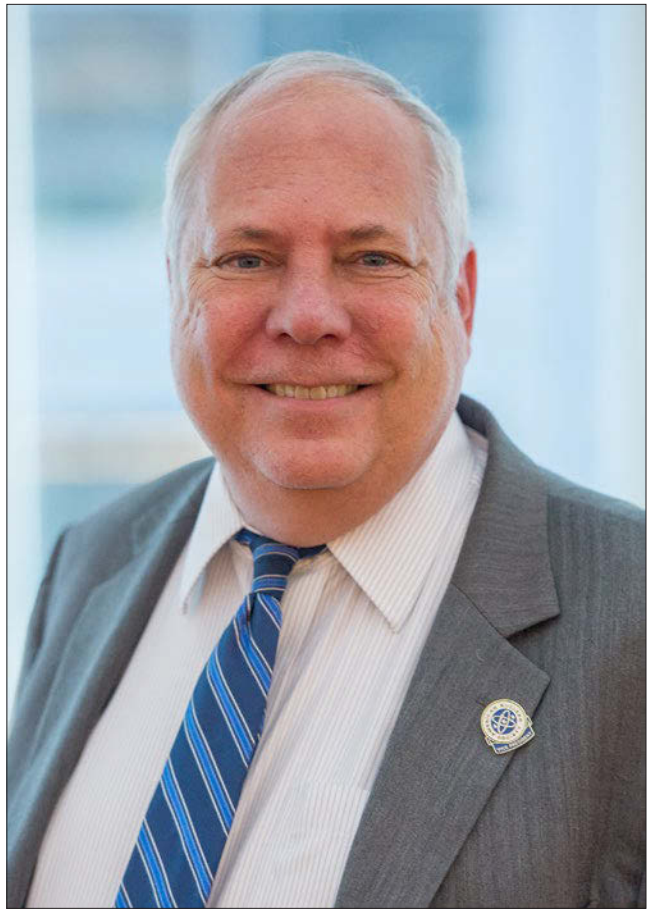


John Kelly: From Motor City to the Capital City

Having specialized in nuclear safety, the 64th president of the American Nuclear Society has long advocated for advancing the country's nuclear technologies.

By Tim Gregoire

In the mid-1970s, when John Kelly was an undergraduate working toward his bachelor's degree at the University of Michigan, he was in need of some spending money. So he took the only job he could find on campus: weekend janitor for his dormitory. It was, he said, not the most glamorous job. "If you have ever had to clean toilets on Saturday and Sunday mornings in a dorm, you are willing to do anything after that," Kelly said.

As a college student from Detroit, the experience stuck with Kelly. Even later in his career, overseeing multimillion-dollar research programs and leading teams of hundreds, that Midwestern work ethic proved valuable. "I really can't ask people to do things where I don't have a good idea of what the work involves," he said. "It is by doing and working your way up that you can relate to the people who are working for you."

The oldest of six children, Kelly was born on March 9, 1954, in Detroit, Mich., to John and Mary Kelly. The senior John Kelly had moved with his parents and siblings from Menasha, Wis., to Detroit during the Great Depression. After earning a bachelor's degree in mechanical engineering from Michigan Technological University, he went to work for an automotive parts manufacturer and supplier.

Kelly at 4 years old

He remained in the automotive industry and eventually became chief engineer for Detroit Steel Products, which manufactured automotive suspension springs. Mary, who was born and raised in Hamilton, Ontario, Canada, was a schoolteacher. "She was quite remarkable," Kelly said. "She graduated from college at 19 and was sent to Sault Ste. Marie to teach, and several of her students were older than she was." This was back when rural students would often split their time between school and the family farm, extending the time required to complete their education.

A childhood memory that stands out for Kelly is spending summers on Lake Erie, where his maternal grandparents had built a cabin on land leased to them from the Canadian railroad, for which his grandfather worked. "From when I was nine until I was 15 years old, I would spend every summer, the whole summer, at the cottage with my grandparents," Kelly said. "It had a beautiful white sand beach, and the water was warm enough for swimming." About an hour from Niagara

Kelly celebrates graduation from Detroit Catholic Central High School with his parents, John and Mary, in 1972.

Falls, the cottage is still in the family. "We try to get out there every year, but we can't quite swing it all the time," he added.

When Kelly was 11, his family, including his brother and four sisters, moved to nearby Dearborn, home of Henry Ford and the Ford Motor Company. Kelly attended Lowrey Junior High School, and then Detroit Catholic Central High School, an all-boys school established in 1928 by the Basilian Fathers. In high school, Kelly ran track and played oboe and clarinet in the marching and concert bands. "I still have close friends that I met in ninth grade from being in band together," he said. "It was a bonding experience." Also an avid bowler, Kelly said that he enjoyed playing in a father-son bowling league with his dad.

