

**Commissioner Stephen G. Burns Remarks
Training and Knowledge Management at the NRC in a Time of Change
February 7, 2017**

Thank you for that introduction. I'm happy to be here in warm Florida addressing you today during this interesting conference. I'm leaving here and headed to Chicago later today, where the weather will not be so nice.

As I look around this room today, I realize that I am looking at a tremendous collection of education, knowledge and experience. The number of degrees, the years of experience, the papers written, the studies done, the classes taught – it's overwhelming if you stop to think about it. In many respects, you are the brain trust for nuclear training and education.

And yet I'm certain that every single one of you is aware that you are not "done." There is no "done."

As one of the greatest minds in science, Albert Einstein, said: "Once you stop learning, you start dying." A bit dramatic, perhaps, but you get the idea.

At the U.S. Nuclear Regulatory Commission we are acutely aware of the importance of education – the foundation of our work is done thanks to the highly educated scientists and engineers who make up our technical staff, as well as the lawyers, accountants and other professionals who support the technical work. But we also know that where the graduation speech and the degree presentation stops, continuing education begins.

Our technical staff generally come from three pipelines – the nuclear Navy, the industry and the university. They come in our doors knowing principles of engineering and science, understanding the language of technical concepts. Some have the advantage of bringing operational knowledge.

But none know how to be a regulator. Even a reactor operator with significant experience does not fully appreciate the unique role of a regulator in a constitutional democracy. From our point of view, for example, not all problems are regulatory problems. So how do we ensure that our technical staff are exercising diligence and performing their duties with excellence, yet being mindful that the regulatory goal is reasonable assurance of adequate protection, not absolute protection? How challenging is it to train new regulators to see the big picture and assess risk? Pretty challenging – as it turns out.

Steve Cochrum heads our Technical Training Center in Chattanooga, Tennessee. But in 2000, he was a newly minted employee joining the NRC as a resident inspector. He remembers well the challenge of growing into a regulator after years as an officer in the nuclear Navy.

Steve recalls poring over the Code of Federal Regulations (that's Title 10 of the CFR for those of those in the know), learning how to conduct inspections, how to apply regulations, listening in on conversations and reviews to gain insight, shadowing the senior inspectors. His senior resident would say "review this and tell me what's wrong" and he would have to find the regulation, have to understand the rule, consult with those more experienced and – what he says was most challenging of all -- come to a conclusion about what actually applies in that particular instance. Despite the operational experience he brought to the table, he still needed to hone his regulatory skills on the way to becoming an NRC technical expert.

David Werkheiser is another, more recent example of this kind of evolution. David temporarily became part of my staff last year on a rotation. His “real job” is being the senior resident inspector at Three Mile Island. By way of background, Dave has bachelor’s and master’s degrees in nuclear engineering, was a reactor operator in the Navy, had been a graduate fellow at the Department of Energy and, had an RTR operator’s license. So, yes he was someone we were more than happy to hire. But despite his background, he was not a regulator – yet.

He has an interesting way of describing the paradigm shift necessary to come from the outside and join the NRC. In his own words, Dave said he was used to working things, fixing things. He had a sand box to work in – yes, his metaphor – but someone else had designed the box and set the rules. His job was to stay there and work within the boundaries. Now, though, his job is to ensure everyone else stays in their box and if they find themselves outside of their box, he needs to make sure they are doing all the right things to get back into the box.

And he has to determine what the implications are of the licensee actions. He’s the regulator. What was the infraction? How serious was it? How does he communicate it to those on site and those in his management, and ultimately the public? Before, he just needed to obey the speed limit. It’s all different when he’s giving the warning on minor issues or writing the ticket on more serious ones.

What any engineer becoming a regulator struggles with is the shift from 100 percent facts, from 100 percent measureable results to samples sizes and judgment calls based on experience, lessons learned, input from other experts. Inspectors don’t inspect to 100 percent, they don’t have a quota of how many violations to write. It is not, as much as we might like it to be, a black and white world in regulatory space. There is much more autonomy – within the confines of the tech specs, licenses, 10 CFR and the Atomic Energy Act.

