heads around, and some people call that—you know, as these tools start helping us to create next and future iterations some people call that singularity.

Some people call that the take off. Whatever it is, it feels like a sort of new era of human history and I think it is tremendously exciting that we get to live through that and we can make it a wonderful thing. But we have got to approach it with humility and some caution.

Mr. FETTERMAN. I mean, I just did—for me, it has been—I get a chance to ask questions to a lot of Edisons as well, too.

The kinds of things that you are all collectively involved are going to transform our society, and people will look back 50, 60 years ago and see what has happened. So to me, over to the Chairman. Thank you.

The CHAIRMAN. Thank you, Senator Fetterman.

Senator Klobuchar.

Senator KLOBUCHAR. Thank you. Good thought, Senator Fetterman. Thank you.

So you guys have been sitting here so long that the Pope has been chosen.

[Laughter.]

Senator KLOBUCHAR. We do not know who.

The CHAIRMAN. Congratulations, Amy.

Senator KLOBUCHAR. The white smoke has come up.

The CHAIRMAN. Congratulations.

[Laughter.]

Senator KLOBUCHAR. You are welcome. Probably would not work.

But in any case, it was—I left for some other things, came back because I had one more question that I wanted to ask and it is related to just the whole deep fake issue just because Senator Blackburn and Senator Coons and Senator Tillis and I worked on this really hard, and they are—Blackburn and Coons are in the lead of the bill.

But we have recently seen deep fake videos of Al Roker promoting a cure for high blood pressure, a deep fake of Brad Pitt asking for money from a hospital bed. Sony Music has worked with platforms to remove more than 75,000 songs with unauthorized deep fakes including voices of Harry Styles and Beyoncé.

I recently—I mean, it is not just famous people. There is a Grammy-nominated artist from Minnesota. Talked to him about what is going on with digital replicas. So there is a real concern and it kind of gets at what Senator Schatz and I were talking about earlier with the news bill.

But I just wanted to make you all aware of this legislation because there were some differences on this and now we have gotten a coalition, including YouTube, supporting it as well as the Recording Industry Association, Motion Picture Association, SAG-AFTRA. So it is a big deal and I am hoping it is something that you will all look at.

But could you just comment? I would go to you, Mr. Smith, first about protecting people from having their likenesses replicated through AI without permission, and even if you all pledge to do it our obvious concern is that there will may be other companies that would not and that is why I think as we look at what these guardrails are the protection of digital—people's digital rights should be part of this.

Mr. Smith.

Mr. SMITH. Yes. No, I think you are right to point to it. It has become a growing area of concern. You know, during the Presidential election last year both campaigns, both political parties, were concerned about the potential for deep fakes to be created.

We worked with both campaigns and both parties to address that. We see it being used in, really, ways that I would call abusive including of celebrities and the like.

I think it starts with an ability to identify when something has been created by AI and is not a genuine, say, photographic or video image, and we do find that AI is much more capable at doing that than, say, the human eye and human judgment.

I think it is right that there be certain guardrails and some of these we can apply voluntarily. We have been doing that across the industry.

OpenAI and Microsoft were both part of that last year, and there are certain uses that probably should be considered across the line and, therefore, should be unlawful, and I think that is where the kinds of initiatives that you are describing have a particularly important role to play.

Senator KLOBUCHAR. And could you look at that legislation?

Mr. SMITH. Absolutely.

Senator KLOBUCHAR. Appreciate it. Mr. Altman, just the same question, same thing.

Mr. ALTMAN. Of course, we would be happy to look at the legislation. I think this is a big issue and it is one coming quickly.

I do not believe—I think there are a few areas to attack it. You can talk about AI that generates content, platforms that distribute it, how takedowns work, how we educate society, and how we build in robustness to expect this is going to happen.

I do not believe it will be possible to stop the generation of the content. I think open source, open weight models are a great thing on the whole and something we need to pursue. But it does mean that there is going to be just a lot of these models floating around that can do this.

The mass distribution, I think it is possible to put some more guardrails in place and that seems important but I do not want to neglect the sort of societal education piece.

I think with every new technology there is some sort of—almost always some sort of new scams that come. The sooner we can get people to understand these, be on the lookout for them, talk about this as a thing that is coming and then a thing that is happening I think the better.

People are very quickly understanding that content can be AI generated and building new kinds of defenses in their own minds about it.

But still, you know, if you get a call and it sounds exactly like someone you know and they are panicked and they need help, or if you see a video that—like the videos you talked about, this, like, gets at us in a very deep psychological way and I think we need to build societal resilience because this is coming.

Senator KLOBUCHAR. Mmm-hmm. It is coming, but we can there—there has got to be some ways to protect people's privacy rights——

Mr. ALTMAN. We should do everything—for sure.

Senator KLOBUCHAR.—and you have got to have some way to either enforce it—damages, whatever. There is just not going to be any consequences in that——

Mr. ALTMAN. Absolutely. We should have all of that. Bad actors still do not always follow the laws and so I think we need an additional shield or whenever we can have them. But yes, we should absolutely protect that.

Senator KLOBUCHAR. All right. Look forward to working with you on it. Thank you.

The CHAIRMAN. So I have to say Senator Klobuchar's question about fakes and AI fakes made me feel guilty because I did, in fact, tweet out an AI-generated picture of Senator Fetterman as the Pope of Greenland. So I am guilty of doing so, although it may not be a fake. It may be a real thing.

Senator KLOBUCHAR. OK. Oh, whoa, parody is allowed under the law. Parody is allowed. That is different than what I am talking about but Senator Fetterman should respond.

Senator FETTERMAN. Or if it was AI.

Senator KLOBUCHAR. I know.

The CHAIRMAN. It may be—it is a good shot, actually.

All right. I have a few more questions and then we will wrap up.

Mr. Altman, what has been the most surprising use for ChatGPT you have seen? What are applications that you are seeing that are surprising?

Mr. ALTMAN. People message ChatGPT billions of times per day so they use it for all sorts of incredibly creative things. I will tell one personal story, which as mentioned earlier I recently had a newborn.

Clearly, people did it but I do not know how people figured out how to take care of newborns without ChatGPT. That has been a real lifesaver.

The CHAIRMAN. So I will tell you a story that I have told you before but my teenage daughter several months ago sent me this long, detailed text, and it was emotional and it was it was really well written and I actually commented. I am, like, wow, this is really well written.

She said, oh, I used ChatGPT to write it. Like, wait, you are texting your dad and you do not—it is something about the new generation that it is so seamlessly integrated into life that she is sending an e-mail, she is doing whatever, and she does not even—does not even hesitate to think about going to ChatGPT to capture her thoughts.

Mr. ALTMAN. I have complicated feelings about that.

[Laughter.]

The CHAIRMAN. Well, use the app and then tell me what your feelings are.

Mr. ALTMAN. OK.

The CHAIRMAN. Google just revealed that their search traffic on Safari declined for the first time ever.

Mr. ALTMAN. It did not send me a Christmas card.

The CHAIRMAN. Will ChatGPT replace Google as the primary search engine, and if so, when?

Mr. ALTMAN. Probably not. I mean, I think some use cases that people use search engines for today are definitely better done on a service like ChatGPT, but Google is like a ferocious competitor.

They have a very strong AI team, a lot of infrastructure, a very well-protected business, and they are making great progress putting AI into their search.

The CHAIRMAN. All right. So a question that I have spent a lot of time talking to business leaders, CEOs in the tech space, AI, and one question that I have asked that I get different answers on—and I am curious what the four of you say—how big a deal was DeepSeek?

Is it a major, seismic, shocking development from China? Is it not that big a deal? Is it somewhere in between and what is coming next?

And let us each of the four of you.

Mr. ALTMAN. Not a huge deal. There are two things about DeepSeek. One is that they made a good open source model and the other is that they made a consumer app that, for the first time, briefly surpassed ChatGPT as the most downloaded AI tool, maybe the most downloaded app overall.

There are going to be a lot of good open source models and, clearly, there are incredibly talented people working at DeepSeek doing great research.

So I would expect more great models to come. Hopefully, also us and some of our colleagues will put out great models too.

On the consumer app, I think if a—if the DeepSeek consumer app looked like it was going to beat ChatGPT and our American colleagues' apps as sort of the default AI systems that people use that would be bad. But that does not currently look to us like what is happening.

Ms. SU. I would say it is somewhere in between, Chairman Cruz. When you think about what we have learned, what we learned is, you know, there are different ways of doing things.

So we have lots of incredibly innovative people in the United States. American models are, clearly, the best by far. However, when you have constraints that are placed there are other ways of doing things and I think we learned a few things in the process.

I think the open source nature of DeepSeek was one of the things that probably was most impactful in just terms of how much can be done in an open source type of model and open ecosystem.

But, clearly, the United States is leading and we need to continue, as we have said, to accelerate innovation and adoption as you started this hearing with.

Mr. INTRATOR. I think DeepSeek did a lot of things. One of the things that it did was it sort of raised the specter of China's AI capability to a much broader audience than was perhaps focused on it prior to that, right, and so you saw that kind of reverberate through the financial markets.

You saw, like, a broad-based reaction and suddenly everyone knows what DeepSeek is and the fact that China is not theoretically in the race for AI dominance but actually is very much a formidable competitor.

And so, you know, it was a starting gun in some ways for the broader population and kind of maybe the broader consciousness of the fact that that this is not a fait accompli and that we are going to have to work as America together to kind of propel our solutions

forward. And so I think that was one of the lasting impacts that we will see from that.

Mr. SMITH. I would say like Lisa that it was somewhere in between. It was not shocking. I mean, it was one of a number of startups that we were following in China that we saw as having the potential to be innovative in this space.

I do think there is a really interesting and important point that constraints encourage innovation in other ways and I just think one of the interesting facts about DeepSeek is that of their, say, 200 or more employees—that was the their size when they released these models—almost all of their employees by design were 4 years or less out of university.

They wanted to hire people that would not bring to their work traditional ways of doing things.

The CHAIRMAN. So the kids are taking over the world?

Mr. SMITH. They do every generation.

[Laughter.]

The CHAIRMAN. Related to that—were you finished with that, Mr. Smith?

Related to that, we talked at the outset about the AI diffusion rule being rescinded, which I am glad. I think it was a bad rule. I think it was overly complex. I think it put on a number of our trading partners unfair restrictions and so I am glad the President is rescinding it.

That does not necessarily mean that there should be no restrictions and there are a variety of views on whether—what the rules should be concerning AI diffusion.

Nvidia has argued that we want American chips everywhere, even in China. Others have argued that we want to restrict at least the most advanced processors.

I am curious—each of the four of you what do you think the rule should be if anything is to replace the AI diffusion rule?

And, Mr. Altman, we will start with you.

Mr. ALTMAN. I also was glad to see that rescinded. I agree there will need to be some constraints. But I think if our—if the sort of mental model is winning diffusion instead of stopping diffusion that directionally seems right.

That does not mean there is no guardrails. It does not mean we say, like, we are going to go build a bigger data center in some other country than the U.S. Our intention is to build our biggest and best data centers in the U.S. Do training in the U.S. Build models here. Have our core research here.

But then we do want to build inference centers with our partners around the world and we have been working with the U.S. Government on that. I think that will be good.

To this point that influence comes from people adopting U.S. products and services up and down the stack, maybe most obviously if they are using ChatGPT versus DeepSeek but also if they are using U.S. chips and U.S. data center technology and all of the amazing stuff Microsoft does, that is a win for us, and I think we should embrace that but make sure that, you know, the most critical stuff—the creation of these models that will be so impactful—that should still happen here.

The CHAIRMAN. Dr. Su.

Ms. SU. I think we would totally agree with the concept that some restrictions are necessary. This is a matter of national security as much as it is about AI diffusion.

That being the case, we were happy to see the rescinding as well and we view this as an opportunity to really simplify, right.

At the end of the day, you know, we have talked about the need to drive widespread adoption of our technology and our ecosystem. You know, simple rules that can be easily applied that really allow our allies to protect our technology while still utilizing the best that the United States has to offer I think is a good start in terms of where we are going and, you know, again, this is an area where I think the devil is in the details and it requires a lot of balance.

And so from an industry standpoint, you know, it is our job to put on the broader hat and work hand-in-hand with the administration and Congress to, you know, make our best recommendations so that it is a policy that has some stability as we go forward as well.

The CHAIRMAN. Mr. Intrator.

Mr. INTRATOR. So I will echo what Sam and Lisa said. But, you know, national security is paramount, and then once you have addressed the limitations around national security the opportunity to work with regulators to put together a regulatory framework beyond that makes a lot of sense, and the diffusion rule did not allow us that opportunity to participate fully enough to feel like we were going to come away with what would be an optimal outcome at this point.

The CHAIRMAN. Mr. Smith.

Mr. SMITH. I think we have all discussed the right recipe. Simplify, eliminate these tier two quantitative restrictions that undermine confidence and access to American technology, but enable even the most advanced GPUs the country has to be exported to data centers that are run by a trusted provider, that meet certain security standards.

That means both physical and cybersecurity standards. That there is protection against diversion of the chips and there are precautions against certain uses, and that means two things.

One is that there are controls in place to ensure that, say, the PLA—the Chinese military—is not accessing and using these advanced models or advanced chips in a data center regardless of the country that it is in, and there are certain harmful uses that one should want to prohibit and preclude like using a model to create the next pandemic, a biological weapon, a nuclear weapon.

And I think that there is an approach that is coming together that can be retained and can move forward and that strikes the right balance.

The CHAIRMAN. OK. Final question for each of you. Would you support a 10-year learning period on states issuing comprehensive AI regulation or some form of Federal preemption to create an even playing field for AI developers and deployers?

Mr. ALTMAN. I am not sure what a 10-year learning period means, but I think having one Federal approach focused on light touch on an even playing field sounds great to me.

Ms. SU. Aligned Federal approach with, you know, really thoughtful regulation would be very, very much appreciated.

Mr. INTRATOR. I agree with both my colleagues.

Mr. SMITH. Yes, I think that builds, obviously, on the op-ed that you and Senator Graham published last year and I think giving the country time—your analogy, your example, was this worked for the internet.

There is a lot of details that need to be hammered out, but giving the Federal Government the ability to lead, especially in the areas around product safety and pre-release reviews and the like, would help this industry grow.

The CHAIRMAN. Well, I want to thank each of the witnesses. This was a very interesting hearing. It was informative. These issues matter.

You saw a great deal of interest on both sides of the aisle in this topic and so I appreciate—each of you are very busy and doing a lot of things and I appreciate your being here today.

Senators will have until the close of business on Thursday, May 15, to submit questions for the record and the witnesses will have until the end of the day on Thursday, May 29 to respond to those questions.

And with that, that concludes today's hearing. The Committee stands adjourned.

[Whereupon, at 1:13 p.m., the hearing was adjourned.]

A P P E N D I X

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. ROGER WICKER TO SAM ALTMAN

Political and Ethical Decisions by AI Technology

Background: xAI was founded by Elon Musk on March 9, 2023, and develops technology similar to OpenAI, which Musk helped found alongside Sam Altman and others in 2015. Grok is xAI's flagship product, which runs on X (formerly Twitter), the social media platform. Musk, along with its developers, has expressed an intent to measure and potentially modify the political and ethical preferences embedded in AI systems. Studies have shown that popular AI models like OpenAI's ChatGPT tend to exhibit specific ideological leanings, particularly favoring environmental protection and expressing left-leaning, libertarian viewpoints.

Question. Mr. Altman, President Trump has said that to maintain U.S. leadership in AI, we must develop systems that are free from ideological bias or engineered social agendas. You have said that you expect AI to be capable of superhuman persuasion well before it is superhuman at general intelligence. According to research recently published by xAI and Scale AI advisor Dan Hendrycks, AI systems exhibit significant left-wing biases in their value systems. What should be done to prevent superhuman persuasion by AI? Should superhuman persuasion by AI be banned? What are you doing to prevent superhuman persuasion in OpenAI's systems?

Answer. Our tools enable the freedom to learn, the freedom to create, and the freedom to innovate. We are accelerating knowledge, creativity, and free expression. Our systems have robust guardrails. We are transparent about how those guardrails work and we work hard to make sure we are enabling creativity and protecting everyone's freedom to use AI. Our models are specifically designed not to "have an agenda" which is outlined in our public documentation, such as *the Model Spec,* describing how our models work; the goal of an AI assistant is to assist humanity, not to shape it.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARSHA BLACKBURN TO SAM ALTMAN

Question. The strength of American businesses has long depended on the enforcement of intellectual property (IP) rights. Recently, OpenAI has publicly argued that unless AI companies in the U.S. are permitted to broadly claim fair use of copyrighted content, the Nation will lose its competitive advantage to China in the AI sector.[1] Specifically, a recent comment letter by OpenAI stated "there is little doubt that the PRC's AI developers will enjoy unfettered access to data—including copyrighted data—that will improve their models." This assertion stands in stark contrast to the long-standing American principles that prioritize IP protection as a driver of innovation and a safeguard against foreign competition. The United States' commitment to upholding property rights and the rule of law has been central to its leadership in technological development. Would you suggest that the U.S. adopt an approach to intellectual property rights more akin to that of China?

