



NRC NEWS

U.S. NUCLEAR REGULATORY COMMISSION

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Good afternoon. Thank you, Dr. Gilligan, for inviting me to come speak to you today. It is a pleasure to be here.

What I would like to do in this seminar is give you an overview of what the Nuclear Regulatory Commission does; then I would like to hear from you and answer some of your questions. As a former university professor, I am used to speaking in 50-minute increments, but don't worry, I won't take that long today.

I recognize that for someone between the ages of 18 and 21 there are probably no words in the English language more boring than "regulatory commission." I'm not sure if Dr. Gilligan is requiring you to be here, but if I were your age and I was attending a lecture by someone who worked for the federal government, on a regulatory commission, I would have turned to the person next to me and said "Wake me up when this is over." But the truth is that the world is seeing a very dynamic rebirth in nuclear energy, and I think that my topic today will hold your attention.

Basically, our agency oversees the safety and security of nuclear power plants, including the uranium that is processed for fuel, and the nuclear waste that needs to be disposed of. We also license nuclear materials such as medical isotopes used in hospitals. And we regulate research and test reactors at universities around the country, including the N.C. State PULSTAR here on campus. While that sounds a little technical, the fact is that the issues raised by nuclear energy have profound implications for the environment, for our economy, and for our national security. We make our decisions based on sound science, so we are a "technical regulator."

Now, I am not suggesting that nuclear energy or nuclear materials are the answers to all the world's problems. Far from it! In fact, they can be very hazardous if misused. That is why the most important part of my job is ensuring that nuclear and radioactive facilities, and materials are used safely and securely.

You may have heard people saying that the U.S. and the rest of the world are in the midst of a so-called Nuclear Renaissance. The word renaissance comes from Latin and means “rebirth”—and, in many ways, it is perfectly true that nuclear power seems to be experiencing a kind of rebirth today. The principal reason is that the world needs more electricity—from a whole variety of sources, including nuclear.

The Energy Department’s statistical office estimates that the global demand for electricity is expected to rise sharply over the next 20 years. This demand will be especially strong in the developing world. In fact, an economist named Robert Solow won the Nobel Prize for demonstrating that access to reliable energy is the single most important factor for economic growth in the modern world.

In the U.S., electric power demand is expected to increase by 50 percent in the next 30 years. If nuclear power were to maintain its current 20 percent share of the electricity supply in this country, the industry would need to add 50 new nuclear power plants, with an average output of 1,000 megawatts each. This would entail going from the 104 commercial reactors that are currently operating to a little over 150 nuclear power plants. I should make clear that I am not advocating this. The NRC does not promote nuclear energy—that is the responsibility of the Department of Energy. We are charged with ensuring safety and security in the use of radioactive materials.

Another factor is the effect of greenhouse gas emissions. The environmental consequences of carbon were not well appreciated when the current fleet of nuclear plants were built. Many of you may be too young to get this joke, but back then the only problem people had with “carbon” was that the stuff rubbed off on your fingers when you made “carbon copies” in the typewriter.

Today, of course, carbon and other greenhouse gases are a major factor in deciding how the world will meet this ever-growing demand for electricity. Most experts agree that renewable energy sources like wind and solar definitely need to be part of the mix. But it’s hard to see how these will be enough. In fact, most analysts agree that they won’t. Renewable sources currently generate less than five percent of America’s electricity—so even a doubling of their generation capacity would still mean that 90 percent of the expected needs are unaccounted for. Moreover, the land-use “footprint” for renewables can be quite high. You have to set aside a lot of acres of land for enough windmills to generate any significant amount of electricity.

That leaves coal and nuclear power. In the U.S., utilities have actually done a very good job in reducing the amount of pollution emitted by coal-fired power plants. Sulfur and nitrogen dioxide emissions today are a small fraction of what they were just two decades ago. But carbon is still an ongoing challenge. So right now, and this is just a statement of fact, nuclear remains the only existing technology for producing substantial new electricity with no carbon emissions into the atmosphere.

I wanted to explain all that so you have some context for understanding why so many nations around the world are interested in building new nuclear plants. China, for instance, which I just visited a few weeks ago, has plans for building as many as 40 new reactors over the next 15 years—which is a staggering pace. Here in the U.S. we are expecting that the NRC will receive about 15 applications to build 32 new reactors in the near future. In fact, the first four

applications have already come in. If approved, these would be the first new nuclear power plants built in the U.S. in decades.

