

Daniel Poneman: Nuclear's role in humanity's future

The Centrus Energy head believes we can enhance the ability of nuclear power to combat climate change even as we reduce the risks of nuclear terrorism.

Daniel Poneman is president and chief executive officer of Centrus Energy Corporation—a provider of enrichment, fuel, and fuel services to utilities that operate nuclear reactors throughout the world—as well as a senior fellow at the Belfer Center for Science and International Affairs at the Harvard Kennedy School. From 2009 to 2014, he served as deputy secretary at the Department of Energy, where his responsibilities included working to implement the Obama administration's "all-of-the-above" energy strategy, which involved fossil and nuclear energy, renewables and energy efficiency, and international cooperation.

In 2009, Poneman led negotiations to address Iran's nuclear program and participated in the Deputies' Committee at the National Security Council (NSC). He also played an instrumental role in the DOE's responses to crises ranging from Fukushima to the Libyan civil war to Hurricane Sandy, and he led the department's efforts to strengthen emergency response and cybersecurity across the energy sector.

Poneman first joined the DOE in 1989 as a White House fellow. The next year he joined the NSC staff as director of defense policy and arms control. From 1993 through 1996, Poneman served as special assistant to the president and senior director for nonproliferation and export controls at the NSC. Prior to assuming his responsibilities as deputy energy secretary, Poneman was a principal of the Scowcroft Group for eight years, providing strategic advice to corporations on a wide variety of international projects and transactions. Between tours of government service, he practiced law for nine years in Washington, D.C., first as an associate at Covington & Burling, later as a partner at Hogan & Hartson.

Poneman spoke recently with *Nuclear News* Associate Editor Paul LaTour about his new book, *Double Jeopardy: Combating Nuclear Terror and Climate Change*, which was published in May by the MIT Press (*NN*, June 2019, p. 78).



Poneman: "We used to be the world's greatest supplier of nuclear fuel and enrichment, and now we're the world's laggard. There are 13 countries ahead of us. That's not how you lead."

What was the inspiration for you to write the book?

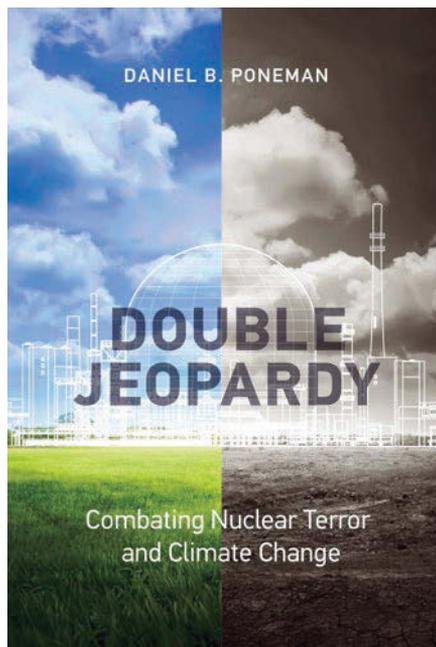
The inspiration for the book came to me when I was working at the Department of Energy in 2009. I had just come to the department as deputy secretary, and we were in the midst of investing heavily and pushing all manner of carbon-free energy technologies to try to bend the carbon curve here and address the climate change challenge. I was chair of the credit review board. We worked very hard to push out \$30 billion in loan guarantee authority, which funded the largest wind farm in the United States—Shepherds Flat, in Arlington, Ore.—and started the whole grid-scale solar photovoltaic [PV] industry. We had zero utility-scale solar PV plants at the time. We also invested in Tesla early. We invested in geothermal projects and biorefineries. All to address this huge

carbon challenge. At the same time, I was diverted to go to Vienna to negotiate with the Iranians, trying to persuade them to give up 1,200 kilograms of low-enriched uranium in exchange for up to 20 percent high-assay low-enriched uranium fuel required for the Tehran research reactor, which they were using for medical radioisotope production.

It dawned on me that here we were in the Department of Energy, faced with two existential threats to humanity—one in the form of potentially catastrophic climate change, and one in the form of potentially catastrophic nuclear holocaust. The power of the atom lay at the root of both of these problems. To address either or both of them effectively required much stronger U.S. leadership. When I left government, the only thing I had in my mind was getting this thing off my chest and writing about what we could do about the threats.