Kelly said he knew fairly early on that he wanted to become an engineer. While he excelled in his math and science courses, he admits that he wasn't one of Detroit Catholic Central's top students. "I didn't care for English and my grades were just average, which brought my GPA down," he confessed. Kelly graduated in 1972 and applied to Purdue University and the University of Michigan. Accepted to both, Kelly chose to stay in Michigan, largely for financial reasons. "I think when I started, tuition was $400 a semester, if you can believe that," he said. "My high school tuition was actually more expensive than college."

A Wolverine

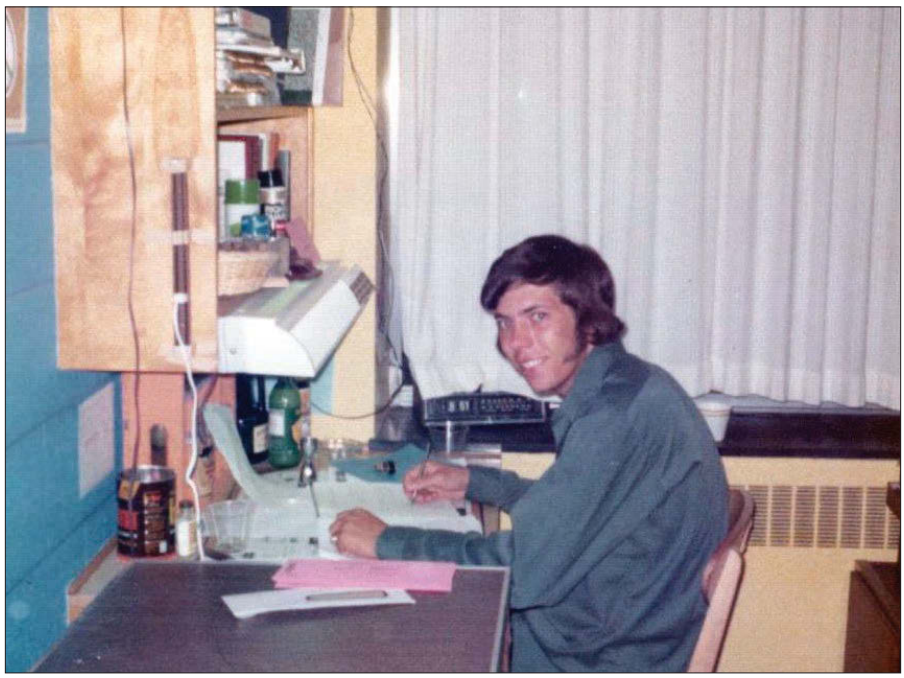
In the fall of 1972, Kelly started at U-M in the College of Engineering. Having already taken two semesters of college-level calculus through an early enrollment program at the University of Detroit during his senior year of high school, Kelly began his first semester taking third-term calculus and aced the final exam. "I loved the math from the beginning," he said. Kelly would end up taking eight semesters of mathematics at U-M.

After a year of general engineering courses, Kelly was faced with choosing a specific field of concentration. "For me, it came down to going into chemical or nuclear engineering," he said. The growth of nuclear power in the early 1970s certainly influenced Kelly's decision to pursue nuclear engineering. As he pointed out, at the time it was projected that the United States would have around 1,000 reactors by the year 2020 and that nuclear engineers would be in great demand.

It was, however, an attraction to physics and an admiration for Albert Einstein and the special theory of relativity that moved Kelly to pursue nuclear. "I basically went on this path to try to understand what Einstein was saying, and nuclear engineering seemed the right way to do it," he said.

At U-M, Kelly said, he received a good deal of guidance from his instructors, including Chihiro Kikuchi, a specialist in the field of solid-state physics who was instrumental in the development of the ruby maser, an important precursor to the optical laser, and John Lee, who remains on the nuclear engineering faculty at U-M. Kelly said that he was also influenced by Jim Duderstadt, who later became U-M president and currently holds the title of president emeritus. The university's major building for technological innovation and research was named after Duderstadt in 2004.

While Kelly said that he remains in occasional contact with Duderstadt, he recalls bumping into his old professor at Reagan National Airport in Washington,



Kelly studies in his dorm at the University of Michigan in 1974.

D.C. Kelly remembers that the conversation between the two colleagues took a very Michigan-centric turn. "He didn't want to talk about nuclear. He wanted to talk about Michigan football and what needed to be done to get a winning team," Kelly said with a laugh.