As you can imagine, all of this means that the NRC is probably the busiest we have been in our history. And if I can take a moment to give a little recruiting pitch, I would mention that this is also probably the most interesting time to work at the NRC in our history. I should add—in case you have not heard—the NRC was chosen last year as The Best Place to Work in the entire federal government. That's very good news for us, because we really do need to attract the best and brightest in order to perform the important work we do.

Now let me tell just a little more about the various things people at the NRC do:

Resident Inspectors: These are the front lines of the NRC's safety oversight—our boots on the ground, so to speak. These are highly trained staff who have learned the operations of power plants inside and out. They live in the community, work on-site at the reactors, and are on call 24 hours a day, 365 days a year for operational oversight and emergency response. Their entire job is to make sure that the nuclear plants they are assigned to operate safely.

At present there are about 135 resident inspectors at 65 nuclear plant sites around the country. The utilities will probably tell you that they don't always find the Resident Inspectors convenient, but at the end of the day, they are grateful for the independent judgment and expertise the Resident Inspectors provide. I should add that many of the most senior managers at the NRC served as Resident Inspectors. They are supplemented in each of the NRC's four regions by technical experts who assist the resident inspectors when complex technical issues arise at plants.

Vendor Inspections: A modern nuclear power plant depends on the smooth operations of tens of thousands of parts: pumps, valves, motors, fans, pipes and many other components that may be produced by any number of companies—both private and state-owned—around the world. These must be of consistently high quality... because even a sub-standard bolt can be a cause of concern. So we have a vendor inspection program that sends people out all over the world to assure that there is consistent high quality in the supply chain. In addition, we have a team that pursues investigations, which can result in criminal sanctions, against people who traffic in fraudulent parts.

Materials: I mentioned earlier that in addition to power plants, our agency licenses the nuclear materials that are used in medical applications. In fields ranging from cardiology, to neurology, oncology, radiology and many more "ologies" I probably don't even know about—radioactive isotopes are helping people all over the world live better, longer, healthier, and more comfortable lives. But it's also possible for these materials to be misused, and people can get hurt or killed. Our agency will investigate, usually in cooperation with the authorities in state and local governments, if radioactive materials have been misused. Similarly, nuclear materials that are used in construction and agricultural to measure the density of soil are sometimes lost or stolen. We help identify and track them down to ensure they don't fall into the wrong hands, and remain under proper handling and care. Not everyone at the NRC is a desk jockey!

International Programs: When the 104 plants operating in the U.S. were built, there were really no standardized designs, unlike in France, where most reactors were built from the same blueprints. Today, however, the new plants that are being proposed will be much more standardized. In fact, there is a very concerted effort under way by regulators around the world to work together, share information, and harmonize—as much as possible—the codes and specifications for new plants. So some of our employees are dedicated entirely to maintaining and strengthening our international programs, and working with other regulators across the globe to improve nuclear safety and security.

Research: The current crop of reactors in the U.S. are largely based on what is called “light-water” technology. But we know that the nuclear energy of the future will involve radical technological changes, and our agency needs to develop the expertise to license and regulate the advanced and innovative new reactors and fuel cycle facilities that we anticipate down the road. This will require advanced computer simulation and greater expertise in computer security and cyber threats. On top of that, we have specialists who review applications for new reactors and when a reactor wants to operate at a higher power. We use scientists from a variety of disciplines to help us with this work.

In addition, if the U.S. decides to join the other major nuclear powers of the world and embrace nuclear recycling, the NRC would need additional chemical engineers with a detailed knowledge of reprocessing, actinide chemists, plutonium chemists, and radio-chemists. And nuclear engineers with expertise in transmutation would be required to review fuel recycling facilities. If you don’t know what all that means, don’t worry, few people do. But if pure science and technically complex issues fascinate you... there will hardly be a more interesting place to work over the next few decades than the NRC.

I could go on at some length discussing other aspects of our agency’s work, and the various responsibilities we have... but I think the jobs I have just mentioned will give you a sense of the variety, the seriousness, and the intellectual rigor of the challenges our employees face every day.

Let me conclude by reiterating the core mission of the NRC. It is our critical responsibility to protect the health and safety of the public and the environment by overseeing the safety and security of nuclear materials and facilities. It’s important, and it’s actually really interesting.

On that note, let me thank you again for your invitation to share some thoughts with you.

Now, I would be happy to take some questions.

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