Answer. America's intellectual property laws have underpinned generations of American technology leadership, from the personal computer to the commercial internet. America's creative professionals have benefitted from the strong protections our laws give to creators, and America's technology innovators have benefitted from existing and longstanding IP doctrines such as fair use, which permits new technologies to interact with copyrighted works in transformative ways. This balanced framework has enabled the success of American AI, and the United States should stand by the existing American legal framework that has served our country so well.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO SAM ALTMAN

AI Standards

The U.S. driving development of AI standards alongside the most advanced democracies in the world offers us an opportunity to set the "rules of the road" for AI on the global stage.

Question 1. In response to my question regarding NIST standards, you stated that NIST standards would not be necessary, but that they could be helpful in improving our competitiveness. Can you explain how you view NIST standards as helping the United States' competitiveness?

Answer. We know that in the race for 5G China took an active role in subsidizing and supporting companies in standard setting bodies. Their influence in voting bodies helped set the rules of the road for 5G. Similar dynamics are occurring with AI standards and NIST can play a role in supporting American companies to navigate these processes, especially for non-legacy technology companies.

In order for AI to benefit the world, technical standards would help countries build on U.S. technology and promote democratic AI. This is what our initiative, OpenAI for Countries, aims to achieve.

Question 2. What standards would you like to see NIST develop and promote to improve U.S. competitiveness?

Answer. As models become more capable, it will be important to further the science of evaluations and metrics for measurement of such capabilities. NIST's measurement science initiatives (benchmarks, test beds, cryptographic validation, AI evaluations) can help further the development of these methods of evaluation and give industry a common vocabulary around safety and security.

Separately, various countries are proposing frameworks for risk management of frontier systems. NIST could play a role in harmonizing those across jurisdictions to help American products get to new markets.

Finally, agents will present a new challenge to how tasks and communication are conducted on the internet. NIST could help drive and establish consensus based industry technical standards to address this challenge.

AI Safety

We are seeing a proliferation of deepfakes and other AI content that threatens the average person's ability to discern truth in media. And that's just one area in the field of AI that presents complicated safety questions. The U.S. AI Safety Institute plays a critical role in ensuring that AI systems are developed responsibly and that the most advanced models are fully tested. This is crucial for building trust and promoting wider adoption.

Question 3. Do you support the work of the U.S. AI Safety Institute?

Answer. OpenAI has had a constructive partnership with the U.S. AI Safety Institute, focused on national security risks posed by dual-use AI capabilities. In our view, this is a good model for how a voluntary partnership between the Federal government and private sector can protect American national security and strengthen our economic competitiveness.

Public Investment in Science

Government investment in fundamental science has been the backbone of American success in technology and innovation. If the United States wants to outcompete foreign adversaries, it cannot defund the National Science Foundation, National Institute of Standards and Technology (NIST), Department of Energy labs, or STEM education programs that power the AI workforce and ecosystem. Leadership in AI requires sustained public investment, not ill-conceived cuts that are not data driven.

Question 4. How has your company benefited from or collaborated with the National Science Foundation, NIST or the Department of Energy Labs in artificial intelligence development?

Answer. OpenAI has greatly valued the opportunity to collaborate with U.S. public institutions, particularly the *Department of Energy National Laboratories,* including *Los Alamos National Laboratory,* in advancing the safe and beneficial use of artificial intelligence for scientific discovery.

Highlights of our collaboration include:

- *Secure deployment of OpenAI models at Los Alamos National Laboratory (LANL):* In a first-of-its-kind partnership, we enabled the deployment of our models on the *Venado supercomputing cluster,* supporting high-assurance scientific research within secure government environments.

- *Wider engagement across the national lab ecosystem:* We have partnered with scientists from across the DOE laboratory network, including hosting a *"1,000+ Scientists Jam Session"* where over *1,500 researchers at nine national labs* explored how AI can accelerate research. These collaborations provide mutual learning: our models improve with real scientific feedback, and lab scientists gain hands-on experience with frontier tools.
- *Ongoing discussions on future-focused projects:* We continue to engage with the labs on mission-aligned areas such as *energy research, bioscience, and materials discovery,* with the shared goal of responsibly harnessing AI to support U.S. scientific and technological leadership.

Question 5. How will cuts to NSF funding impact your workforce and search for talent?

Answer. OpenAI benefits from and deeply values the strong scientific ecosystem fostered by U.S. institutions such as the National Science Foundation (NSF). NSF-funded programs play an important role in supporting the researchers, students, and discoveries that shape the future of artificial intelligence.

A healthy academic research environment:

- *Expands the pool of AI-ready talent,* including many of the researchers we are proud to have hired.
- *Strengthens foundational science,* much of which underpins progress in machine learning and adjacent fields.
- *Supports broader innovation,* ensuring that developments in AI benefit from and contribute to the wider scientific enterprise.

We are committed to working with government and academic partners to ensure the U.S. remains a global leader in both talent and innovation.

Question 6. What impact will cuts to Federal funding for science and research at universities have on U.S. competitiveness in AI?

Answer. The strength of America's research universities has long been a key driver of national competitiveness in advanced technologies, including AI. Public investment in university research plays a unique role in enabling both fundamental discovery and talent development.

In the context of AI:

- Many core innovations have emerged from university labs supported by Federal grants.
- AI models themselves are increasingly being used to support scientific discovery, amplifying the value of research investment.

Continued support for university-based research ensures that the U.S. remains at the forefront of scientific and technological progress. We are enthusiastic about the opportunity to continue contributing to this shared mission alongside academic and Federal partners.

Energy Needs and R&D for Fusion Energy

The growing demand for electricity to power AI data centers is staggering. By some estimates, global electricity demand from data centers is projected to more than double by 2030 exceeding 945 terawatt-hours (TWh). It will strain electric grids and energy providers.

Question 7. What plan does your company have to meet energy needs for AI, and what investments are you making into non-fossil fuel sources of energy such as fusion?

Answer. We anticipate that AI's energy needs will incentivize substantial new investment in grid infrastructure and drive innovation in energy technologies. Advances in AI, including reasoning models, hold significant promise for scientific discovery, including in the field of abundant, affordable energy solutions. Indeed, our existing partnership to deploy reasoning models for use by the National Labs includes Lawrence Livermore, whose scientists were first in the world to demonstrate fusion ignition. Alongside others within the industry, we also will continue our work to find new ways to ensure our technology is as efficient as possible, including when it comes to energy consumption. Even as we continue to see promising research and innovation, we also remain focused on optimal use of available computing power, both in research and deployment.

Question 8. With respect to fusion energy, how can the government partner with the private sector to scale fusion technology as it continues to develop?

Answer. The scaling laws are clear. American AI leadership is a function of energy, data, and chips. Government support for fusion research and pilots can be cru-

cial, as companies look to identify viable paths to raising the capital they need for continued scientific progress and ultimately development at scale. As the government continues to support fusion research by private entities and at our national labs, we hope that our work with the National Labs as well as early explorations with a range of fission and fusion companies provides early indication of the role that AI can play in advancing energy abundance.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. AMY KLOBUCHAR TO SAM ALTMAN

Topic: Workforce Development of Engineers

In your testimony you said that by the end of this year Open AI "will release AI powered tools that can handle sophisticated software engineering." I'm concerned we won't be able to grow senior engineers if AI replaces junior engineers.

Question. How will you ensure Open AI grows the talent needed for future success?

Answer. We are very focused on fostering and training software engineering talent—including through the role our technology can play in bolstering American education at all levels and expanding computer science capabilities across our schools and all sectors of the economy. Our AI tools are highly complementary to existing software know-how and can dramatically increase the capabilities of small and large businesses. One example is how our tools can reduce a software engineer's manual work and allow those engineers to focus on more complex tasks, thereby strengthening their skills in important areas like critical thinking, creativity, and problem-solving.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BRIAN SCHATZ TO SAM ALTMAN

Future of Work

Question 1. How is your company taking advantage of the automation you're empowering to scale productivity without leaving workers behind?

Answer. Our AI tools are used in a wide range of ways at OpenAI, such as helping people with tasks like developing code, interacting with customers, and analyzing data. We see advanced AI as a way to help people and businesses gain new capabilities, increase innovation, and uplift productivity. As AI tools become increasingly capable, we think it's important to bolster education at all levels, from elementary schools through mid-career workers. Everyone should have the opportunity to benefit from AI.

Question 2. Once OpenAI has "generated orders of magnitude" of returns on investments, do you believe the Federal government has any responsibility to make sure those benefits are distributed equitably across all Americans?

Answer. OpenAI is a relatively young company and we continue to invest at scale to develop new and more capable AI models, and we invest heavily in the infrastructure required to achieve our mission. We are not a profitable company at this stage, unlike more mature technology firms that have large, sustained profit margins. We believe the Federal government should ensure Americans have the freedom to access and benefit from AI as it advances.

Question 3. OpenAI's capped profit structure was originally designed, in part, to mitigate the harms of workforce automation by using excess profits from AI to support those who lost their jobs. However, per your corporate restructuring announcement, you now intend to remove that cap. Do you still intend to support potential displaced workers under this new structure?

Answer. Earlier this month *we reaffirmed our commitment* to the OpenAI nonprofit having control over the organization. The previously existing for-profit subsidiary—originally structured as a "capped-profit" LLC—will be converted into a Public Benefit Corporation (PBC), and this new entity will remain under the control of the nonprofit. The PBC's mission will be the same as the nonprofit's, which is to ensure AGI benefits all of humanity. The new structure will allow us to strengthen our ability to attract capital, talent, and resources, while preserving our founding mission to make our services broadly available to all of humanity. We believe our mission of achieving safe and beneficial advanced AI will help people and businesses gain new capabilities, increase innovation, and uplift productivity.

Question 4. Will OpenAI commit to developing clear standards not only for data quality, but for labor protections and responsible practices across the AI training data supply chain?

Answer. OpenAI has a strong track record of transparency around how our models are built and how we ensure they're safe and designed to prevent a wide range of potential harms. We will continue to work with the public and private sectors to provide insights and understanding as our technology advances. We also have made public our supplier *code of conduct.*

Corporate Restructuring

In 2017, you said "That's why we're a nonprofit: we don't ever want to be making decisions to benefit shareholders. The only people we want to be accountable to is humanity as a whole." In your previous testimony before the Senate, you explained the specific safeguards in OpenAI's structure that ensure it remains true to its charitable mission. On May 5, 2025, OpenAI announced that it would transition its for-profit operations to a Public Benefit Corporation (PBC), but that the nonprofit would retain control.

Question 5. What mechanisms are in place to prevent mission drift and ensure that the PBC's actions align with OpenAI's foundational goals?

Answer. The nonprofit will control and be a large shareholder of the PBC. Both the nonprofit and the PBC will have the same mission—to ensure that AGI benefits all of humanity. We have *described our plans,* including our ongoing commitment to our mission, in this recent statement. Other AI labs, like Anthropic and xAI, are also PBCs, as are other purpose driven companies like Patagonia.

Question 6. What criteria, metrics, or benchmarks will OpenAI use to evaluate whether its actions serve the public interest?

Answer. We will continue to be transparent about how our models work, including publishing a "*model spec*" that outlines how our models are designed and the safety guardrails incorporated into training. We also maintain a public *preparedness framework,* which details how we evaluate and mitigate potential AI harms.

In addition, our corporate structure is fundamentally designed to serve the public interest. As a Public Benefit Corporation (PBC), the PBC board of directors will hold a fiduciary duty to uphold the public benefit objectives outlined in our charter. These objectives are aligned with—and in fact identical to—those of the OpenAI nonprofit. This means that serving the public interest is not just a guiding principle, but a legal obligation embedded in our governance model.

By combining technical transparency, safety-focused metrics, and a mission-aligned corporate structure, we ensure that our actions remain squarely focused on advancing the public good.

Question 7. Will OpenAI commit to regular public disclosures about its operations, decision-making processes, and AI developments?

Answer. We have a long track record of transparency and engagement on these issues, including published, *in-depth research, system cards, safety specifications* and testing information, ongoing research programs and academic partnerships, and disclosures about how our models and safety work are developed and implemented.

Question 8. Do you still agree that the interests of your shareholders are not the same as the interests of the public, and might not always be aligned with America's security interests?

Answer. Our mission is to ensure that AGI benefits all of humanity, and that will not change. We believe that advancing democratic AI, led by the U.S. and like-minded nations and anchored by a commitment to freedom and democratic principles, is the best way to ensure both our mission and America's security interests. As we *announced* earlier in May, OpenAI was founded as a nonprofit, and is today overseen and controlled by that nonprofit. Going forward, it will continue to be controlled by that nonprofit. Our for-profit LLC, which has been under the nonprofit since 2019, will transition to a Public Benefit Corporation (PBC)—a purpose-driven company structure that has to consider the interests of both shareholders and the mission. The nonprofit will control and also be a large shareholder of the PBC, giving the nonprofit better resources to support many benefits. Our mission remains the same, and the PBC will have the same mission.

Question 9. How will OpenAI manage potential tensions between profit-driven investor expectations and its nonprofit mission?

Answer. Our mission remains the same—to ensure that AGI benefits all of humanity. The nonprofit and PBC share the same mission.

Safety and Security

Question 10. Do you agree that one of the board's core responsibilities is to ensure OpenAI's models are thoroughly tested before their release to ensure they won't harm the public?

Answer. We conduct extensive safety testing and outline both how our models are designed and the work we do to safeguard against potential risks. This process is outlined on *our website* and is discussed and detailed in extensive public documentation. Last year, the Board formed the *Safety and Security Committee,* an independent oversight committee focused on model safety and security. The Committee is briefed by company leadership on safety evaluations and exercises oversight over major model releases.

We also maintain a productive partnership with the U.S. AI Safety Institute that enables AI research, testing, and evaluation focused on national security risks.

Question 11. Do you agree that employees should be encouraged to raise concerns about threats to the security of the United States?

Answer. OpenAI believes that open communication is essential to a successful work environment and that all employees should feel free to raise issues of concern without fear of reprisal. We have worked to foster a culture where people feel a responsibility to raise potential safety concerns and work to address them. This is encompassed in our *Raising Concerns policy,* which is made available to all OpenAI employees.

Question 12. Does OpenAI maintain the commitments it made under the Biden Administration Voluntary AI Commitments?

Answer. OpenAI continues to prioritize the safe, secure, and transparent development and use of AI technology.

Question 12a. If so, will OpenAI continue to maintain these commitments under its new PBC structure?

Answer. Regardless of our corporate structure, OpenAI will always be committed to the safe, secure, and transparent development and use of AI technology.

Question 13. Does OpenAI maintain the commitments it made under the Frontier AI Safety Commitments?

Answer. OpenAI remains committed to fulfilling the voluntary Frontier AI Safety Commitments made at the Seoul AI Summit in May 2024. In advance of the Paris AI Action Summit in February 2025, we published an update showing our progress on the voluntary commitments made at Seoul and at previous AI summits, available *here.* [*https://cdn.openai.com/global-affairs/paris-summit-update-on-voluntary-commitments-20250207.pdf*]

Question 13a. If so, will OpenAI continue to maintain these commitments under its PBC structure?

Answer. We will continue to prioritize the safe, secure, and transparent development and use of AI technology.

Accelerating Scientific Research

Question 14. How is OpenAI expanding partnerships or tool development to accelerate breakthroughs in biotechnology and other scientific research, and what additional support do you need from Federal agencies to scale these efforts responsibly?

Answer. We are incredibly excited about how our AI models can accelerate scientific progress. We have established a *strong partnership* with the National Laboratories to further these efforts. We would continue to encourage public sector uptake of AI tools across institutions that work on science and health. And we strongly encourage efforts to incorporate AI into education at all levels, which will equip many more people to harness AI for scientific breakthroughs.

Question 15. OpenAI models increasingly generate content used in scientific inference. What evaluation protocols or benchmarks do you believe are necessary to ensure that AI-generated results in scientific fields are robust, reproducible, up-to-date, and trustworthy?

Answer. Different fields have different approaches to this, but generally speaking, robust science should be reproducible and peer reviewed. This helps ensure the validity, significance, and originality of scientific work and helps improve the overall quality of research across various fields.

United Arab Emirates (UAE)

Question 16. Please share why you believe the UAE is a trustworthy partner for increased collaboration on AI.

