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THE BEST THOUGHTS OF THE BEST MINDS ON CURRENT INTERNATIONAL QUESTIONS

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Fueling Nuclear Energy's Global Growth

THE SINGLE MOST IMPACTFUL THING YOU CAN DO

Address by SETH GRAE, Chairman, American Nuclear Society International Council
Delivered at the Ferguson Library, Stamford, Connecticut, June 4, 2026

Let me start with the big picture, because the scale is difficult to overstate. The world is entering an era of unprecedented electricity demand; global demand is not just growing—it is accelerating. In the United States alone, electricity demand is projected to grow by about 25% by the early 2030s.

But the United States is only part of the story. Across the developing world, billions of people are gaining access to electric power. Economies are electrifying transportation, heating, and industrial processes that previously ran on fossil fuels.

And layered on top of all of that is the explosion in artificial intelligence. The U.S. Department of Energy estimates that data centers could account for 12% of all U.S. electricity use by 2030.

To meet that demand with reliable 24/7 clean power, nuclear power must grow significantly within the diversified energy mix.

Solar and wind are intermittent energy sources that operate at capacity factors of 25% and 35%, respectively. U.S. nuclear plants run above 92 percent.

When a data center needs power at three in the morning on a windless night, nuclear delivers. When a hospital needs uninterrupted power during a polar vortex, nuclear delivers. Nothing else does—not at that scale, not with that reliability.

Nuclear energy is gaining momentum around the world.

Globally, there is growing support for the resurgence of nuclear power. At COP28, the U.N.-sponsored international climate conference, I was privileged to be there when the United States and more than 20 other countries pledged to triple global nuclear capacity globally by 2050. And the U.S. has set an even more ambitious domestic target: to quadruple nuclear power in America by 2050.

Think about what that means. There are 94 large reactors now in the U.S. Quadrupling means adding the equivalent of almost 300 large reactors—an undertaking that dwarfs anything the energy industry has attempted.

To put this in perspective, it would mean adding 300 gigawatts (GW) of electricity in the U.S. That is a massive amount of power. Consider that a 1 GW nuclear plant can power roughly 750,000 homes. This 300 GW of added capacity could supply electricity for 225 million homes, or about 300 cities.

In addition to growing international support, for the first time in a generation, U.S. political winds are blowing decisively towards a growing future for nuclear energy. Bipartisan legislation, executive orders, and billions of dollars in federal investment are accelerating nuclear energy's growth.

For instance, the Accelerating Deployment of Versatile, Advanced Nuclear Energy Act passed in 2024 streamlines nuclear regulation and supports new fuel development and advanced reactor demonstrations. Fortunately, it is better known as the ADVANCE Act,

As for public opinion, according to a Pew Research Center survey last year, about 60% of U.S. adults say they favor building more nuclear power plants to generate electricity. That's up from 43% in 2020, driven by increasing support among both Republicans and Democrats.

Finally, wars in Iran and Ukraine have sparked a re-evaluation of energy security around the world. Governments realize they need to reduce their reliance on imported energy, and nuclear offers a way to do that.

The International Energy Agency recently called the Iran war and the closing of the Strait of Hormuz, "the biggest supply disruption in the history of global oil markets," with some 15 percent of supply being removed from the market. The U.S. Energy Information Association estimates 2.6 million barrels of oil are being drawn down from inventories daily, with reserves at an 11-year low.

Nuclear power is also increasingly part of the great power competition. China and Russia are financing reactors they deploy in other countries, as part of efforts to make those countries more dependent on them. I find that most customers around the world correctly perceive American nuclear technology to be superior.

If U.S. companies and our government can match deals offered by China and Russia, we could use nuclear energy to strengthen our ties to other countries. No country can supply everything needed for a nuclear power program. From providing uranium to pressure vessel forgings to specialty grades of steel, the U.S. and our allies can come together and offer it all.

Utilities in the United States operate 94 power reactors that collectively produce the most nuclear energy of any country in the world—about a quarter of the global total. While there are about 440 operable power reactors in the world, more importantly, about 70 new reactors are under construction, and more than 120 are in advanced planning stages.

What stands out the most is how global demand drivers are coming together. The rapid increase in data center capacity to handle AI workloads is spiking demand for power that is virtually always available. At the same time, national desires for clean energy and concerns about energy security are strengthening the case for nuclear power.

One other major trend is large-scale innovation making nuclear power more cost-effective, efficient and safer.

Increasing interest in and demand for nuclear energy is drawing more investment in the sector. This additional investment is supporting a rush of innovation among companies, large and small, as they advance to meet the moment.

Companies are designing innovative new reactor vessels, new cooling systems and new containment architectures. Some of these designs are under construction, and others are just drawings on PowerPoint slides.

If you look at where the nuclear industry is investing its innovation dollars, you see something striking. There are over 160 reactor designs under development worldwide. Microreactors. Small modular reactors. Advanced reactors of every variety.

However, at the same time, we need to realize that for over half a century, traditional large water-cooled reactors have produced the vast majority of nuclear power worldwide.

These include light-water reactors—pressurized water reactors and boiling water reactors—as well as pressurized heavy-water reactors, including the Canadian CANDU design. Among these, pressurized water reactors, or PWRs, produce most of the world's nuclear electricity, including the two PWRs at Millstone Power Station, about 80 miles east of here in Connecticut.