One important component of our success is to start with motivated people. Then we put them through a rigorous two-year training program where they are learn in-depth technical and regulatory knowledge, mostly in classrooms, and with guided self-study. They then complete on-the-job training with qualified senior personnel who show them how things are done in the field. This is where the technical knowledge expands into regulatory effectiveness.

Finally, for most positions, an oral board must be passed before that employee is considered fully qualified to be a reactor operations inspector, health physics inspector, vendor or fire protection inspector, emergency preparedness inspector, fuel cycle technical reviewer, low-level waste project manager and other positions. In all, the NRC has more than 35 qualification programs.

Finally, we send them into the field where they spend the next 3-5 years gaining on the job experience and getting to the point where they actually feel confident in their ability to do the job effectively.

For those we hire directly from the university, the path can be even a bit longer. The NRC’s Nuclear Safety Professional Development Program is our entry level pipeline for technical staff. For this 18-month program, we select a few outstanding individuals and then rotate them through various assignments for at least 90 days, so they get the range of available career tracks before settling on their sights on a specific position and determining what further training is needed.

Let me step away from the technical disciplines for a moment and give you a perspective from my profession – the law. Each year, the NRC also selects a small number of graduating law students or judicial law clerks to serve in the Office of General Counsel’s Honor Law Graduate Program. This 45-year-old program – through which I entered the NRC in 1978 -- allows us to put highly qualified candidates into a two-year program of rotational assignments whereby they gain broad exposure to the diverse legal practice at the NRC. They collaborate with seasoned attorneys and work independently on a variety of assignments, including participating in administrative litigation involving nuclear power plants, reviewing environmental impact statements with technical staff, and drafting proposed regulations for new or revised safety standards. At the successful completion of the program, they become permanent staff.

The program has the same objective as our technical programs: to teach young lawyers how to be regulators, to develop client relationships with our technical staff, and to be effective representatives of the agency to our stakeholders.

These programs have served us well over the years, but we know that training and education styles, needs and approaches are evolving, and time and resource constraints are as well.

We’re also sensitive to the costs of classroom training, and understand that younger people may have a different approach to learning – although, frankly, technology has changed the way we all learn. A simple example from my experience is the fundamental change in legal research in the time since I was in law school; from book-based to extraordinarily deep and integrated electronic research.

And we also know that we may need to retrain existing employees – so not all training is focused on the newly minted NRC employee. The jobs may change or our needs may change and employees will need help in developing the skill set to make that change, too.

Because the world outside the classroom is changing, the NRC is also re-designing how we teach inside the classroom. We’re integrating more modern learning methods, and saving time and money. For example, we’ve piloted a reactor technology series via web-based distance learning rather than in-classroom. This reduces the traditional seven-weeks of travel to just 2-weeks for the hands-on simulator portion of the training.

Augmenting our training catalogue and certification programs is an agency-wide and well supported Knowledge Management Program. It’s aimed at all employees at all levels within the organization and applies to new employees, mid-career and even more experienced staff. It goes to the heart of the “you’re never done” philosophy of learning. It’s also especially critical at this time, when many NRC senior experts are retiring and newer staff are stepping into their shoes. We cannot lose the vital experience of those who leave. Three Mile Island may be last century, and the time since 9/11 and Fukushima is growing longer. But what we at the NRC learned from those events must not be lost to either retirements or fading memories.

Knowledge management also plays an important role in ensuring we build a bridge over the inevitable generation gap in our workforces. At times, the NRC has had four generations in the workplace. Entry level hires may be as young as their early 20s, working with colleagues old enough to be their grandparents.

Each generation shares common cultural experience. Their values and behaviors tend to be similar, and they are shaped by historical and environmental influences. By understanding the common background, perspectives, attitudes, and work styles of each generation we create a

more successful workplace environment -- and meet the NRC's important mission. The tricky part is to leverage the experience and wisdom across generations while encouraging innovation and enhancing collaboration as well.

I appreciate your attention today. Again, it's been my pleasure to be here today to talk to you about learning. Knowledge and experience are the keys to carrying out the NRC mission. And perhaps the keys to carrying out our missions just generally in all we do and for as long as we do it. As Socrates said: "Education is the kindling of a flame, not the filling of a vessel."