Answer. The UAE is aiming to be a world leader in integrating AI into their industry and society. They have spent years developing plans that bring together government, investor, private sector and educational institutions towards this end. We

believe it's important that American companies don't sit on the sidelines as they proceed with their plans.

As we partner with countries under our OpenAI for Countries initiative we are ensuring that democratic values shape the future of AI. To do this securely, we need smart export controls that balance innovation and safety, while aligning nations around rights like free expression and safeguards against surveillance. We are working with the Federal government to ensure our international partnerships meet the highest standards of security and compliance.

Question 17. What actions by the UAE would cause you to reconsider support for cooperation and collaboration on AI?

Answer. Our partnerships with foreign governments will only succeed by following the standards of security and compliance set forth by the United States government. Foreign governments will also be required to comply with our usage policies.

Energy Consumption and Cost of Winning

Question 18. Do you support President Trump's efforts to expand coal power for AI data centers?

Answer. We support efforts to ensure AI infrastructure is powered by energy that is affordable, reliable, and scalable—goals that are critical to U.S. economic competitiveness and job creation. How best to achieve that, across a mix of energy sources, is a matter for policymakers and the broader energy sector.

Question 19. How are you addressing the costs associated with new infrastructure development in the short-term, including in terms of water consumption, pollution, and climate impacts?

Answer. We take very seriously the impacts associated with AI infrastructure projects. We intend to actively engage with federal, state, and local officials, as well as communities, to responsibly manage water usage and climate impacts. Our aim is to ensure that our AI infrastructure projects not only support technological advancement but also contribute positively to sustainability and quality of life.

Question 20. What plans do you have to source clean energy and to publicly report your companies' emissions?

Answer. We expect our near-term infrastructure projects to incorporate significant clean energy components, including nuclear energy, solar generation, wind and large-scale battery storage, as well as to comply with all applicable environmental and reporting requirements. We are also actively exploring how we can support accelerated timelines for advanced clean energy technologies, including advanced nuclear and fusion.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. EDWARD MARKEY TO SAM ALTMAN

Comprehensive Impacts of Data Center Construction

Question 1. When planning for data center construction, does your company conduct a cradle-to-grave infrastructure study that includes wildlife, community, and pollution impacts during and beyond the operational lifespan of a data center? If yes, what have you learned from those studies? If no, why not?

Answer. In our ongoing site selection process, we are assessing sites in accordance with all applicable Federal and state environmental laws, as well as utilizing industry experiences, consultants, and best practices. We work closely with our infrastructure partners such as Oracle and Microsoft which have been responsible for these activities to date.

Backup Energy Generation

Question 2. Does your company use backup diesel generators at any facilities?

Question 2a. If yes, please provide a list of each facility where diesel generators are being used, along with the location, quantity, and type of generators.

Question 2b. If yes, did your company consider the use of battery storage technology as an alternative to diesel generators? Please explain your decision process.

Answer. We are not currently utilizing backup diesel generators. In our site selection and design process, we will consider alternatives to diesel generators, including BESS technologies. We have battery backup power.

Energy Mix

Question 3. Does your company utilize any on-site or colocated energy generation to power your data centers?

Question 3a. If yes, please provide detail how much power comes from on-site and colocated energy generation.

Question 3b. If yes, please list all on-site and colocated energy sources (*e.g.,* renewable, nuclear, hydropower, gas-powered turbines, etc.) that are being utilized to power your data centers.

Answer. In developing our AI infrastructure, we will consider both on-site and utility power, including co-located energy sources.

Question 4. How does your company ensure local ratepayers are not responsible for paying the cost of new energy infrastructure, such as transmission lines, needed to meet the data center's energy demand?

Answer. We intend to actively collaborate with utilities, regulators, and local governments to ensure that infrastructure costs associated with our data centers do not unfairly burden local ratepayers, maintaining fairness and affordability for all energy consumers

Energy Consumption in AI Model Training

Question 5. How many GWh of energy do you estimate was used to train GPT–4.1 and any new AI models?

Answer. We are actively working to reduce energy consumption across all stages of AI development, from initial training to practical inference. We invest continuously in improvements to both hardware and software efficiency, collaborating closely with researchers, policymakers, and industry partners to establish stronger industry standards and credible, open benchmarks, such as those developed by *ML Energy Initiative* and *Epoch AI.*

As we explore new ways to enhance efficiency, we remain committed to thoughtful and responsible use of computing resources. Innovations like model distillation, which allows us to train large, comprehensive models that can subsequently be refined into smaller, highly efficient versions for targeted applications, are a key part of this strategy. As algorithms and AI technologies continue evolving, we anticipate ongoing improvements in both energy efficiency and resource conservation, including reductions in water usage.

Question 6. Data centers require vast amounts of water for cooling. When water is at critically low levels, does your company continue to pull water for building cooling? Does it have a contingency for operating as to not put further stress on the water supply and potentially take limited resources from households, agriculture, or small businesses?

Answer. We are currently evaluating strategies to ensure sustainable water use, including in site selection, through advanced cooling technologies, and via operational adjustments and contingency plans that prioritize community water needs, ensuring responsible resource management and minimizing potential impacts on local agriculture, households, and small businesses.

Government Partnerships

Question 7. Your company offers AI products specifically for the public sector, which are now used across Federal agencies and state and local governments. Given the especially heightened risks related to governments' use of AI—including the denial of rights or access to services and false or incorrect information about government benefits and programs—what additional steps have you taken to ensure that these tools are safe and effective to use in the context of government?

Answer. We provide advanced AI tools to consumers, businesses, and governments. Each of these use cases is different, but each requires safe and beneficial AI. We have outlined our safety and security work on our *website* and have published a "*model spec*" which provides extensive details about how we engineer safety in model development.

Question 8. What protocols do you have in place to work with government agencies to rectify any harms or errors when they occur?

Answer. We solicit feedback from customers and partners, including government agencies. We don't decide how our models will be used by particular customers but work to ensure these models are highly capable and safe to deploy. We also provide a secure way to report harms through our Trust & Transparency reporting *resources.*

Business Partnerships

Question 9. When you make your AI systems available to other users/deployers, what are the types of issues you agree on?

Answer. We have usage policies in place for our various products and tools, including our API, which businesses typically use as a base to build new products and services. Our *usage policies* are publicly available.

Question 10. What information do you provide to those other parties/deployers?

Answer. We share publicly available information about how the models are *trained,* how they are designed to be *safe,* and our *usage policies.*

Question 11. What step does your company take any steps to reduce the likelihood that, for instance, those downstream users don't use your services in ways that could harm people or that violate your terms of use?

Answer. We use a combination of automated systems, human review, and user reports to find and assess uses that potentially violate our policies. Violations can lead to actions against the content or a customer account, such as warnings, sharing restrictions, or ineligibility for inclusion in our services.

AI Hallucinations

Recent reporting suggests that generative AI hallucinations are getting worse as the technologies become more powerful. Hallucinations can lead to great harm in certain scenarios, such as when assessing job applications, or even more dangerously in the national security context.

Question 12. Do you agree that we need guardrails to ensure that AI tools are not used or misused in ways that could cause harm to people?

Answer. Yes and we have *usage policies* that are designed to protect against potential harms.

Question 13. What steps is your company taking to address this issue?

Answer. We have *usage policies* that are designed to protect against potential harms.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. TAMMY BALDWIN TO SAM ALTMAN

Question. You have spoken publicly on how you believe AI can be used to advance medical research and improve patient outcomes. However, I am concerned about sensitive personal information being compromised in the development of such models, and how systems may intrench bias. Can you share what role you envision AI having in health care and what protections need to be in place to safeguard patient privacy?

Answer. OpenAI has developed and implemented a range of privacy safeguards across the AI lifecycle, from model development to model deployment. We undertake extensive efforts at the training stages to limit the presence of personal information and decrease the likelihood that our models output sensitive personal information, and we provide users information and tools to address their privacy concerns. We are strongly committed to keeping secure any information we obtain from users or about users. These safeguards are outlined in our *privacy policy.*

We are already seeing our tools being used to accelerate scientific research and help fight disease. We have partnerships across *medical research* and *clinical care.* We have outlined *our approach* to working with healthcare providers, including privacy and security settings for patients. This is critical to ensuring AI tools are used safely in healthcare, where AI is a game changer.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JACKY ROSEN TO SAM ALTMAN

Model Security

Question 1. It's essential we ensure the AI models we use do not become another cybersecurity vulnerability. Would voluntary cybersecurity standards for large AI models or high-risk models and the infrastructure they were trained on be helpful in establishing trust?

Answer. We are committed to continuously upleveling our cybersecurity practices, both from a security perspective (protecting our users, systems, and intellectual property) and from a safety lens (preparing for dual-use frontier capabilities, such as cyber, that have the potential to cause harm).

To ensure the security of our models and systems, we are leveraging our own AI technology to scale our cyber defenses and protect our users, systems, and intellectual property; partnering with third-party cybersecurity experts to rigorously test our cyber defenses through realistic red-teaming; and working to adopt industry-leading security practices such as zero-trust architectures and hardware-backed security solutions, together with our partners.

To ensure the safety of our models, we rigorously evaluate model capabilities consistent with our Preparedness Framework, and publish extensive documentation

about how safeguards we have built into our models and approaches we use to ensure safety and security. We work closely with cybersecurity experts to conduct rigorous third-party assessments of our models, including with government agencies that are focused on combatting cyber risks. Lastly, we continuously monitor and disrupt attempts by malicious actors to exploit our technology.

AI T&E Workforce

A key factor in ensuring the U.S. continues to lead the world in the AI race is by ensuring the AI we develop is the best and therefore the most trustworthy. Validating model outputs is an important step in establishing trust. Right now, however, the U.S. has neither the standards nor the trained workforce to evaluate AI models to establish that we can trust model outputs.

Question 2. What should Congress consider to incentivize and grow the AI test and evaluation workforce?

Answer. We support congressional action to further educational opportunities to grow the AI workforce of the future. Additionally, OpenAI maintains a productive partnership with the U.S. AI Safety Institute that enables AI research, testing, and evaluation focused on national security risks. This partnership relies on skilled technical experts on the government side. More broadly, as AI tools are adopted across government, it will be important to promote AI skills and literacy across the Federal workforce, in order to ensure a capable workforce for AI development and implementation, and for the type of AI safety engineering and testing that you describe.

Question 3. How can Congress support more interdisciplinary approaches to testing and evaluating AI? For example, how do we ensure a model being used in a healthcare setting has been evaluated both by experts in the model technology, but also experts in the healthcare setting in which it will be deployed?

Answer. Different AI use cases will require different approaches. We have worked extensively with regulated industries like financial services and healthcare to ensure our tools comply with their regulatory requirements. This is very important to ensuring AI is adopted across these sectors and that safety and security requirements are met.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. LISA BLUNT ROCHESTER TO SAM ALTMAN

Mr. Altman, AI is becoming integrated into our critical economic and societal infrastructure, with McKinsey *stating* that long-term AI opportunity could be about $4.4 trillion in added productivity growth potential from corporate use cases.

But vendor lock in could be a real *issue,* where an AI vendor dramatically falls behind the competition and leaves its client with a vastly inferior product, which could threaten key industries the AI product operates in.

Question. Do you have any plans or strategies regarding mitigating lock-in for your AI products operating in critical sectors, like the financial and medical sectors, to prevent potential lock-in effects that might harm these critical sectors and the folks therein?

Answer. AI is a highly competitive space, with lots of companies developing advanced model capabilities and new products. The state of the art is advancing rapidly. Firms typically work with multiple models and multiple developers, reducing the risk of lock-in to a particular provider. We think it's important that consumers and businesses are able to choose the best AI models and the best cloud infrastructure on which to run those models.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. TODD YOUNG TO DR. LISA SU

AI Public Awareness and Education

Winning the diffusion race not only requires providing a pathway for greater adoption of the technology and its applications into the general stream of commerce but also bolstering our public awareness and education of AI.

Question. Dr. Su, would you like to comment on this, especially as it relates to building a workforce capable of solving more advanced scientific R&D challenges? If the workforce isn't here at home, where will it go and what are the consequences of that?

Answer. U.S. leadership in artificial intelligence is ultimately based on talent. The single greatest determinant of our long-term competitiveness is whether we can at-

tract, train, and retain the people who will design, build, and govern these systems. Today, there are critical gaps across three main categories:

- Advanced AI research and systems engineering. There is a significant shortfall of PhD-level talent capable of designing and scaling frontier AI models. This includes expertise in machine learning, algorithm optimization, and systems co-design. Many of the leading researchers in this field are being aggressively recruited—and retained—by overseas institutions, often with the backing of state-directed strategies.
- Applied AI and deployment talent. We also lack enough engineers who can safely and responsibly integrate AI into critical sectors like healthcare, manufacturing, national security, and logistics. These are cross-disciplinary roles that require fluency in both AI and the domain in which it's being applied. Bridging that gap is essential if we want AI innovation to translate into broad-based economic benefit.
- Technical infrastructure and hardware specialization. AI leadership requires leading in the underlying hardware stack—everything from chip architecture and interconnect design to advanced packaging and power management. The U.S. has a chronic shortage of semiconductor engineers, firmware developers, and skilled technicians. These roles are vital for making AI models performant, efficient, and scalable.

Addressing these gaps requires more than just graduate fellowships or university funding. A coordinated, national approach—from STEM education in K–12 to community college pathways, visa policy for high-skill immigrants, and public-private partnerships that give students and workers real exposure to cutting-edge AI development.

If the workforce is not in the United States, it will be in other countries, including strategic competitors, to their benefit and our detriment. This includes being able to attract and retain properly vetted foreign talent, many of whom seek to study, work and live here to contribute to our technology leadership.

If we want to lead the world in AI, we must lead the world in talent. That is the foundation—and right now, we are playing catch-up in too many areas.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO DR. LISA SU

AI Standards

The U.S. driving development of AI standards alongside the most advanced democracies in the world offers us an opportunity to set the "rules of the road" for AI on the global stage.

Question 1. How do NIST standards help the United States' competitiveness?

Answer. NIST's Risk Management Framework, including its comparisons with other AI frameworks and international standards, supports U.S. competitiveness because it was developed through a transparent public process which improves customer confidence. NIST has successfully used this framework in areas such as cybersecurity and AI, which AMD has relied upon.

Question 2. What standards would you like to see NIST develop or promote to improve U.S. competitiveness?

Answer. While some standards, like chip design, are best driven by industry consortium, standards that protect national security, such as cybersecurity and silicon providence, are best when NIST partners with industry to promote U.S. competitiveness.

Question 3. How has your company benefited from or collaborated with the National Science Foundation, NIST or the Department of Energy Labs in artificial intelligence development?

Answer. Through more than a decade of partnership with the Department of Energy, AMD now powers the world's two fastest supercomputers: Frontier, which went into operation at Oak Ridge National Labs in 2021, and El Capitan, which went into operation at Lawrence Livermore National Labs late last year. These systems are critical infrastructure for U.S. national security and scientific leadership, including the latest advances in drug discovery, medical research, climate research, hypersonic flight, and even training future generations of more capable Al models.

Question 4. How will cuts to NSF funding impact your workforce and search for talent?

Answer. NSF funding for science and engineering research and education at U.S. colleges and universities provide formative training ground for the American semiconductor workforce pipeline. We support continued funding for these purposes to maintain U.S. AI leadership.

Question 5. What impact will cuts to Federal funding for science and research at universities have on U.S. competitiveness in AI?

Answer. U.S. competitiveness in AI is based on five priorities: (1) accelerating U.S. chip and system innovations to keep our leadership in Al compute infrastructure where U.S. universities have played a key role; (2) open ecosystems that enable universities to directly contribute innovation; (3) U.S. research funding for advanced semiconductor manufacturing and packaging; (4) research investment do drive U.S. AI talent development; and (5) research in cyber techniques to strengthen U.S. defense capabilities. Federal funding for research related to these priorities at U.S. universities has been critical to maintaining our lead. To the extent less Federal funding is available for research related to these priorities at U.S. universities, the private sector will need to provide additional funding and support.

Question 6. What are you most concerned with when it comes to your supply chains?

Answer. As a fabless company, AMD focuses on ensuring that the products it designs can be readily produced and delivered to customers. AMD consequently supports trade policies that allow those efforts to continue, including policies that do not impair the work underway to enhance semiconductor manufacturing capabilities in the United States. We must build a robust domestic supply chain for advanced semiconductor manufacturing and packaging. AI leadership depends on the ability to build complete, integrated systems. That means ensuring we have domestic capabilities in both wafer manufacturing at the most advanced nodes and next-generation packaging technologies, as well as the advanced system capabilities needed to bring it all together. This is an area where strong public-private partnerships are critical. The entire semiconductor industry is aligned on the need to work together and partner with the government to significantly scale U.S. chip production and advanced packaging capabilities here at home.