Bipartisanship is needed to get anything done regarding energy and nuclear policies, but is that even possible with today's hyper-partisan divide?

Two advanced nuclear bills were passed and signed into law during the last session of Congress [the Nuclear Energy Innovation Capabilities Act (NN, Oct. 2018, p. 17) and the Nuclear Innovation and Modernization Act (NN, Feb. 2019, p. 17)]. And there's more legislation coming that may also garner widespread bipartisan support. It's not totally surprising in the sense that when you think about it, different people may see different things in nuclear, but they may support it for their own reasons. For example, you might believe that the United States has to be the strongest



ing to overwhelm us before we're able to turn the corner on carbon reduction. So they may turn to nuclear for a very different reason. So what I say in the book is that people may agree on what to do about U.S. nuclear leadership even though they don't necessarily agree on why.

Which has been more difficult: getting the left to support nuclear power or getting the right to accept climate change?

I would say the hardest sell has been among those environmentalists who do care about climate change but who are concerned about nuclear for all the reasons we know about from TV and so forth. These are people—and it's what I argue in the book—who really need to embrace nuclear. By 2050, we're going to have probably a 100 percent increase in electricity consumption. And all the scientists that the environmentalists respect tell us that we basically have to decarbonize power generation 100 percent—that's before you get to things like building and transportation—by the same year.

There is no way, let me repeat, *no way* to reach that number on any projection that any responsible party I've seen put out without a significant expansion of nuclear. So if you are really serious about climate change, you have to be very serious about looking at nuclear.

For all the progress we've made on renewables, it basically hasn't helped, because it's replacing carbon-free power. It's just replacing nuclear and hydro. That's not how you get to zero. Let me give you one statistic.

This just came out. In 2011, California got 53 percent of its power from clean, carbon-free sources. After the massive ramp-up of both wind and solar in that state since 2011, after seven years' effort, they are now at 53 percent. So zero progress. Why? The biggest factor is that they shut down the San Onofre nuclear plant. And second, they've lost a lot of hydro, which may itself be a product of climate change and drought. In other words, they added 32 billion kilowatt-hours of solar and wind but lost 34 billion kilowatt-hours of nuclear and hydro. So we're just not going to get the job done in the climate space unless we deploy every possible element that contributes to the reduction of carbon, and nuclear is the most prodigious source of carbon-free power generation that we have.

What is the importance of the United States' taking the lead globally in this effort?

The United States invented this industry decades ago. Without casting aspersions on anyone else, I'm very proud of U.S. standards for safety and nonproliferation. And I would say they're second to none. There are over 400 reactors in the world. If the United States just abandoned the field, the party with the most rigorous and vigorous safety and nonproliferation standards would fall away. Ours is an industry based on peer review, so if nuclear energy is a fact of the world, which it is, then you want it to be safe and you want it to be secure and you want to minimize proliferation. And if you want it to be safe and secure and minimize proliferation, you want to have U.S. leadership.

How much of the United States' global leadership on nuclear power has been lost at this point?

U.S. leadership depends on the United States having a forceful presence. We are now closing reactors, and when it comes to the global scene, of the 50-plus reactors being built around the world, the United States has zero export orders. That's not how you exert influence. Why are they going to listen to us if we're not even in the game? If you don't have standing, if you don't have presence, you're not going to be a factor. And the world will then be led by others who are engaged. We used to be the world's greatest supplier of nuclear fuel and enrichment, and now we're the world's laggard. There are 13 countries ahead of us. That's not how you lead. And, obviously, uranium enrichment is a critical factor, not only to nuclear energy generation, but also to nonproliferation controls.

What are the biggest consequences to the United States if it remains in this diminished role?

I see a general loss of global influence. As others have said, when you get into a

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global nuclear superpower in terms of the nuclear umbrella we extend to our allies to defend them and their freedom, and to basically exert the kind of diplomatic leadership we've shown time and time again, whether it's with North Korea or Iran. So you might think you need U.S. leadership for that. But you might not care about climate change. But then there are those who are not so interested in national security interests but are terrified, as many people are, that catastrophic climate change is go-

big deal to build nuclear reactors in another country, you're establishing a 100-year relationship due to the planning, the financing, the construction, the fueling, the operation, the decommissioning. If you lose all of that, you're going to lose a few degrees of influence.