These are the types of reactors that have won in the marketplace. Non-water-cooled reactors have always had small shares of the global market, including gas reactors in the United Kingdom. The designs of water-cooled reactors, which are mostly PWRs, have not stood still. They have benefitted from decades of enhanced safety equipment and procedures.

Look at what's being built around the world right now: almost all the new nuclear power plants under construction, on order, or planned are water-cooled reactors, and almost all of those are PWRs. The large-scale reactors expected to deliver the hundreds of gigawatts the world needs over the coming decades are PWRs.

Likewise, we can expect that much of the nuclear-generated power for data centers will come from large PWRs.

There will be use-cases for microreactors, advanced reactors, and SMRs. Industrial heat, military applications, remote settings—these new designs will serve important needs.

Some planned advanced reactors will provide high quality steam or process heat at temperatures needed by some industries, at temperatures above which PWRs could provide. These can be very good use cases for certain advanced reactors, if they can do so economically. Some advanced reactors will also be able to provide a mix of heat and electricity that could be useful to certain industries.

But to put it in perspective, it would take an enormous number of SMRs and microreactors to equal the electricity produced by a fleet of large PWRs.

I expect that most nuclear power will still be produced by water-cooled reactors—mostly PWRs—for decades to come.

And the good news is that as we build more PWRs, the delays and cost overruns that have beset the industry will decrease, especially as new supply chains develop, and an increasingly talented and experienced nuclear workforce grows.

Now, here's a point that I think gets lost in most conversations about nuclear energy, and it's probably the most important point I'll make today.

Uranium is an extremely energy dense fuel material. By volume, enriched uranium is 33 thousand times more energy dense than oil, 43 thousand times more energy dense than coal, and 37 million times more energy dense than natural gas.

A uranium fuel pellet the size of your fingertip can produce as much energy as one ton of coal or 17,000 cubic feet of natural gas.

The power of the fuel is key. The reactor is the vessel and the engineering around the fuel, but the reactions that produce all the energy happen in the fuel. The fuel is the reactor's beating heart.

And that's where Lightbridge comes in.

Other companies are making incremental improvements to old fuels —adjusting enrichment levels and coating pellets with additives.

We are developing the only truly new nuclear fuel. We are developing it to work in existing, proven reactors. That's Lightbridge Fuel™.

The fuel is metallic uranium-zirconium alloy, co-extruded with its cladding, in a patented helical multi-lobe geometry. There are no pellets and no tubes. This is a new nuclear fuel invention, not an evolution of the current fuel.

And here is why that matters: our fuel is designed to transform existing reactors into advanced reactors. You don't need to build a new plant. You don't need a new reactor vessel. You don't need new containment structures.

Enhanced operating performance by existing reactors is the fastest way to generate additional nuclear power now. We can add significantly to the power output of existing and new reactors, while enhancing safety.

Our fuel is designed to be safer, operating at much lower temperatures.

Our advanced fuel is also designed to extend fuel cycles from 18 months to 24 months, eliminating an entire refueling outage every six years.

Each outage costs tens of millions of dollars in direct costs and lost revenue from the power not produced during the downtime. Reducing outages is a direct improvement to the bottom line of every reactor operator.

We are now testing samples of the fuel alloy material at Idaho National Laboratory in the Advanced Test Reactor, which is the world's most powerful test reactor.

Our development timeline targets demonstration in commercial nuclear power plants, benefitting from advanced testing methods, regulatory streamlining, and supportive policy environments.

Utilities that are advising Lightbridge tell us what they need is safety, manufacturability, and economic value.

Better fuel technology can enable power uprates, generating significantly more electricity from the same reactor. In a world that aims to triple nuclear capacity, the ability to increase output from existing plants is extraordinarily valuable. It is the fastest, cheapest path to more nuclear-generated gigawatts.

A utility can load the fuel assemblies into a reactor that's already operating, already licensed, already connected to the grid—and you can get dramatic improvements in safety, fuel performance, power output, fuel cycle economics, and nonproliferation. That is a value proposition that no new reactor design can match in terms of deployment speed at scale.

And as companies develop water-cooled SMRs, they can also benefit from our advanced fuel. The addressable market is not a niche. It is almost all global nuclear power, today and for the foreseeable future.

The U.S. Department of Energy recently launched the Utility Power Reactor Incremental Scaling Effort ("UPRISE"), a new initiative aimed at significantly expanding the nation's nuclear energy capacity by maximizing the output of existing reactors, restarting dormant facilities, and extending reactor operating lifespans. UPRISE puts more of a focus on adding more nuclear power by increasing the power output of existing plants.

We believe the reactors that will deliver the most power for the next several decades—overwhelmingly—will be water-cooled reactors, mostly PWRs. Proven technology that has supplied reliable electricity for over half a century.

And the single most impactful thing you can do to make those reactors even safer, more proliferation-resistant, and more economical is to give them advanced fuel.

Let me leave you with this. The world is about to build more nuclear capacity than it has in the last 50 years. The drivers are real and durable—AI, climate, energy security, and electrification.

The United States has committed to quadrupling its domestic nuclear power generation. More than 20 nations have pledged to triple global nuclear power. And advanced fuel is going to help make it happen.

Thank you.