Question 7. How will the higher costs from tariffs and potential supply chain disruptions impact your plans for building AI infrastructure?

Answer. AMD supports efforts to bring leading-edge manufacturing back to the U.S. We should be clear-eyed about the fact that building leading-edge semiconductor manufacturing will be a years-long project. AMD is encouraged by the new announcement by TSMC of an increase of $100 billion investment in the U.S. It is not viable to have 100 percent of semiconductor manufacturing in one location. As an industry, we need to find ways to invest in the U.S. while building resiliency in our supply chain.

Question 8. Do you anticipate any delays in construction or other work on AI infrastructure around the country? If so, where might these impacts hit the hardest?

Answer. This is a question best answered by parties building AI infrastructure in the U.S.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. AMY KLOBUCHAR TO DR. LISA SU

Topic: Chips Supply Chain

The bipartisan *CHIPS and Science Act* was a landmark investment in domestic semiconductor R&D and manufacturing that I strongly support. Yet design and manufacturing are only part of the supply chain. For example, according to the *Council on Foreign Relations,* chips are typically sent to Southeast Asia for assembly, testing, and packaging.

Question 1. What are additional key points in the chip supply chain that we need to focus on to bolster U.S. economic resiliency?

Answer. We appreciate the continued focus on strengthening America's semiconductor capabilities. Looking ahead, any future legislation offers an opportunity to address areas that are essential to our national and economic security but may have been underweighted in prior legislation. I'd offer three key priorities.

- First, U.S. leadership in chip design must be treated as a national priority. Design is where technological differentiation happens—where performance, efficiency, and capability are defined. Other nations are investing aggressively in this space, not just in manufacturing. A forward-looking policy framework should include targeted tax incentives and refundable R&D credits to ensure

the U.S. becomes a more attractive environment for advanced semiconductor architecture, software tooling, and AI accelerator innovation.

- Second, advanced packaging deserves far greater strategic emphasis. The future of computing increasingly depends on chiplet architectures and 3D integration. Yet today, as you note, most of the high-end advanced packaging capacity resides in Asia. This is a growing risk for both commercial and national security applications. Focused investments in domestic packaging R&D hubs and supply chain readiness can create meaningful capability in an area where the U.S. still has time to lead—but the window is closing.
- Third, talent must remain at the center of any long-term strategy. The current shortage of semiconductor engineers, software-hardware co-design specialists, and packaging technicians is a structural challenge. We encourage continued and expanded Federal support for workforce development programs—from apprenticeship-style models and community colleges to advanced university research partnerships that align directly with industry needs.

In short, we believe future action should be calibrated toward areas where strategic leverage is highest—design, packaging, and talent—and should be structured in a way that encourages broad private-sector investment without distorting the market.

We thank the Committee for its leadership and look forward to working together on policies that secure U.S. semiconductor leadership for the decades ahead.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BRIAN SCHATZ TO DR. LISA SU

Securing American AI Systems

Question 1. Could you please detail what physical security and cybersecurity standards you have adopted, or will commit to adopting, to prevent IP theft and cyber disruptions by foreign adversaries?

Answer. U.S. companies have long-standing partnerships with manufacturers who treat chip technology IP with the utmost sensitivity to ensure customers continue using them for manufacturing.

For the physical security of AMD's products after manufacturing, we take our obligations under export control laws very seriously. As chip manufacturers, we implement strict Know Your Customer procedures and work closely with government partners to ensure compliance.

Effective enforcement ultimately depends on a strong partnership between industry and government, clear regulations, and rigorous oversight across the supply chain.

Question 2. What investments, including know-your-customer processes, are you making in hardware security research and development to prevent your products from falling into the wrong hands?

Answer. AMD maintains a rigorous export control compliance program, which was developed in accordance with guidance from the U.S. Bureau of Industry and Security ("BIS"). Every single order must pass an export compliance review. We have well-established management policies on global trade compliance, which we regularly review and update, and distribute to all our employees. Each element of our program addresses specific requirements associated with U.S. and international regulations to make sure we export our products consistent with our obligations. Our compliance system also leverages software controls to block prohibited sales, such as to government sanctions lists, as well as controls reflecting bans against exports to certain locations and for specified end-uses.

Additionally, we leverage the latest technology and take a risk-based approach to our compliance efforts. Our goal is to know our customers, and we also gather information on indirect customers with point-of-sale records. Before we consider doing business with any party, we screen them for sanctions issues. We have deployed leading third-party resources—including the same ones trusted by the U.S. government—to scrutinize potential customers. These platforms continually study open-source data to see if it yields new intelligence, and we refresh our systems with their up-to-date findings. If red flags arise, our team conducts enhanced due diligence before taking any further steps.

At AMD, compliance is an enterprise-wide effort. All of our employees undertake mandatory compliance training on a yearly basis in order to stay current with their export control responsibilities. We also have a core GTC team of specialists around the world who are responsible for our export control policies, processes, and procedures. This team is located in six countries and collectively has decades of experi-

ence navigating export compliance regulations—and managing and executing export compliance policies—on a global scale.

Question 3. Are these processes industry standards? How do we ensure that your competitors also exercise them?

Answer. AMD strives to have a best-in-class compliance program, as described above. Encouraging all companies to do the same and ensuring the government has sufficient resources to monitor compliance and apply the regulations in a consistent and transparent manner, will enhance the effectiveness of the current controls.

PRC Deployment of AI

Question 4. What do you believe is the greatest national security threat posed by the People's Republic of China's deployment of AI systems?

Answer. AMD is a proud American company for over five decades. We want the U.S. to thrive, innovate and lead. That is good for us as a company and good for our employees, not just in the U.S. but around the world. As a company, AMD is not in a position to identify or prioritize national security threats.

Question 5. What are your recommendations for addressing these threats?

Answer. The export control regulations describe the threats and impose restrictions, accordingly. As noted above, AMD's extensive compliance program is designed to comply with those restrictions, address the identified threats and prevent diversion, working closely with government partners to ensure compliance.

Accelerating Scientific Research

Question 6. How can AMD's collaboration with U.S. national labs be deepened to ensure scientists across disciplines can access next-generation compute?

Answer. AMD's work in supercomputing illustrates the benefits of collaboration with the national labs. As mentioned above, through more than a decade of partnership with the Department of Energy, AMD now powers the world's two fastest supercomputers: Frontier, which went into operation at Oak Ridge National Labs in 2021, and El Capitan, which went into operation at Lawrence Livermore National Labs late last year. These systems are critical infrastructure for U.S. national security and scientific leadership, including the latest advances in drug discovery, medical research, climate research, hypersonic flight, and even training future generations of more capable Al models. In a similar vein, AMD stands ready to continue and enhance its collaboration with U.S. national labs in next-generation compute.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JACKY ROSEN TO DR. LISA SU

Competition Across the AI Ecosystem

It's essential that as we build a strong AI industry in the U.S., we also focus on establishing a competitive one.

Question 1. What should Congress consider to promote competition in the AI ecosystem and across the tech stack, such as interoperability requirements or securing access to computing power for researchers?

Answer. At AMD, we strongly believe that open ecosystems and interoperability are foundational to driving innovation, enhancing security, and fostering robust competition—especially in the fast-evolving AI sector.

Open ecosystems allow developers, researchers, and companies of all sizes to collaborate, build upon shared standards, and accelerate breakthroughs. By designing our platforms to support open-source software and industry-standard interfaces, we lower the barriers to entry for innovators, enabling a broader and more diverse set of participants to contribute. This democratization of access leads to faster iteration cycles and richer innovation pipeline because no one company, however large, has a monopoly on good ideas.

Interoperability ensures that technologies from different vendors can work together seamlessly. This not only gives customers more choice, but it also prevents vendor lock-in and encourages healthy market competition. From a national competitiveness standpoint, it strengthens the entire AI supply chain by creating resilience, redundancy, and flexibility.

Critically, openness also promotes transparency and security. Open standards and community-driven software allow vulnerabilities to be identified and resolved more quickly. This collaborative scrutiny results in more secure systems than those built in closed silos.

In short, interoperability and open ecosystems are not just good engineering practices—they are strategic imperatives. They catalyze innovation, enhance trust, and ensure that the U.S. remains at the forefront of global technology leadership in AI.

As we consider how to foster a more inclusive and competitive AI ecosystem, it's essential to emphasize that this is not just an innovation issue—it's also a national security imperative.

Open ecosystems and interoperability are particularly useful to help ensure that we are not concentrating risk, capability, or decision-making power in the hands of a few companies or platforms. In a world where AI systems will increasingly be used to support defense, critical infrastructure, and intelligence operations, resilience and diversity in the ecosystem are just as important as raw capability.

AI Skills

Question 2. Both of you mentioned the importance of digital skills in your testimony. Can you discuss how it might hurt the U.S.'s ability to compete with China if we don't leverage congressionally-mandated Federal programs like those created under the Digital Equity Act, which were explicitly designed to help Americans build digital skills, like teaching seniors, small businesses, and veterans how to use AI?

Answer. AMD recognizes the importance of digital skills for the U.S. to compete and lead on the international stage. Talent must remain at the center of any long-term strategy to succeed. The current shortage of semiconductor engineers, software-hardware co-design specialists, and packaging technicians is a structural challenge. We encourage continued and expanded Federal support for workforce development programs—from apprenticeship-style models and community colleges to advanced university research partnerships that align directly with industry needs.

We must invest in talent and ensure our national strategy for STEM education and workforce training. The private sector can certainly do more, including expanding university partnerships, investing in reskilling programs, and developing the cross-disciplinary talent required for success. We should incentivize companies to increase their most critical Al R&D efforts. We should make America the absolute best place for Al talent in the world.

To that end, we recognize education holds immense power in shaping the leaders and innovators of tomorrow, and we are passionate about enhancing digital literacy and preparing students for the demands of the 21st century workforce. This is why we partner with schools, educators, and local nonprofit organizations to outfit AMD Learning Labs with AMD processor-based equipment, helping empower teachers and inspire students to pursue STEM education.

As additional examples of AMD's commitment to skills development and training the leaders of tomorrow, AMD supports the Ann Richards School for Young Women Leaders, a unique public school in Austin, Texas, which provides out-of-the-box education strategies and enrichment opportunities that incorporate real-world, hands-on projects that prepare and equip students to tackle big problems with big ideas. High school students complete a college-to-career pathway in STEM fields where women are historically underrepresented. In the university context, AMD University Program offers professors and lecturers free software licenses, hardware donations, and educational resources to support classroom teaching in digital design, embedded systems, computer science and AI.

Beyond the classroom, AMD also welcomed our first cohort of veterans in late 2023 through the Hiring Our Heroes (HOH) Corporate Fellowship Program, strengthening our workforce. The HOH Program, developed by the U.S. Chamber of Commerce, immerses transitioning service members, veterans, military spouses, and military caregivers in the civilian workforce, creating economic opportunity by building their experience and increasing the possibility of a job in the industry.

Through private sector initiatives, such as those at AMD, and the support of Federal programs, we can pave the way for the digital skills literacy for the U.S. to compete and succeed on the international stage.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JOHN FETTERMAN TO DR. LISA SU

Question 1. Dr. Su, data centers use far too much energy—U.S. government data from the Lawrence Berkley National Lab expects that they'll use up to 12 percent of all U.S. electricity by 2028.[1] While my Republican colleagues have been busy overturning important energy efficiency standards, it's more critical than ever for

[1] *https://newscenter.lbl.gov/2025/01/15/berkeley-lab-report-evaluates-increase-in-electricity-demand-from-data-centers/*

American industry to lead on energy efficiency and renewable energy. What role can hardware manufacturers play in improving data center energy efficiency?

Answer. We agree that, as AI systems grow more capable, the demand for compute—and the energy to power them—is rising quickly. Without thoughtful planning, we risk that pressure falling unfairly on everyday Americans who share the grid.

One of the most important ways that we can address this energy concern is at the chip level. Improving compute per watt—that is, how much useful work we get out of each unit of energy—is essential. As a chip design company, we see this as a central part of our mission. Every generation of AI hardware must be significantly more energy efficient than the last. That's not just good engineering—it's good economics and good energy policy.

We also need to be smarter about where and how AI workloads are run. More efficient chips, paired with intelligent system design, can dramatically reduce the power needed to train and deploy these models—especially at scale.

At the same time, industry needs to partner with utilities and policymakers to ensure the costs of growth are not passed on to households. That means investing in clean energy, modernizing grid infrastructure, and being part of the solution—financially and operationally.

AI leadership shouldn't come at the cost of affordability or sustainability. If we lead on efficiency—from the chip level all the way up—we can deliver more innovation with less energy, and make sure the benefits of AI are shared broadly.

Question 2. I appreciate that you referenced technological and process efficiency in your testimony. Specifically, what is AMD doing to improve the energy efficiency of its chips for data center use?

Answer. AMD is highly focused on improving the energy efficiency of its chips for data center use. AMD takes a holistic approach to energy efficient design, balancing advancements across the many complex architectural levers that make up chip design, incorporating tight integration of compute and memory with chiplet architectures, advanced packaging, software partitions, and new interconnects. One of our primary goals across all of our products is to extract as much performance as possible while balancing energy use.

In addition, AMD is not only working on improving the efficiency of its own solutions, but working with partners and the larger ecosystem to optimize virtually every aspect of the AI pipeline. Optimization of its processing units and myriad of connectivity technologies, which link chips, systems and racks, will all help enhance efficiency, along with quantizing models, improving software, and tweaking algorithms. AMD's holistic approach to optimizing power efficiency means continually addressing every link in the virtual AI chain to maximize performance-per-watt.

This is an important consideration because it means the power and energy requirements of products when they initially hit the market, typically improve over the lifetime of the product. AMD has made significant efficiency gains year over year, and supercomputers built using AMD technologies have earned top rankings on the GREEN500. At one point, the AMD-powered Frontier TDS (test and development system) at Oak Ridge National Labs actually topped the GREEN500 list. The GREEN500 ranks supercomputers from the TOP500 list, in terms of energy efficiency.

One of the key areas where significant efficiency gains are possible relate to data movement. The largest AI models require huge amounts of data. As bits move from the tiny register files inside GPUs or accelerator chips, to cache memory, out to High Bandwidth Memory, and to the CPU, and so on, energy consumption grows exponentially. Keeping as much data as close to the accelerator as possible is paramount to maximizing energy efficiency. It's why, for example, AMD continues to increase the amount of cache and memory on its Instinct accelerators generation-on-generation, and why the company continually explores ways to optimize how the data is actually processed.

If we look at typical, large-scale AI system today, roughly half the total power required to run the system is consumed by the GPU's high bandwidth memory (HBM), but the other half is comprised of CPU, scale-up and scale-out networking, and various things like cooling and other data center facility overhead. AMD's goal is to maximize system-level performance, while also minimizing total power consumption, not just from its chips, but from everything around them in the data center as well.

While the significant amounts of compute resources required for AI today are a concern, AMD is working hard to maximize the efficiency of its platforms and meet its related efficiency goals.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO MICHAEL INTRATOR

AI Standards

The U.S. driving development of AI standards alongside the most advanced democracies in the world offers us an opportunity to set the "rules of the road" for AI on the global stage.

Question 1. How do NIST standards help the United States' competitiveness?

Answer. NIST special publications, developed through broad stakeholder consultation, offer American companies specific and adaptable guidance for creating frameworks to develop and deploy AI technologies. For example, the NIST Cybersecurity Framework assists U.S. firms by providing a common vocabulary and voluntary guidelines for information security and cyber risk management.

Question 2. What standards would you like to see NIST develop and promote to improve U.S. competitiveness?

Answer. By providing the technical foundation and establishing common vocabulary for industry-led standards development, NIST can help ensure that U.S. security approaches shape global benchmarks.

Public Investment in Science

Government investment in basic research has contributed significantly to U.S. advances in scientific discovery, innovation and U.S. competitiveness. Continued investment in the U.S. research complex is essential to maintaining U.S. economic strength and national security. This is also the case with AI given the need to continue to develop our high performance computing capabilities and next generation energy technologies required to power the data centers of the future.

Question 3. How has your company benefited from or collaborated with the National Science Foundation, NIST or the Department of Energy Labs in artificial intelligence development?

Answer. As of May 2025, to the best of its knowledge CoreWeave has not formally collaborated with the Department of Energy Labs, the National Science Foundation, or NIST. However, we do look forward to opportunities to collaborate with the Department of Energy on its efforts regarding potential data center development on Federal lands.

Question 4. How will cuts to NSF funding impact your workforce and search for talent?