How do you handle security issues surrounding nuclear energy?

It's critical to be in the game. The vulnerable aspects of dealing with nuclear power and nonproliferation are in the fuel cycle and the possibility of diverting either enriched uranium at the front end or plutonium at the back end. The way I have thought about doing this is to provide the kind of services that address the fuel cycle needs of known, established, and strong nonproliferation players, like the United States. Many years ago, I coauthored an article with then professor Ernest Moniz, John Deutsch, and the late Arnold Kanter, in which we advocated for promoting an assured nuclear fuel services initiative so that as more countries adopt nuclear power for fighting climate change and providing electricity for their people, they would not need to build their own fuel-cycle plants, which have inherent proliferation risks, especially since the whole fleet globally is fueled by enriched uranium fuel. That was what we focused on, providing an assured supply of enriched uranium fuel to provide for the needs of the vast majority of countries that don't have weapons aspirations but do want cheap, clean power from nuclear.

One of the 13 recommendations you make in the book is to launch an assured nuclear fuel services initiative. How would you get other nations to agree to an initiative like that?

If you're interested in power and doing it in a commercial sense, the vast investment that's required just to enrich uranium only makes sense if you have a program with about 25 reactors. And none of these new countries that are getting into nuclear power are going to have that many reactors, especially now with enriched uranium prices so low. The market is already vastly over-supplied. So if you're looking at it from an economic, commercial perspective, this initiative is going to be very attractive. And if you reject the offer, then I think the world will probably ask you why. It will actually shine a light of scrutiny. I'm not suggesting that North Korea or Iran would say, "Oh, this is wonderful, let me sign up today." But most countries that want power but not weapons will sign up for it, and those that don't will probably be subjected to scrutiny as to their motivations. And it will help support diplomatic efforts to get them to give up their nuclear weapons aspirations.

How do you impress upon people the sense of urgency that is required to make the "double jeopardy" issue a policy priority not only in the United States but globally?

People have to get the sense of urgency—that's the biggest challenge. Different things capture the imagination of different people. Unfortunately, too often it takes a catastrophic event to persuade people to actually change course. God forbid we should have to have something like that. For me, reading the Intergovernmental Panel on Climate Change report that said even if we could limit global temperature increase to 2 degrees centigrade, we're going to lose 99 percent of the world's coral reefs by mid-century. That was a wake-up call. There was a recent study [published in the journal *Science*] explaining that we've lost almost 30 percent of North American birds since 1970.

Different things move different people, but we just have to impress upon them that this is really a do-or-die moment. Just to take one example, even if you love, and I do, renewable energy, we just can't risk relying only on that to save the day, because if we're wrong, we'll be clobbered by irreversible, catastrophic climate change. Somehow that has got to get through to people to a much greater degree than has so far been possible. Frankly, what I'm trying to do in writing this book is to make this case. Groups such as ANS are helping to educate people on what's at stake.

What is your view of the next generation of nuclear reactors and the technologies that are out there?

I'm very encouraged by this. There is a lot of innovation out there. There is a full suite of technologies being worked on, from hydrogen gas-cooled reactors to molten salt reactors, in addition to the small modular reactors that NuScale and others are designing. I think the bright future for U.S. nuclear, when it comes to reactors, is going to be in that next generation of reactors that can be built in factories and deployed on trucks. There is a lot of exciting work going on at the Pentagon. We're looking at the possibility of even smaller micro-nuclear power plants—1 to 20 megawatts—and that sort of thing. I think that in terms of deployment, cost-curve, and gaining widespread public acceptance, it's very promising.

Speaking of public opinion, how do you move it toward nuclear, especially now with the HBO special on Chernobyl and similar popular culture portrayals?

It is a continuing challenge. I didn't see all of *Chernobyl*, but the part I did see was compelling drama and quite frightening, obviously. And, as many will recall, the Three Mile Island accident happened to coincide with the premiere of the movie *The China Syndrome*. The unfortunate thing about all of this is that these images burn themselves deeply into the public consciousness, and it's very hard to displace them with things like data. It is a continuing challenge. I think the only way one can address it is by presenting the issues and the enormous benefits that nucle-

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ar can bring and its potentially indispensable role in saving us from catastrophic climate change in an equally compelling and sometimes dramatic fashion.