Answer. CoreWeave supports NSF's important role in workforce development by training U.S. workers in emerging technologies. For example, NSF's *Experiential Learning in Emerging and Novel Technologies program* aims to provide experiential learning opportunities for individuals interested in career pathways in key technologies such as artificial intelligence, semiconductors, advanced manufacturing, and more. These types of programs bolster U.S. competitiveness and ensure that the U.S. has a pipeline of talent to support AI infrastructure and AI development.

A skilled and trained workforce is vital for the stability and expansion of AI data centers—which rely on specialized data center technicians, network and electrical engineers, cybersecurity professionals, and project managers. CoreWeave supports efforts to train the domestic workforce comprised of the skilled workers required to meet the growing AI demand and to accelerate AI innovation.

Question 5. What impact will cuts to Federal funding for science and research at universities have on U.S. competitiveness in AI?

Answer. Science and research universities play an important role in maintaining global leadership in AI. Researchers and students collaborate with the technology industry on cutting-edge projects to shape the future landscape of AI innovation. A unique American advantage in the AI race is our ability to support our researchers and students at universities, as well as to create effective partnerships between academia, industry, and government.

CoreWeave is deeply committed to supporting AI research, science, and education, and public-private collaborative partnerships.

For example, CoreWeave is proud to be a founding partner of the New Jersey AI Hub, along with Microsoft, Princeton University, and the New Jersey Economic Development Authority. The founding partners will collectively invest over $72 million to support the long-term success of the NJ AI Hub, which focuses on research and development efforts, applications of AI in several industry sectors, and AI workforce development and education.

Tariff Impacts

High tariffs and overreaching export controls, especially that are not well coordinated with the private sector and U.S. allies, have the potential to disrupt supply chains and raise costs for U.S. companies. That makes building AI infrastructure like data centers, chips, power plants, and grid modernization more expensive.

Question 6. What are you most concerned with when it comes to your supply chains?

Answer. CoreWeave invests billions of dollars in the equipment which powers AI. Like any business which purchases long-lived capital assets, CoreWeave relies on cost and policy certainty to plan its business and make critical investments in the U.S. This enables us to provide predictable pricing to our customers.

One of our top concerns is ensuring strategic investment stability and predictable prices in the supply chain. We believe it's important to continue to maintain robust supply chain relationships with like-minded and reliable international strategic partners, including chipmakers, original equipment manufacturers, and software providers, to continue to scale AI data center operations in the U.S. and lead in the global AI race.

Question 7. How will the higher costs from tariffs and potential supply chain disruptions impact your plans for building AI infrastructure?

Answer. Volatility in the global supply chain for critical components, such as advanced semiconductors and networking equipment, can raise costs or disrupt deployment timelines, adversely affecting American companies' ability to rapidly scale the AI capabilities necessary to meet the requirements of leading enterprise companies and AI labs.

Acquiring the necessary high-performance components to power AI workloads requires managing a complex global supply chain and maintaining robust supply chain relationships. Continued engagement with leading global suppliers and strategic partners is vital to ensuring the continued operation, expansion, and rapid deployment of U.S. AI infrastructure and to uphold U.S. competitiveness.

We are focused on a supply chain strategy that maintains robust, resilient access to the critical components we need to continue to develop AI infrastructure. We hope the ongoing discussions with trading partners will provide the clarity and certainty American companies require to make the large scale capital necessary to build the AI infrastructure at the scale and urgency this moment requires.

Question 8. Do you anticipate any delays in construction or other work on AI infrastructure around the country? If so, where might these impacts hit the hardest?

Answer. No, we do not anticipate delays in construction or machine (*e.g.,* GPU, storage, networking) work on AI infrastructure. CoreWeave does encounter challenges that we factor into our planning and construction processes. Acquiring utility power can involve long lead times for switch gear and large transformers due to high demand and the availability of critical components. Access to both data center equipment and underlying materials, such as steel or concrete, requires close collaboration with data center operators and supply chain vendors.

Labor constraints can pose another challenge, given the high demand for data center infrastructure and the limited pool of skilled tradesmen and technicians. Even in markets experienced with data center zoning and permitting, government administrative capacity to manage these processes can be a limiting factor.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. AMY KLOBUCHAR TO MICHAEL INTRATOR

Topic: Competition in Cloud Infrastructure

The Federal Trade Commission has raised concerns that startups face significant barriers to entry into artificial intelligence (AI) markets because large technology firms have more access to troves of data, individuals with the necessary expertise, and computational resources.

Question. Can you describe the importance of ensuring that innovative AI startups are able to thrive in markets alongside large, established tech companies? As a relatively new entrant into the AI infrastructure market, what factors are important to ensure a competitive ecosystem?

Answer. CoreWeave's infrastructure is the only cloud platform that was purpose-built for AI and Machine Learning (ML) workloads at the maximum performance and efficiency. CoreWeave's success to date demonstrates that cutting-edge innovation, rapid execution, and unparalleled performance has enabled the company to compete with incumbent platforms.

Our recent growth shows that the market can reward companies that differentiate based on performance, delivering specialized solutions to customers' specific needs. Through our proprietary software capabilities, we enable our customers to achieve substantially higher total system performance and more favorable uptime relative to other AI offerings within existing infrastructure cloud environments and unlock speed at scale.

Policies that ensure a level playing field for all industry stakeholders help ensure that technical merit and innovation determine success.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BRIAN SCHATZ TO MICHAEL INTRATOR

Energy Consumption and Cost of Winning

Question 1. Do you support President Trump's efforts to expand coal power for AI data centers?

Answer. At CoreWeave, we believe that there are abundant solutions for powering AI data centers. Our company is committed to advancing AI infrastructure powered by modern, efficient energy technologies. While we understand the challenges of meeting the rapidly growing electricity demands of AI data centers, we believe the future lies in a diversified energy mix that prioritizes renewables, nuclear power, and fossil energy sources using the most efficient, low emitting technologies.

Question 2. How are you addressing the costs associated with new infrastructure development in the short-term, including in terms of water consumption, pollution, and climate impacts?

Answer. CoreWeave prioritizes balancing growth with also being efficient and responsible with resources. Regarding water consumption, CoreWeave often deploys closed-loop, air-cooled infrastructure and liquid cooling technologies that drastically reduce or eliminate water use compared to traditional data centers. Many of the data centers where we operate provide non and low-emitting energy sources for our operations.

Question 3. What plans do you have to source clean energy and to publicly report your companies' emissions, if you are not already?

Answer. CoreWeave is currently in several data centers that use clean energy, have on-site renewables and/or buy Renewable Energy Certificates. As we expand into new data centers, we are actively engaged in procuring clean energy to power our services.

To meet its compliance obligations under California law SB 253, CoreWeave will report its Scope 1 and Scope 2 greenhouse gas emissions in 2026.

Question 4. Do you believe current incentive structures drive or ignore the opportunity for energy innovation?

Answer. Past and current incentive structures have helped to drive down the cost of all energy sources during the 21st century. These include research and development and tax policies.

To maintain and strengthen the U.S. position in the AI-continued policies are required to ensure adequate supplies of clean, reliable supplies of affordable energy CoreWeave supports policies which will enable a balanced diverse portfolio of energy technologies including advanced nuclear, carbon capture and sequestration, and continued advances in renewable energy. The nation also needs to modernize the grid and improve energy efficiency.

PRC Deployment of AI

Question 5. What do you believe is the greatest national security threat posed by the People's Republic of China's deployment of AI systems?

Answer. The national security concerns surrounding the People's Republic of China's (PRC) deployment of AI systems are interconnected. These include the integration of AI into their long-standing civil-military fusion strategy, resulting in dual-use capabilities that further their economic and defense goals. At the same time, the PRC aims to expand its global AI influence by establishing its AI ecosystem as a foundational element in numerous countries, increasing its capacity to shape the rules governing AI development and deployment worldwide.

Question 6. What are your recommendations for addressing these threats?

Answer. To maintain its leadership in AI and effectively address national security threats, the U.S. must scale its AI ecosystem and foster innovation across all layers of the AI stack. Carefully calibrating export controls and trade agreements to address security concerns will limit the PRC's access to vital AI technologies and diminish its global AI influence. Enabling the diffusion of the American AI ecosystem

to allies and like-minded nations that commit to security and technology frameworks will also address this threat. Strengthening American AI leadership will ensure that democratic values and security interests shape the rules governing global AI development.

Accelerating Scientific Research

Question 7. What barriers do you see to making advanced cloud computing capacity available to academic and national lab researchers?

Answer. We are well-positioned to serve academic and national lab researchers because we offer products designed with those users in mind. We may face challenges in finding available capacity due to increasingly large demand from the private sector and AI labs.

Question 7a. How could Congress help to responsibly reduce those barriers?

Answer. Congress could consider establishing opportunities and resources to enable partnerships between the private sector and Federal research centers. A dedicated resource or consortium that aggregates computing demand across research institutions could create more procurement power and reduce uncertainty that currently acts as a constraint.

Relatedly, implementing streamlined, standardized procurement vehicles for advanced cloud computing could reduce administrative barriers that better align with both research timelines and industry business models.

Question 8. Should there be dedicated Federal channels or procurement pathways to ensure U.S. Federal researchers can access AI compute at the pace of scientific need?

Answer. Compute allocation is presently dictated through large procurement contracts with private sector companies. We seek out and prioritize these contracts as they help us derisk our financial operations due to their large size and length. This leads us to deprioritize shorter-term and smaller-value contracts. The Federal government could consider mechanisms to aggregate demand across academic and national lab institutions to ensure they can access the compute needed to maintain the U.S. leadership in AI.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. EDWARD MARKEY TO MICHAEL INTRATOR

Comprehensive Impacts of Data Center Construction

Question 1. When planning for data center construction, does your company conduct a cradle-to-grave infrastructure study that includes wildlife, community, and pollution impacts during and beyond the operational lifespan of a data center? If yes, what have you learned from those studies? If no, why not?

Answer. CoreWeave is developing a more formal site selection process that will ensure we are tracking climate risk and resiliency, as well as examine broader ecosystem risks. While we do not currently conduct formal cradle-to-grave lifecycle analyses for every facility, our approach integrates rigorous environmental due diligence, stakeholder engagement, and adaptive best practices to minimize ecological and community impacts.

We select sites with adaptive reuse as the focus and we often retrofit existing structures rather than developing greenfield sites, allowing us to have less impact on land use. In addition, we focus on using our existing data centers as efficiently as possible so that we can fit more servers into less space, therefore reducing the need for overall square footage.

Backup Energy Generation

Question 2. Does your company use backup diesel generators at any facilities?

Answer. Our data center providers use backup diesel generators in the data centers in which we operate. These backup generators are assets that belong to our data center providers. Their service to us includes redundancy to the utility power source for the data center.

Question 2a. If yes, please provide a list of each facility where diesel generators are being used, along with the location, quantity, and type of generators.

Answer. Our data center providers use backup generators, and these assets belong to the providers.

Question 2b. If yes, did your company consider the use of battery storage technology as an alternative to diesel generators? Please explain your decision process.

Answer. We do this currently. Our data centers have uninterruptible power supply infrastructure in place that would cover the immediate 4–6 minutes of a power outage to the data center.

CoreWeave is exploring ways to incorporate battery storage into our back-up generation as part of maintaining our competitive edge with a focus on network resiliency. Backup battery storage would allow us to have greater resiliency for CoreWeave's operations and the grid overall.

We see battery storage as a complementary technology that can further strengthen our microgrid capabilities, manage renewable intermittency, and provide fast-responding backup for mission-critical workloads.

Energy Mix

Question 3. Does your company utilize any on-site or colocated energy generation to power your data centers?

Answer. No.

Question 3a. If yes, please provide detail how much power comes from on-site and colocated energy generation.

Question 3b. If yes, please list all on-site and colocated energy sources (*e.g.,* renewable, nuclear, hydropower, gas-powered turbines, etc.) that are being utilized to power your data centers.

Question 4. How does your company ensure local ratepayers are not responsible for paying the cost of new energy infrastructure, such as transmission lines, needed to meet the data center's energy demand?

Answer. As we review new sites, we are assessing the cost structure of our energy. For at least one of our large expansions coming later this year, the rate CoreWeave pays will include additional surcharges in order to fund rate protection for local ratepayers. We understand that there is a concern that incumbent ratepayers will bear the cost of increased data center power demand. CoreWeave is committed to paying its fair share of the costs required to meet its power demand.

Energy Consumption in AI Model Training

Question 5. Data centers require vast amounts of water for cooling. When water is at critically low levels, does your company continue to pull water for building cooling? Does it have a contingency for operating as to not put further stress on the water supply and potentially take limited resources from households?

Answer. CoreWeave aims to reduce the amount of water it uses and we have a different approach to cooling data centers. Whenever possible, we set up air cooled chillers, which are a closed loop system. Once the system is filled, there is a limited amount of water required. Each data center is evaluated to consider the environmental and climate cost-benefit analysis of power usage versus water usage.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JACKY ROSEN TO MICHAEL INTRATOR

Competition Across the AI Ecosystem

It's essential that as we build a strong AI industry in the U.S., we also focus on establishing a competitive one.

Question 1. What should Congress consider to promote competition in the AI ecosystem and across the tech stack, such as interoperability requirements or securing access to computing power for researchers?

Answer. Competitive dynamism is essential for continued American AI leadership. Policies that ensure a level playing field for all industry stakeholders will benefit American dynamism and innovation more broadly. In this vein, it is important to streamline government certification processes, ensure the efficient administration of existing requirements like export license reviews, and ensure that newer entrants can effectively bid for government contracts. The key is ensuring that technical merit and innovation determine success.

In addition, open standards are an important factor for operating our cloud at scale. CoreWeave currently participates in industry groups that define open standards and hardware interoperability. Without these industry groups defining hardware interoperability, CoreWeave would not be able to deploy the heterogeneous mix of hardware that our customers demand at the scale and speed that they need. Open standards can enhance supply chain resiliency and accelerate innovation, while also reducing barriers for different and new stakeholders to participate.

Model Security

Question 2. It's essential we ensure the AI models we use do not become another cybersecurity vulnerability. Would voluntary cybersecurity standards for large AI models or high-risk models and the infrastructure they were trained on be helpful in establishing trust?

Answer. Yes, voluntary cybersecurity standards for AI infrastructure can be helpful in establishing trust and establishing common vocabulary for stakeholders, particularly through industry-led initiatives.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. ROGER WICKER TO BRAD SMITH

Fiber Optic Cable Supply Chain

Background: Despite some domestic manufacturing expansion, the U.S. remains heavily dependent on foreign imports of fiber optic cable from Thailand, with a particular dependency on components from China. In 2024, China had 300 million km of excess fiber capacity, which has depressed global prices.

Question. Mr. Smith, when we talk about AI infrastructure, we often focus on compute needs and the gaps in sufficient energy to power AI data centers. But there's also a critical need for infrastructure. This committee often considers fiber infrastructure in terms of its importance to broadband, but it is also essential for AI and our ability to stay ahead in AI development. Can you describe the importance of connecting AI data centers to one another and why this matters?

Answer. AI workloads require significant computational power and fiber networks play a crucial role in delivering high-speed, low-latency connections for real-time data transfer in and out of datacenters. Hyperscalers often have significant fiber optic transport infrastructure, some of which they own and some of which they contract with telecom service providers to use. For example, Microsoft has constructed a fiber-optic AI wide-area network connecting its data center footprint with a 400 terabyte per second fiber-optic backbone, capacity that is ten times what was enabled for traditional data centers. This private network is critical to the functioning of the Microsoft cloud as it moves data between datacenters.

Connecting AI data centers to one another is vital for enhancing performance, reliability, and scalability for AI operations. Interconnected centers enable distributed processing and optimize resource utilization while facilitating load balancing to ensure no single datacenter is overwhelmed. Enabling redundancy and failover mechanisms also enhances disaster recovery and ensures continuous operation. Public networks play a crucial role too and must be sufficiently robust to reliably carry data to and from the data center network.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. TODD YOUNG TO BRAD SMITH

Federal Investment in Science Research

America's global leadership in technology didn't happen by accident—it's been built on decades of strong, sustained Federal investment in basic research.

Question 1. Mr. Smith, Can you speak to why that kind of foundational support from the Federal government remains essential today, and how it has helped position the United States as a global engine of innovation, particularly in emerging fields like AI and quantum?

Answer. For the last 80 years, the United States has led the world with its scientific and technological prowess, resulting in transformative products and capabilities. To outcompete nations like China, we must significantly boost our R&D investments and ensure we have skilled researchers and scientists focused on emerging technologies. Experts predict China will continue to invest substantial resources into next-generation technologies such as AI, advanced manufacturing, clean energy, quantum computing, and semiconductors over the next decade. The United States needs the same level of intentionality today that we had in the early 20th century—where a deliberate effort brought together industry, government and academia to propel scientific advancement.

AI technology is at an inflection point. It is precisely at this stage—when scientific breakthroughs are on the cusp of scaling—that public investment matters most. Cuts to basic research, particularly in AI, risk delaying or even derailing the U.S. trajectory in this modern AI moment. Without predictable, long-term investment,

the United States will fall behind in both scientific leadership and the commercialization of critical technologies.

AI Public Awareness and Education

Winning the diffusion race not only requires providing a pathway for greater adoption of the technology and its applications into the general stream of commerce but also bolstering our public awareness and education of AI.

Question 2. Mr. Smith, can you speak to how the Secretary of Commerce can have a whole of government approach to fostering greater awareness for AI literacy and growing STEM opportunities to create the next generation of our workforce?

Answer. AI, like all new technologies, will disrupt the economy and displace some jobs. However, we believe AI will help lower the barriers to entry for many professions, replace rote tasks, and create a foundation for human creativity that builds on AI tools. AI will create new economic opportunities, allowing entrepreneurs to start new businesses and create new jobs. We are already seeing some of these benefits both at Microsoft and across the economy. A recent LinkedIn report highlighted research on how businesses using AI are seeing the benefits in innovation and creativity, and even in expanding their workforce.

Americans of all ages and backgrounds need AI skills to complete in this new world of work. A key opportunity for most people will be to develop an AI fluency that will enable them to use AI in their jobs, much as they use laptops, smartphones, software applications, and the Internet today.

The U.S. Department of Commerce includes key agencies like NIST, NTIA, MBDA, and the Census Bureau, each playing a unique role in economic development, data governance, and innovation. AI literacy can be integrated across these departments by aligning with their missions—for example, NIST can support standards-based AI education, and NTIA can embed AI training in their digital programs. Recent legislation and national strategies also call on the Department to lead public awareness campaigns and fund AI learning initiatives through libraries, nonprofits, and workforce programs.

AI and Quantum

We know AI and quantum computing are both strategic frontiers, but what's becoming clearer is that the breakthroughs we'll need most may come from how these technologies interact.

Question 3. Mr. Smith, from your vantage point, how should the United States be thinking about the convergence of AI and quantum—not just as two separate priorities, but as part of a unified strategy to outpace China in foundational technologies?

Answer. Artificial Intelligence and quantum computing are two strategic frontiers of technology—and their convergence is poised to unlock unprecedented breakthroughs. In our view, both AI and quantum computing are "foundational technologies" that will drive innovation across industries, from healthcare to defense. We believe there is a powerful synergy in combining AI with quantum computing. For example, quantum computing can vastly accelerate AI. Certain computations that choke classical computers can run exponentially faster on quantum machines. This hints at quantum's potential to turbocharge AI tasks like machine learning optimization, large-scale data analysis, and complex simulations. In practical terms, a future quantum co-processor might, for example, dramatically speed up a clustering algorithm working on high-dimensional data or enable AI to analyze combinatorial scenarios that are infeasible for classical computers. Conversely, AI can help quantum progress. AI algorithms assist in designing better quantum circuits and error-correction methods, essentially using AI to overcome quantum engineering challenges. AI can also generate synthetic data or heuristics to guide quantum algorithm development—essentially, using AI to explore which problems a quantum computer should tackle and how. By co-developing these technologies, we unlock new capabilities—from more accurate drug discovery (*e.g.,* AI identifying candidates, quantum evaluating molecular interactions) to climate modeling and materials science breakthroughs.

Harnessing this dual momentum is not just a scientific imperative, it is a strategic necessity. Given China's coordinated, state-led advancements in both artificial intelligence and quantum technologies, we believe the United States must pursue bold, comprehensive investment across all dimensions: research, policy, industry, and workforce. This includes targeted support for their convergence, cross-disciplinary collaboration, and enabling private-sector innovation.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO BRAD SMITH

AI Standards

The U.S. driving development of AI standards alongside the most advanced democracies in the world offers us an opportunity to set the "rules of the road" for AI on the global stage.

Question 1. How do NIST standards help the United States' competitiveness?

Answer. Industry-led voluntary standards are instrumental in driving U.S. competitiveness by establishing globally recognized benchmarks for quality, safety, and interoperability in AI systems. These standards ensure that American AI technologies are seen as reliable, trustworthy, and high performing, which is critical for adoption both domestically and internationally. NIST's convening function across government, industry, and civil society encourages active participation by U.S. entities in the development of pre-standardization materials—which will ultimately influence the global AI landscape. NIST's priorities—as a reflection of the Administration's priorities—also provide an important signal to industry, encouraging strategic alignment on shared values and global trade.

Question 2. What standards would you like to see NIST develop or promote to improve U.S. competitiveness?

Answer. Today, there is a dearth of consensus reference points—even across industry—that identify the most likely AI risks and how to evaluate and mitigate them reliably. Microsoft is working with industry peers to develop consensus best practices, but there are opportunities to expand and accelerate these efforts. NIST's expertise in test, evaluation, validation, and verification (TEVV) and measurement science should be leveraged to provide structure and guidance to developers and deployers on how to best develop and use evaluations to accelerate adoption while minimizing risks. For example, NIST could develop practices for evaluating evaluations to ensure they are scientifically valid and could assemble panels of evaluations for use by the government and industry to evaluate specific risks or capabilities.

AI Exports and Export Controls

The U.S. needs a strong national export strategy for technology and other U.S. exports. Alliances create markets and engaging our allies is essential to effective coordination and implementation of export controls.

Question 3. What is the best way for the U.S. Government—specifically, the U.S. Department of Commerce—to support U.S. companies in exporting AI technologies? Where should we target to make sure our foreign adversaries do not get there first?

Answer. Congress and the Administration both have key roles in protecting our national security by preventing adversaries from obtaining advanced technology components. Policies must be balanced so that American companies can thrive and set the global standard for the technology.

The proposed "AI Diffusion" rule, sets forth a robust set of security standards expected of companies building AI datacenters. We believe these qualitative guardrails point in a sensible direction for U.S. policy especially as it relates to national security concerns. However, we disagree with the "tiering" of countries as well as certain quantitative restricts—absent a universal license—as we think arbitrary restrictions undermine international confidence in access to critical American AI technology and therefore restrict the ability of U.S. firms to compete globally.

Question 4. You mentioned that countries around the world will only use American AI if they can trust it. How can the U.S. government partner with the private sector to build that trust?

Answer. Business planning and investment decisions rely heavily on predictable and trusted relationships on both sides. By the same token, uncertainty complicates and slows decision making and execution. Clear and consistent policies enable companies like Microsoft to make long-term commitments to innovation, workforce development, and infrastructure investment both abroad and domestically. The Federal government has an opportunity to lead in their own procurement rules and the adoption and utilization of AI products and services.

Privacy

Data is a foundational element in the tech stack for any AI system. Advances in AI will spur an increase in demand for data, both to train and ground AI models. This enhances the need for bright lines related to consumer data collection and usage. The best way to set these bright lines is through a strong, comprehensive Federal data privacy law.

Question 5. Do you agree that bright lines around consumer privacy will spur innovation in artificial intelligence?

Answer. Yes, raising privacy protections will spur innovation and benefit the U.S. economy by bolstering consumer confidence and ensuring that data will be appropriately protected while still being available for beneficial uses. Both components are critical to AI development. Consumers remain deeply concerned about the collection and processing of their personal information.[1] They report confusion about where it is going and cite concern over a loss of privacy from social media, AI, and impact on children.[2] They also report little faith in government's ability to solve the problem, with 71 percent saying that they do not expect social media companies to be reined in even as 77 percent say they would like more government action.[3] Concern is shared across the political spectrum with 68 percent of Republicans and 78 percent of Democrats saying there should be more regulation over personal information.[4] By some measures the problem is actually getting worse.

The share of adults reporting that they understand privacy laws very little/not at all has risen from 63 percent in 2019 to 72 percent in 2023.[5] None of this should be a surprise. Consumers are deluged by the ways that lost or misused personal information can harm them. Whether it's through data breach notifications and fears over increasingly sophisticated identity theft scams,[6] misuse of personal information by employers,[7] or unexpected negative outcomes such as a fitness app revealing the location of secret U.S. military bases,[8] the use and misuse of personal information can spill into every facet of a consumer's life.

This lack of consumer confidence is directly impacting economic growth. A recent report by the World Trade Organization and the OECD found that if all nations adopted privacy safeguards, global exports would increase by 3.6 percent and global GDP would grow by 1.77 percent.[9] An absence of privacy protections would cause global GDP to fall by almost 1 percent and global imports by over 2 percent with the largest impact on high-income economies.[10] A fragmented U.S. privacy landscape—such as the state patchwork currently in place in the US—also risks negatively impacting the U.S. economy. One industry estimate puts the cost of a patchwork of state laws at over $1 trillion over 10 years, with $200 billion of that burden falling on small businesses.[11] Given these important benefits and looming potential costs, passage of Federal comprehensive privacy legislation is critical for spurring AI innovation.

Question 6. Will Microsoft work with me on Federal comprehensive privacy legislation to set those bright lines?

Answer. Yes, Microsoft will work with you and any other members of congress on Federal comprehensive privacy legislation. We've been advocating for it since 2005, because we believe it is critical to building consumer trust and driving economic growth in the United States.[12]

Energy Needs and R&D for Fusion Energy

The growing demand for electricity to power AI data centers is staggering. By some estimates, global electricity demand from data centers is projected to more than double by 2030 exceeding 945 terawatt-hours (TWh). It will strain electric grids and energy providers.

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[1] *How Americans View Data Privacy,* Colleen McClain, Michelle Faverio, Monica Anderson and Eugenie Park, Pew Research Center, October 18, 2023. See: *https://www.pewresearch.org/internet/2023/10/18/how-americans-view-data-privacy/*

[2] *Id.*

[3] *Id.*

[4] *Id.*

[5] *Id.*

[6] *Verizon 2024 Data Breach Investigations Report, see: 2024 Data Breach Investigations Report | Verizon*

[7] Michelle Boorstein, Marisa Iati, and Annys Shin, "Top U.S. Catholic Church official resigns after cellphone data used to track him on Grindr and to gay bars," Wash. Post (July 21, 2021), *see: https://www.washingtonpost.com/religion/2021/07/20/bishop-misconduct-resign-burrill/* .

[8] Jeremy Hsu, "The Strava Heat Map and the End of Secrets", Wired (Jan 29, 2018), *see: Strava Data Heat Maps Expose Military Base Locations Around the World | WIRED*

[9] OECD/WTO (2025), *Economic Implications of Data Regulation: Balancing Openness and Trust,* OECD Publishing, Paris, *https://doi.org/10.1787/aa285504-en.*

[10] *Id* pg. 39.

[11] ITIF, "The Looming Cost of a Patchwork of State Privacy Laws," (January 2022) see: *https://itif.org/publications/2022/01/24/50-state-patchwork-privacy-laws-could-cost-1-trillion-more-single-federal/*

[12] "Microsoft Advocates Comprehensive Federal Privacy Legislation," Microsoft News, November 3, 2005, *see: https://news.microsoft.com/2005/11/03/microsoft-advocates-comprehensive-federal-privacy-legislation/*.

Question 7. What plan does your company have to meet energy needs for AI, and what investments are you making into non-fossil fuel sources of energy such as fusion?

Answer. As we consider any power sources, we look for reliable, scalable and cost-effective options that can be developed in rapid timelines aligned to our datacenter growth. To match our carbon emitting electricity use, Microsoft has entered into power purchase agreements to add 34 GW of renewable energy capacity globally. In 2024, we entered into a power purchase agreement to add 835 MW of carbon-free, nuclear energy from Constellation's Crane Clean Energy Center that is anticipated to be put into service by 2028, which will provide additional capacity to the PJM interconnect.

In 2023, we announced an agreement with Helion Energy to procure power from its first fusion power plant that is under development. We are optimistic that fusion energy can play an important part of the grid mix in the future.

Question 8. With respect to fusion energy, how can the government partner with the private sector to scale fusion technology as it continues to develop?

Answer. To achieve fusion breakthrough and scale fusion energy, government and private sector partnerships are essential in order to reduce risk, accelerate innovation, and build the foundation for fusion commercialization. The government can support cost-sharing programs and adopt clear, adaptive regulatory frameworks specific to fusion to accelerate deployment. Aligning public resources with private innovation can help bring fusion energy to market faster and more affordably.

AI Safety

We are seeing a proliferation of deepfakes and other AI content that threatens the average person's ability to discern truth in media. And that's just one area in the field of AI that presents complicated safety questions. The U.S. AI Safety Institute plays a critical role in ensuring that AI systems are developed responsibly and that the most advanced models are fully tested. This is crucial for building trust and promoting wider adoption.

Question 9. Do you support the work of the U.S. AI Safety Institute?

Answer. Yes, we support the work of the U.S. Center for AI Standards and Innovation, formerly known as the U.S. AI Safety Institute. Their efforts to promote reliable development of artificial intelligence, establish rigorous safety standards, foster cross-sector collaboration, and address potential risks are crucial for responsible innovation. We share their commitment to ensuring AI benefits society through principles of reliability, transparency, and accountability.

AI Workforce

The U.S. needs a skilled workforce to build and maintain AI infrastructure, including electricians, pipefitters, carpenters, and engineers. Labor shortages are already slowing down data center construction, yet there is no national strategy to train or retain this talent.

Question 10. What do you think Congress and the administration should be doing to support AI education, training, and workforce development?

Answer. AI, like all new technologies, will disrupt the economy and displace some jobs, and we which we know causes concern for many people and the workforce at large. We believe AI will create new opportunities that will outweigh many of the challenges ahead. AI will help lower the barriers to entry for many professions, replace rote tasks, and create a foundation for human creativity that builds on AI tools. AI will create new economic opportunities, allowing entrepreneurs to start new businesses and create new jobs. We are already seeing some of these benefits both at Microsoft and across the economy. A recent LinkedIn report highlighted research on how businesses using AI are seeing the benefits in innovation and creativity, and even in expanding their workforce. We encourage congress to invest in Federal apprenticeships focused on major AI infrastructure initiatives, establish Federal programs for on-the-job training and support the reauthorization of the Workforce Innovation and Opportunity Act.

Question 11. What challenges do your companies and others face from the administration's immigration policies, and what concerns do you have about impacts on high-skilled immigration?

Answer. The United States faces a critical talent bottleneck. Our universities educate some of the world's most talented engineers, scientists, and entrepreneurs, but outdated immigration policies often force them to leave the country shortly after graduation. Companies like ours face long delays and constant uncertainty in the visa and green card process, which makes it difficult to hire and retain the talent we need. In high-demand fields like artificial intelligence, advanced engineering,

and quantum computing, the need for specialized expertise far exceeds the available domestic supply.

This isn't about replacing American workers. It's about enabling innovation by complementing the U.S. workforce with global talent. To build the technologies of the future, we need to work with the best minds from around the world. American companies serve customers across the globe, and having a smart people from around the world work on our teams helps us create products that truly meet the needs of a global audience.

To remain globally competitive, the United States needs an immigration system that attracts and retains top talent. That means creating fast, reliable pathways for highly skilled individuals—especially graduates of U.S. universities—and addressing the green card backlog for workers from countries facing extreme wait times. If we want to lead the world in AI and other emerging technologies, we must continue to be a magnet for the world's best and brightest—and ensure they have the opportunity to build a future in the United States.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BRIAN SCHATZ TO BRAD SMITH

Future of Work

Question 1. What is your vision of the future of work and what are the valuable jobs of the future, in the near-term and long-term?

Answer. We believe that AI is going to impact the future of work tremendously—largely for the better. Additionally, this is an important moment for the government to be engaged in these conversations. At the beginning of the year, I published a blog post connected to this question. LinkedIn also recently published a report, AI and the Global Economy, examining how AI is already impacting the workforce and the economy at large.

Question 2. How is your company taking advantage of the automation you're empowering to scale productivity without leaving workers behind?

Answer. We design our technologies to augment human capability—empowering people to achieve greater impact with each hour they spend at work. That means investing in broad-based skilling initiatives, including apprenticeships and workforce partnerships, so every worker, not just those in tech, can benefit from AI. We encourage employees and partners to experiment with tools like Copilot to find the best use cases for their work. And we've built feedback mechanisms to ensure continuous improvement and keep worker experience at the center of our innovation.

PRC Deployment of AI

Question 3. What do you believe is the greatest national security threat posed by the People's Republic of China's deployment of AI systems?