It must be accurate, of course. But we simply have to break out of just talking within the circles of people who already agree with each other about the value of nuclear. We've got to bring in other people who have credibility among a wider set of stakeholders to really understand what is at stake in terms of saving our planet.

Secondly, we have to show what nuclear can do to a degree that no other form of energy can and emphasize the fact that we need every possible contributor to decarbonization, whether it's saving energy through conservation or reforestation or geothermal or hydro or wind or solar or nuclear. We need every drop that we can get our hands on. Again, the scope of the challenge is that electricity demand is going to increase by 100 percent by mid-century, and in that same period of time, we have to take out 100 percent of the carbon that is now emitted from electricity generation. That's a huge, huge lift. We just cannot afford to leave any of the major contributors such as nuclear on the sidelines.

You mentioned the Three Mile Island accident. It still comes up, even though it happened 40 years ago. What can be done to move the conversation away from accidents to focus instead on the positive aspects of nuclear energy?

Nobody died from the event at Three Mile Island. Nobody. People sometimes forget that in the much more recent accident at Fukushima, the 18,000 people who died were killed by the earthquake and the tsunami. And maybe another couple

of hundred died by virtue of the evacuation and some of the related aftereffects of that. The Chernobyl case is different for a lot of reasons—the design of the reactor, the way the Soviet system at the time responded, and so forth. That was a bad one. A few thousand people—I think 4,000, depending on how one counts—may have died in that one. But as a consequence of Fukushima, 54 nuclear power plants were shut down in Japan and eight in Germany, with the rest to follow by 2022, and thousands of people are dying from the aggravated emissions from the coal-fired plants that have displaced that power.

We have to try and put these things into context and understand that there is no energy form that is without risk. We need to understand which ones are safer relative to the others. We need to realize how important the overall challenge of decarbonizing our environment is and why we need to do everything we can to maximize that effort.

You've been interested in or involved with the nuclear industry since the 1970s. How do you see the difference today among young people compared to what it was like in the '70s?

I guess I would say that I've seen ebbs and flows in this. In the '70s there was a lot of enthusiasm about nuclear. What has

happened is this unfortunate phenomenon that every time people start to wrap their minds around nuclear as something they really want to push and support, something bad happens—Three Mile Island, Chernobyl, Fukushima. But I would say that nowadays, I see a lot of enthusiasm from people who are interested in nuclear for all the right reasons. That is to say, making sure the people of the world have access to electricity and making sure that electricity is carbon-free and therefore environmentally friendly.

In going to Georgia Tech and other places in recent years and talking to students, I've seen a level of enthusiasm that I think is going to be necessary for them to actually follow up on some of these designs to build these advanced reactors. But they have to believe, as I believe, that nuclear is important to our children and their children.

Every year when the Nuclear Energy Institute holds its Nuclear Energy Assembly, the first day is dedicated to this upcoming generation. It's really inspirational to see how enthusiastically the younger generation is embracing the challenges and the opportunities present in nuclear energy.

Speaking of the accidents and the safety concerns, I heard you say that even mentioning something like "accident tolerant

fuel" puts in the forefront that accidents can happen. It seems that safety is always front-of-mind, much more so than in the airline industry, for example. Is the nuclear industry too defensive, and if so, how can this be addressed?

I think that overall, nuclear has had an exemplary safety record. I don't want to get into invidious comparisons, but there have been gas pipeline explosions in which all manners of people have suffered, and it's awful whenever that happens. But if you just rack and stack energy forms, nuclear has been extraordinarily safe. I do not believe that the industry should back off at all from the "safety first" deeply embedded consciousness that is the hallmark of this industry. I'm not suggesting that in the least. To the contrary. I think that needs to be continually emphasized and reinforced.

However, using phrases like "accident-tolerant fuel"—you never talk about an "accident-tolerant car" or an "accident-tolerant airplane." Certainly, when it comes to driving cars, every time you get on the road, there is a risk. There is a risk in everything. But I do think that the industry could do better in thinking of how to communicate our safety record and the commitment to safety without saying so in a way that actually raises the very concerns we are trying to address. **N**