Answer. The People's Republic of China's deployment of AI systems presents a range of national security risks. For example, the spread of Chinese technology to third countries may undermine global cybersecurity and information integrity. Through advanced AI-driven surveillance, cyber-espionage, and disinformation campaigns, China could exploit vulnerabilities in critical infrastructure, manipulate public opinion, and erode trust in democratic institutions.

Question 4. What are your recommendations for addressing these threats?

Answer. Microsoft advocates a comprehensive, multi-layered approach to counter the national security risks posed by China. To address AI-driven surveillance and cyber-espionage, Microsoft recommends deploying zero-trust architectures, enhancing endpoint detection and response capabilities, and investing in AI-powered threat intelligence to detect and mitigate advanced persistent threats. Strengthening public-private partnerships is essential to ensure real-time information sharing and coordinated responses to cyber intrusions.

Microsoft also recognizes the risks posed by nation-state actors including China employing cyber enabled influence operations targeting critical institutions within America. Microsoft harnessed the data science and technical capabilities of our AI for Good Lab and Microsoft Threat Analysis Center (MTAC) teams to assess these risks including whether or not these actors were utilizing AI in these operations. When appropriate, the team calls on the expertise of Microsoft's Digital Crimes Unit to invest in and operationalize the early detection of AI-powered criminal activity and respond fittingly, through the filing of affirmative civil actions to disrupt and deter that activity and through threat intelligence programs and data sharing.

In addition, Microsoft is committed to advancing information integrity and believes that including content credentials is an important driver for this. We are a founding member of the Coalition for Content Provenance and Authenticity (C2PA).

To achieve transparency, support information integrity, and empower our users, we are leveraging C2PA's "content credentials" open standard across several products. For example, content containing the "Content Integrity" technology has been automatically labelled on LinkedIn, with users beginning to see the "Cr" icon on images and videos that contain C2PA metadata.

Beyond technological solutions that improve defenses, Microsoft also stresses the importance of political solutions to these threats—governments taking a more proactive and coordinated role in attributing, exposing, and deterring Chinese malicious cyber activity. This includes timely public attribution, diplomatic pressure, and legal action where appropriate. Clear consequences for state-sponsored cyberattacks are essential to shift the cost-benefit calculus and reinforce international norms against digital aggression.

This is especially true for cyber intrusions which target critical infrastructure in order to "preposition" for disruptive or destructive attacks in a future contingency. Such operations put civilians at significant risk and are meaningfully different from traditional espionage. Prepositioning cyberattacks should be recognized as a "threat" of force prohibited by international law that must be deterred via sufficient consequences across domains.

Finally, ensuring that U.S. AI technology retains its global leadership and that regulations and policies do not unnecessarily hinder the global diffusion of U.S. AI is a key component to countering China.

Accelerating Scientific Research

Question 5. Microsoft's AI for Health and AI for Earth programs have supported hundreds of academic and nonprofit research projects. How would you suggest the government can better structure collaborations to accelerate scientific discovery using AI?

Answer. *See answer below.

Question 6. You've led efforts to aggregate and standardize environmental and biomedical datasets. What further steps should industry and government take together to ensure researchers have access to well-structured, interoperable, and annotated datasets for AI-driven discovery?

Answer. The government can play a pivotal role in increasing access to datasets and accelerating scientific discovery by supporting initiatives that make data more discoverable, accessible, and usable. Launching a national open data campaign would empower institutions such as the National Archives, the Library of Congress, the Smithsonian, and other government agencies to digitize, organize, and share non-classified and non-sensitive data for AI training. Additionally, the creation and expansion of open data commons within non-profit, academic, and cultural institutions could further democratize access to valuable datasets. Addressing paywalls that restrict access to scientific research and establishing dedicated funds to unlock closed-access journals would also contribute significantly to the availability of critical knowledge for innovation.

The government should also prioritize the development and enforcement of clear guidelines for data sharing and annotation. Stronger incentives and monitoring mechanisms are needed to ensure timely and secure sharing of federally funded research data, in alignment with funding agreements. Supporting the adoption of metadata and provenance standards for datasets can enhance their utility and reliability, particularly in the era of synthetic data generated by AI models. By taking these steps, the government can foster a robust ecosystem where data serves as the backbone for scientific advancement and technological progress.

Energy Consumption and Cost of Winning

Question 7. Do you support President Trump's efforts to expand coal power for AI data centers?

Answer. The availability of reliable, resilient, and cost-effective electricity is essential for economic growth in the United States. The recent Executive Orders from the President on coal generation highlight the urgency to meet energy sector demand growth, including as a bridge to future carbon free generation as new energy options are built out. At Microsoft, when we consider any potential dedicated power source, we look for generation options that align with our need for reliable, cost-effective, and sustainable electricity. We also invest in the next generation of energy supply technologies to support accelerated innovation and cost-declines. In practice, this has meant that we use and invest in a diverse mix of electricity generation technologies that align with our needs for reliable and cost-effective electricity. These technologies also must align with our commitment to be carbon negative by 2030. Across all of these priorities—reliability, cost-effectiveness, and sustainability—we do not see a business case for expanded use of coal to meet the energy

needs of our data centers. Rather, we see increasingly strong arguments for integrating more renewables, nuclear, net-zero, and net-negative electricity generation technologies into the system in addition to a diverse set of energy storage technologies. While many of these new technologies present promising options in the future, we also recognize that there will sometimes be a need to build other options in the near term as we grow our Nation's energy infrastructure.

Question 8. How are you addressing the costs associated with new infrastructure development in the short-term, including in terms of water consumption, pollution, and climate impacts?

Answer. When improvements to the grid are required to serve our load, we work with our local utility to ensure that we pay for the improvements required to serve our site. We are thoughtful about the resource intensity of AI from the moment that we decide to build a datacenter. We're working to advance low-carbon materials and create global markets to help advance sustainability across industries. When operating our datacenters, we optimize energy and water efficiency, including announcing a new datacenter design that consumes zero water for cooling. We also are increasingly adopting a circular approach to reach our target of zero waste by 2030. We target preventing waste first, then focus on reusing, and recovering materials. This includes reusing and recycling construction and demolition waste, diverting operational waste and advancing circular cloud hardware and packaging.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. EDWARD MARKEY TO BRAD SMITH

Comprehensive Impacts of Data Center Construction

Question 1. When planning for data center construction, does your company conduct a cradle-to-grave infrastructure study that includes wildlife, community, and pollution impacts during and beyond the operational lifespan of a data center? If yes, what have you learned from those studies? If no, why not?

Answer. Datacenters are long-term investments, and planning is a multi-year, capital intensive program that requires alignment across a range of factors to be successful. These factors include energy, water, fiber, land suitability, environmental considerations including wildlife impacts, and an available, trained workforce to ensure that we deploy the data center on the timelines our customers expect.

We are thoughtful about resource intensity of AI from the moment that we decide to build a datacenter. We're working to advance low-carbon materials and create global markets to help advance sustainability across industries. When operating our datacenters, we optimize energy and water efficiency, including announcing a new datacenter design that consumes zero water for cooling.

We also are increasingly adopting a circular approach to reach our target of zero waste by 2030. We target preventing waste first, then focus on reusing, and recovering materials. This includes reusing and recycling construction and demolition waste, diverting operational waste and advancing circular cloud hardware and packaging.

Backup Energy Generation

Question 2. Does your company use backup diesel generators at any facilities?

Answer. Yes. Generators at datacenters, most often powered by diesel fuel, play a key role in delivering reliable backup power so we can meet the needs of the many customers that rely on our services, including hospitals, first responders, and educational institutions. Each of these generators is used for no more than a few hours a year or less at our datacenter sites, most often for routine maintenance or for backup power during a grid outage.

Question 2a. If yes, please provide a list of each facility where diesel generators are being used, along with the location, quantity, and type of generators.

Answer. We use generators at all of our datacenter sites. A complete list of our datacenter sites can be found *here.* [*https://datacenters.microsoft.com/globe/explore/*] We operate our backup generators sparingly.

Question 2b. If yes, did your company consider the use of battery storage technology as an alternative to diesel generators? Please explain your decision process.

Answer. As we consider any back-up power sources, we look for reliable, scalable and cost-effective options that can be developed and deployed in rapid timelines aligned to our datacenter growth and operate within the constraints of our datacenter facilities, including batteries and other technologies (*e.g.,* alternative fuels). The primary requirements for such backup generation are that they can

quickly ramp to meet the emergency event and can store sufficient energy to supply the datacenter through an outage in case site access is limited.

Energy Mix

Question 3. Does your company utilize any on-site or colocated energy generation to power your data centers?

Answer. No.

Question 3a. If yes, please provide detail how much power comes from on-site and colocated energy generation.

Answer. N/A

Question 3b. If yes, please list all on-site and colocated energy sources (*e.g.,* renewable, nuclear, hydropower, gas-powered turbines, etc.) that are being utilized to power your data centers.

Answer. N/A

Question 4. How does your company ensure local ratepayers are not responsible for paying the cost of new energy infrastructure, such as transmission lines, needed to meet the data center's energy demand?

Answer. When improvements to the grid are required to serve our load, we work with our local utility to ensure that we pay for the improvements required to serve our site.

Energy Consumption in AI Model Training

Question 5. In the past year, how many GWh of energy do you estimate was used to train new AI models?

Answer. To date, most of our infrastructure sites have been serving both AI and traditional cloud services for our customers and the critical business and communications requirements they rely on us for. AI has shared space and resources in those locations, so we are not yet able to specifically separate out AI energy use for prior years. We continue to drive efficiency into every part of this infrastructure as we deploy this new technology at scale. We are working on further analysis of energy use.

Question 6. Data centers require vast amounts of water for cooling. When water is at critically low levels, does your company continue to pull water for building cooling? Does it have a contingency for operating as to not put further stress on the water supply and potentially take limited resources from households, agriculture, or small businesses?

Answer. For the datacenter, water requirements will vary depending on the cooling technology used. Microsoft is moving to solutions that utilize zero water for cooling in water-stressed areas. However, water and sewer connections are typically required for basic safety and administrative functions, like restrooms and breakrooms.

Government Partnerships

Question 7. Your company offers AI products specifically for the public sector, which are now used across Federal agencies and state and local governments. Given the especially heightened risks related to governments' use of AI—including the denial of rights or access to services and false or incorrect information about government benefits and programs—what additional steps have you taken to ensure that these tools are safe and effective to use in the context of government?

Answer. The Federal government's leadership in AI adoption is vital for setting standards and keeping the U.S. at the forefront of innovation. By integrating AI into its operations and using existing AI applications, it can speed up public service delivery, drive widespread adoption, improve services, and boost industry confidence. To do this effectively, we've taken additional steps to ensure the tools used in government are safe and effective. For example:

Microsoft has cloud instances designed specifically for the public sector, meaning specialized versions of its cloud services designed to meet unique security, compliance, and operational needs of government agencies. For example, Microsoft Azure Government and Microsoft 365 Government are built to handle sensitive data and regulated workloads and are certified to meet the standards of FedRAMP High. While the underlying technology is often the same as in our commercial offerings, these instances are configured and governed to align with public sector requirements. Our AI for regulated customers is in most cases exactly the same as what we offer our commercial customers. Our commercial Azure cloud is also FedRAMP High authorized and hosts an array of State, Local, Federal agencies who utilize this as their primary cloud offering today.

Question 8. What protocols do you have in place to work with government agencies to rectify any harms or errors when they occur?

Answer. Microsoft offers a layered framework that combines technical, procedural, and ethical safeguards. We recognize the heightened responsibility that comes with deploying AI in the public sector, especially where consequential decisions can impact access to rights, services, and benefits. Our approach to Responsible AI is grounded in principles such as accountability (including human oversight and control), transparency, fairness, and reliability & safety.

For example, we utilized the following techniques:

- Human-in-the-Loop Oversight: We ensure that critical decisions involving eligibility or access to services include a human review and override mechanisms.
- Incident Response Framework: We work closely with agencies to establish clear escalation paths and remediation protocols for identifying, reporting, and correcting AI-related errors or harms.
- Bias and Fairness Audits: Our models undergo rigorous pre-deployment and ongoing audits to detect and mitigate bias, especially in sensitive use cases.
- Transparent Documentation: We provide model cards, data sheets, and decision traceability to support explainability and accountability.

Microsoft also provides access to our responsible AI dashboard, which enables agencies to monitor fairness, accuracy, and error rates across demographic groups. We are committed to continuous collaboration with government partners to ensure AI systems are safe, equitable, and aligned with public values. We welcome the opportunity to co-develop governance frameworks tailored to your mission needs.

Business Partnerships

Question 9. When you make your AI systems available to other users/deployers, what are the types of issues you agree on?

Answer. Microsoft works closely with its customers, the deployers of its AI systems, to ensure that AI technologies are used responsibly, safely, and in line with legal requirements. When Microsoft makes an AI system available to a customer, both parties agree on key issues of responsible AI use, Microsoft provides extensive information and guidance to the customer, and Microsoft takes proactive steps to prevent misuse of the AI services. These are codified in Microsoft's *Terms of Use, Acceptable Use Policy,* and the *Microsoft AI Services Code of Conduct,* to which customers must adhere. In addition, some services, which have a higher risk of misuse, are available only through a *Limited Access Program.*

Question 10. What information do you provide to those other parties/deployers?

Answer. Microsoft provides extensive information, tools, and guidance to customers deploying its AI systems, so they can understand how to use the technology responsibly and effectively. This includes detailed documentation and transparency notes that explain how AI technology works, its capabilities and limitations, and how to achieve the best results. We also provide usage guidelines, best practices, and responsible AI resources to guide deployers in safe implementation (*e.g.,* recommendations for human oversight, testing, and fairness checks).

Additionally, we build in safety features like content filtering and abuse detection models directly into our AI services and offer ongoing support, including technical support channels and updates, to help customers deploy AI correctly. This helps ensure deployers understand the system and have the tools to uphold the agreed principles.

Question 11. What step does your company take any steps to reduce the likelihood that, for instance, those downstream users don't use your services in ways that could harm people or that violate your terms of use?

Answer. We take active steps to reduce the risk of downstream misuse of our AI services. Our services have built-in safety controls at multiple levels (the model, the API service, and the application) to automatically filter or block harmful content. We enforce our terms of use, including by pursuing legal action against actors who try to bypass safety measures, such as cybercriminals who intentionally develop tools specifically designed to circumvent the safety guardrails to create offensive and harmful content. Additionally, over a year ago, we implemented security policies to include, if we observe a nation-state actor, cybercriminal or other malicious actor using our AI tools or services, we will disrupt and disable them immediately, notify any service providers they may be using and share our learnings with the public and stakeholders to improve the AI ecosystem. *Staying ahead of threat actors in the age of AI | Microsoft Security Blog* Furthermore, we continually strengthen our guardrails by learning from new threats and updating our safety systems, and we work with partners and provide channels for users to report abuses. These measures collectively help ensure that even after deployment, our AI services are used in ways that do not harm people or violate the agreed-upon terms.

AI Hallucinations

Recent reporting suggests that generative AI hallucinations are getting worse as the technologies become more powerful. Hallucinations can lead to great harm in certain scenarios, such as when assessing job applications, or even more dangerously in the national security context.

Question 12. Do you agree that we need guardrails to ensure that AI tools are not used or misused in ways that could cause harm to people?

Answer. Yes. We agree that thoughtful, risk-based guardrails are necessary for advancing safe, trustworthy, and responsible AI.

Question 13. What steps is your company taking to address this issue?

Answer. Over several years, Microsoft has developed a structured approach to responsibly releasing generative AI applications, guided by a "map, measure, and manage" framework. At each stage of this process, we've embedded best practices, guidelines, and tools informed by real-world experience. A key focus has been addressing the risk of hallucinations, also known as ungroundedness, where AI models generate plausible but unsupported content. As part of this comprehensive approach, product teams are equipped with centralized tools to evaluate the likelihood of ungrounded outputs and are supported with design patterns and mitigation strategies tailored to their specific applications.

A key example of how these risk mitigation practices work is the 2023 release of Copilot Studio, which harnesses generative AI to enable customers without programming or AI skills to build their own copilots. One of the key risks for this product is groundedness, and, as with all generative applications, the Copilot Studio engineering team mapped, measured, and managed risks according to our governance framework prior to deployment. By improving groundedness mitigations through metaprompt adjustments, the Copilot Studio team significantly enhanced in-domain query responses, increasing the in-domain pass rate from 88.6 percent to 95.7 percent. This means that when a user submits a question that is in-domain—or topically appropriate—copilots built with Copilot Studio are able to respond more accurately. This change also resulted in a notable 6 percent increase in answer rate within just one week of implementation. In other words, the improved groundedness filtering also reduced the number of queries that copilots declined to respond to, improving the overall user experience.

The team also introduced citations for outputs, so copilot users have more information about the source of information included in AI-generated outputs. By amending the safety system message and utilizing content filters, the Copilot Studio team improved citation accuracy from 85 percent to 90 percent. Following the map, measure, and manage framework and supported by robust governance processes, the Copilot Studio team launched an experience where customers can build safer and more trustworthy copilots.

Just as we measure and manage AI risks across the platform and application layers of our generative products, we empower our customers to do the same. We offer features to our customers that detect ungrounded statements within generative AI outputs in applications using grounded documents, such as Q&A Copilots and document summarization applications. Groundedness detection finds ungrounded statements in AI-generated outputs and allows the customer to implement mitigations such as triggering rewrites of ungrounded statements.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. TAMMY BALDWIN TO BRAD SMITH

Question 1. I serve as Ranking Member of the LHHS subcommittee of the Appropriations Committee where we are tasked with ensuring we are investing in the education of the next generation of American workers. Part of Microsoft's investment in the Mount Pleasant data center includes partnering with Gateway Technical College to build a Data Center Academy. Can you share why Microsoft has decided to invest in local STEM education?

Answer. Microsoft is committed to local workforce development. This initiative is designed to train over 1,000 students in 5 years, equipping them with the skills needed for careers in IT and data center operations. By aligning infrastructure investment with education, Microsoft aims to ensure that local communities benefit directly from the economic opportunities created. It also supports the company's broader goal of building a diverse, future-ready workforce in regions poised for tech growth.

Question 2. At the end of 2023, Microsoft entered into a first of its kind partnership with AFL–CIO to ensure workers are at the table in the development and im-

plementation of artificial intelligence. I believe it is critically important that technology advances in a way that enhances our workforce instead of eliminating jobs. Can you share why Microsoft decided to pursue this partnership and what you have gained from it?

Answer. Microsoft partnered with the AFL–CIO to ensure that workers have a voice in how AI is developed and deployed. The partnership focuses on expanding access to AI education, incorporating labor feedback into product design, and shaping public policy that supports inclusive economic opportunity. It reflects Microsoft's broader commitment to responsible AI and to building a future of work that benefits everyone. Microsoft has learned the value of embedding worker voice directly into the deployment of AI technologies and reinforced the need for inclusive AI skilling strategies.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JACKY ROSEN TO BRAD SMITH

Adversarial AI

The reason cybersecurity experts were able to identify gaps in security in DeepSeek's platform was because it is an open-source model.

Question 1. How can Congress protect Americans from future models developed by entities affiliated with foreign adversaries that may put users' data at risk, whether they're open source or not?

Answer. *See the answer below

Question 2. Are there ways users—whether Federal or commercial—could safely use AI models developed by companies in adversarial nations?

Answer. There is a clear demand for this technology. As more and more businesses and individuals look to innovate and explore new markets, they'll want to consider a wide range of AI model types that best fit their needs. Access to the latest AI technologies enables innovation, but they should be used in a trusted and safe environment. When handling sensitive data or used in high-risk use cases, additional measures, such as red teaming, automated assessments, and in-depth security reviews, can be used to discover and mitigate potential risks in models and the systems they're used in. Consistent with shared responsibility practices, we encourage customers to carefully review model and system documentation and transparency notes and adopt platform safeguards, such as content safety filters, *and to conduct their own security and safety evaluations* tailored for their specific use case.

Model Security

Question 3. It's essential we ensure the AI models we use do not become another cybersecurity vulnerability. Would voluntary cybersecurity standards for large AI models or high-risk models and the infrastructure they were trained on be helpful in establishing trust?

Answer. Voluntary risk-based cybersecurity standards for AI models, particularly cutting-edge models and the infrastructure they're trained on—would be a valuable step toward building trust.

Previous waves of technology have highlighted that to drive innovation and adoption of new technologies, users must both trust in how technology itself performs and trust that the technology can be used successfully, safely and securely. Cybersecurity frameworks and standards provide a foundation for that trust. For the past decade, risk-based cybersecurity standards developed by organizations such as NIST and ISO/IEC have helped public and private sector stakeholders manage cybersecurity risks effectively, regardless of their size or maturity. These standards also support compliance and assurance schemes that deliver both economic and security benefits.

In our public comments to the White House Office of Science and Technology Policy (OSTP) in its Request for Information (RFI) for the Development of an AI Action Plan, Microsoft encouraged the Federal government to avoid developing duplicative policies by leveraging existing risk-based and outcome-focused cybersecurity standards, such as the NIST Cybersecurity Framework and the Secure Software Development Framework (SSDF). These standards offer the flexibility needed to streamline regulation, promote consistency, and foster innovation and cross-border collaboration.

Unlike prescriptive cybersecurity requirements, risk-based standards offer flexibility and agility to streamline regulations, drive consistency, and incentivize innovation and cross-border commerce. Developing new standards from scratch is a resource-intensive process, and the Federal government can save substantial resources using and building existing risk-based standards while still ensuring robust

cybersecurity measures are in place. In our comments, we also encourage the administration to invest in NIST, as they play a critical role in informing the global AI conversation, bringing U.S. perspectives to international standardization bodies like ISO/IEC. Alignment and interoperability between U.S. cybersecurity and international standardization approaches is important for the growth of cross-border commerce and trust in American AI.

AI Skills

Question 4. You mentioned the importance of digital skills in your testimony. Can you discuss how it might hurt the U.S.'s ability to compete with China if we don't leverage congressionally-mandated Federal programs like those created under the Digital Equity Act, which were explicitly designed to help Americans build digital skills, like teaching seniors, small businesses, and veterans how to use AI?

Answer. Americans of all ages and backgrounds will need AI skills to compete in this new world of work. A key opportunity for most people will be to develop an AI fluency that will enable them to use AI in their jobs, much like they use laptops, smartphones, software applications, and the Internet today. China is home to some of the world's most talented computer science researchers. They also lead the world in graduating STEM students. Therefore, it is critical the United States, government, private sector, and non-profits, to invest in AI and digital skilling. For example, we launched the AI for Community Colleges program, in collaboration with the American Association of Community Colleges, designed to empower both students and educators by providing valuable resources and support. The program offers AI training for faculty and staff tailored to all skill levels, ensuring a comprehensive understanding of AI concepts. It will deliver AI-focused curriculum that equips students with in-demand skills to meet regional workforce needs, as well as AI technology to enhance various departmental functions at community colleges. By helping educators integrate AI skilling directly into their classrooms, the program ensures students are well-prepared to enter the workforce as AI-ready professionals, addressing the growing demand for AI expertise across industries.

AI For Spectrum

Artificial Intelligence has the potential to dramatically improve how we manage and utilize spectrum, particularly unlicensed bands like those used for Wi-Fi.

Question 5. What are some of the most promising ways AI can be applied to enhance dynamic spectrum access, reduce interference, and optimize performance in congested environments—and what should Congress do to support those efforts?

Answer. There are companies that are applying machine learning and AI to create automated tools to better manage spectrum utilization in various frequency bands through shared use. There are also universities examining some of the more fundamental questions associated with dynamic spectrum sharing. Presumably, some of this research is exploring how AI tools can be applied. However, Microsoft is not involved in these efforts.

Question 6. The Citizens Broadband Radio Service (CBRS) model has demonstrated how dynamic sharing between Federal and non-federal users can unlock valuable spectrum for innovation. How can AI enhance and expand these types of spectrum sharing frameworks by enabling more agile, real-time spectrum coordination, and what steps should the Federal government take to accelerate the development of AI-powered spectrum management tools?

Answer. Although Microsoft participated in multiple CBRS proceedings that go back over a decade, in recent years the company has not been engaged.

Need for Broadband and Wi-Fi

Question 7. Wi-Fi is the foundation of connectivity in our homes, schools, hospitals, and workplaces. As AI becomes more embedded in applications across sectors—from diagnostics and patient monitoring to smart factories and personalized education—how critical is it that we continue to invest in broadband infrastructure across the U.S. and robust, high-capacity Wi-Fi networks to realize AI's full economic and social potential?

Answer. Microsoft agrees that Wi-Fi-enabled devices play an essential role in today's communications networks and will continue to do so in the future. The Federal Communication Commission's (FCC) decisions to authorize unlicensed Low Power Indoor (LPI) and Very Low Power (VLP) devices across the entire 5925–7125 Megahertz (6 GHz) band and higher-power Standard Power (SP) devices under control of an Automated Frequency Coordination (AFC) system over portions of the 6 GHz band, allow for multiple, large bandwidth channels that serve as large on-ramps for individuals and enterprise users to access broadband services, and which is a prerequisite for high-capacity low-latency Wi-Fi networks. FCC authorization of LPI,

VLP, and SP (under control of an AFC) devices has set the stage for significant private sector investments. With respect to AI enabled devices, several of Microsoft's more recently released Copilot + PC computer models incorporate Wi-Fi 7 radios that feature 320 Megahertz ultra-wide channels. Along with our customers, we are learning in real-time how AI embedded systems and services can best leverage high-capacity low latency Wi-Fi connections.

AI T&E Workforce

A key factor in ensuring the U.S. continues to lead the world in the AI race is by ensuring the AI we develop is the best and therefore the most trustworthy. Validating model outputs is an important step in establishing trust. Right now, however, the U.S. has neither the standards nor the trained workforce to evaluate AI models to establish that we can trust model outputs.

Question 8. What should Congress consider to incentivize and grow the AI test and evaluation workforce?

Answer. Congress should consider creating AI upskilling sector-based collaboratives, where governments fund efforts that bring together companies that use the same or similar AI technologies to help train workers more efficiently and at scale, which would be especially beneficial to subject matter experts that may not otherwise have the infrastructure to establish AI training programs. Additionally, we recommend advocating for expanding, streamlining and promoting Section 127, which allows employers to provide tax-free educational assistance to employees pursuing education while working. As part of any effort to expand or streamline Section 127, legislation could also highlight or further incentivize employers using this benefit for AI upskilling. There may be an opportunity to further promote Section 127 benefits, which are often underutilized, by highlighting the ways in which it can address AI skilling needs.

Question 9. How can Congress support more interdisciplinary approaches to testing and evaluating AI? For example, how do we ensure a model being used in a healthcare setting has been evaluated both by experts in the model technology, but also experts in the healthcare setting in which it will be deployed?

Answer. Microsoft has consistently emphasized that cross-disciplinary testing of AI—specifically through testing specific to a deployment setting—is essential to secure and trustworthy AI use. During our own product development, we conduct stress testing, or red teaming if necessary, at both the model and the application layer. Red teaming the model helps to identify how a model can be misused, scope its capabilities, and understand its limitations. These insights not only guide the development of platform-level evaluations and mitigations for use of the model in applications but can also be used to inform future versions of the model. Application-level AI red teaming takes a system view, of which the base model is one part. This helps to identify failures beyond just the model, by including the application specific mitigations and safety system. Red teaming throughout AI product development, when appropriate, can surface previously unknown risks, confirm whether potential risks materialize in an application, and inform measurement and risk management. The practice also helps clarify the scope of an AI application's capabilities and limitations, identify potential for misuse, and surface areas to investigate further.

Congress can assist these efforts by supporting and funding NIST, which is currently considering scoping for workstreams to develop methods and metrics for AI testing, evaluation, verification, and validation.

Response to Written Question Submitted by Hon. John Fetterman to Brad Smith

Mr. Smith, I'm a big supporter of renewable energy, and that includes nuclear. Whenever we talk about the energy transition, as we discussed at this hearing, my focus has been clear: making sure ratepayers in Pennsylvania aren't hurt. The Washington Post has reported that increasing electricity demand from data centers is jacking up residential power bills by 20 percent.[13] That's unacceptable. These data centers don't even offer long lasting, stable jobs: the new jobs are in the construction phase, but the higher utility rates last forever. I've been tracking the plan to reopen Three Mile Island to power Microsoft's data center energy needs. I appreciate innovative plans, but Pennsylvanians come first.

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[13] *https://www.washingtonpost.com/business/2024/11/01/ai-data-centers-electricity-bills-google-amazon/*

Question. Will you commit to me—as you did at the hearing—that your power purchase agreement with Constellation will not raise electricity rates for PA households?

Answer. The power purchase agreement that Microsoft entered into with Constellation Energy will add 835 MW of electricity to the PJM region. By entering into this power purchase agreement, Microsoft is guaranteeing a customer for this power produced by the nuclear unit at the Crane Clean Energy Center and fully responsible for the costs of the energy and capacity from this facility.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. LISA BLUNT ROCHESTER TO BRAD SMITH

Cybersecurity and AI

Mr. Smith, I know that many tech companies like yours see AI agents as a big part of AI advancement.

But AI agents also can contain sensitive data about its users, like a flight *agent* containing payment information and location data. This data needs to be secure from cyberattacks.

Also, there is *potential* for AI agents to be used by cybercriminals to orchestrate attacks more quickly and at a far larger scale than humans could.

Question 1. I know that Microsoft has a good amount of visibility into global cybersecurity threats. How would you assess the current state of AI cybersecurity, and what concrete steps should this committee consider to strengthen the cyber-protection of AI agents?

Answer. Earlier this month at Microsoft Build, our annual developer conference, we *outlined our vision* for a world where AI agents make decisions and perform tasks across users, teams, or organizations. To realize our vision, AI agents must be both capable and secure. Today's threat landscape—from the unprecedented volume of ransomware attacks by cybercriminals to the sustained cyberespionage and attacks from state-sponsored adversaries—already demands a strong, coordinated response. AI agents, especially those interacting with sensitive data, introduce new risks that must be addressed proactively and through trusted multistakeholder partnerships.

AI agents can operate autonomously, make real-time decisions, interact with external tools and data, and even collaborate with other agents. This has the potential to transform industries, from optimizing energy grids to coordinating fleets of autonomous vehicles. *More than 230,000 organizations—including 90 percent of the Fortune 500*—have already used Copilot Studio to build AI agents and automations.

These powerful capabilities also introduce new risks. AI agents can be manipulated through prompts or data sources to perform harmful actions—like profiling employees, crafting targeted phishing e-mails, or leaking sensitive information. In multi-agent systems, a single compromised agent can trigger cascading failures. For example, a hacked warehouse robot could disrupt an entire supply chain. An attacker could hide secret instructions in a document used for training of or accessed by a public-facing agent. When a secure AI agent later interacts with the public-facing agent, the embedded instructions can trick it into bypassing its safeguards and leak sensitive data. These risks are amplified because these systems often operate without direct human oversight, raising important questions about accountability.

We would welcome the opportunity to engage with you further on this topic, and hope to see the Committee's support for the following:

- Emphasize robust cybersecurity foundations, such as secure-by-design-and default practices and Zero Trust Architecture for all AI systems—including agents.
- Support voluntary, risk-based AI cybersecurity standards that are adaptable, technically grounded, and internationally aligned.
- Remove barriers to cloud adoption, recognizing the security, scalability and efficiency benefits cloud services provide for AI agent deployment.
- Encourage open, secure protocols like *Agent2Agent* (A2A) and *Model Context Protocol (MCP)* to enable safe *and interoperable* agent-to-agent and agent-to-tool collaboration.
- Invest in public-private collaboration to share threat intelligence, simulate adversarial scenarios, and evolve best practices.

AI and Competition

Mr. Smith, AI is becoming integrated into our critical economic and societal infrastructure, with McKinsey *stating* that long-term AI opportunity could be about $4.4 trillion in added productivity growth potential from corporate use cases.

But vendor lock in could be a real *issue,* where an AI vendor dramatically falls behind the competition and leaves its client with a vastly inferior product, which could threaten key industries the AI product operates in.

Question 2. Do you have any plans or strategies regarding mitigating lock-in for your AI products operating in critical sectors, like the financial and medical sectors, to prevent potential lock-in effects that might harm these critical sectors and the folks therein?

Answer. Today's AI ecosystem is open, evolving, and increasingly decentralized. Microsoft is working to ensure it stays that way.

We are seeing a surge of innovation across sectors, with new models, tools, and platforms emerging regularly. This is especially true in financial services and public health, where AI's potential is still be discovered and applied. From fraud detection to disease surveillance, the applications are expanding rapidly. And so are the choices available to customers.

At Microsoft, we are committed to supporting that diversity. Azure hosts a wide range of AI models, including those from OpenAI, Meta, Mistral, and open-source communities; we recently added xAI's Grok 3 and Grok 3 Mini into the Azure AI Foundry. Customers can also bring their own models, fine-tune them, or use pre-trained ones. They can run models in Azure, on-premises, or across multiple clouds. We support that flexibility because we believe it's essential to trust and innovation.

We also recognize that many of our customers operate in regulated environments. That's why we invest in interoperability, portability, and compliance—so they can move workloads as needed, with minimal friction and constraint.

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