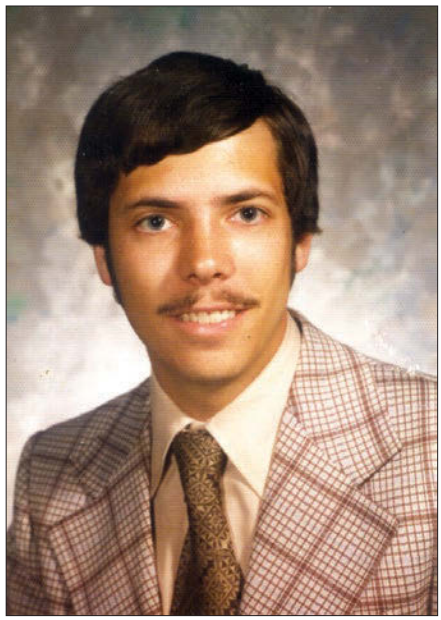
In addition to his studies, Kelly became involved in the College of Engineering student government, beginning as secretary and eventually moving up to student president. "It was a rewarding experience, and we did many good things for the students in the college," Kelly said. And of course, there was always football and the U-M Wolverines. "I never saw them lose a game at home while I was there," he said, adding that they tied Ohio State once. Kelly himself joined a U-M bowling league, and his five-man dorm team took home the league championship his sophomore year. Years later, one of Kelly's former bowling teammates would join his team at Sandia National Laboratories, although they didn't recognize each other immediately. "We remembered the other three guys on the team, but neither of us really remembered each other," he laughed.

In 1976, during his senior year at U-M, Kelly talked to a number of recruiters from the nuclear industry, visiting potential employers such as the Knolls Atomic Power Laboratory in New York. None of them, however, seemed like a good fit, he said. At the same time, he was applying to graduate schools and was accepted to the U-M program and to the Massachusetts Institute of Technology. In the spring of 1976, Kelly visited the MIT campus. "I was very impressed," he said. "I really liked it. So in the end, I decided it was time to leave Michigan and go to Massachusetts."

Before leaving for the East Coast, Kelly spent the summer working as an intern at Argonne National Laboratory outside of Chicago, converting paper documents—primarily environmental impact statements for U.S. nuclear power plants—into a digital format. While Kelly describes the work as tedious, he fondly recalls living in Chicago for the summer, sharing an apartment with a friend from U-M who was a graduate of the Illinois Institute of Technology. The apartment, in an IIT fraternity house, was close to Comiskey Park, home of the Chicago White Sox, and Kelly and his roommates would sometimes walk to the ballpark to catch a game.

Moving on to MIT

When Kelly showed up in Cambridge in the fall of 1976, the city was still immersed in the celebration of the United States Bicentennial. Having played such a significant role in the American Revolution, Boston was a focal point of the celebratory events.



Kelly in 1975

Kelly said that MIT, however, was very "businesslike" during those years, and he would carry a briefcase to his classes. His fellow students also made an impression on him. "My classmates were the top students from other schools across the country," he said. "And although it was very competitive, there was a lot of camaraderie, too."

Kelly spent his first two terms as a teaching assistant and became acquainted with Lothar Wolf, who was then a visiting professor from Germany. Kelly became Wolf's research assistant and began to focus on thermal hydraulics and using then state-of-the-art computer codes to perform simulations. This led to a number of research projects, including a utility-funded project to use simulation codes to analyze plant operations.

In February 1978, Kelly decided to take the general exam to be accepted into MIT's doctoral program. The exam involved two days of written and a half-day of oral examinations. Kelly spent the month prior preparing for the exam, spending hours in the library reworking sample test problems with two of his classmates who were also taking the exam. Two days before the exam, Kelly and his study buddies were thrown a curveball by Mother Nature.

"Boston got 30 inches of snow, and everything closed down," he remembers. "The National Guard was patrolling the roadways because people weren't allowed to drive." With the city and campus shut down, the exam was postponed, and Kelly worried that the delay would affect his performance on the exam. "We had spent the whole month of January prepping for this exam," he said. "Information starts to leak out of your brain at that point. You hit this peak, and then you find yourself on a downward spiral." Fortunately, Kelly passed the exam with flying colors.

After Wolf left MIT to return to Germany, Mujid Kazimi, who served as head of MIT's Department of Nuclear Science and Engineering from 1989 to 1997, became Kelly's Ph.D. thesis advisor. Kelly said he greatly enjoyed working with Kazimi, and the two were good friends until Kazimi passed away suddenly in 2015 during a trip to China as part of an international advisory committee. Kelly said that until Kazimi's death, the two were in constant contact on both personal and professional matters. "I had emailed him just four hours before I learned he had died," Kelly said. "It was really just a shock for me."

It was at MIT that Kelly first became involved in the American Nuclear Society, joining the ANS student section there. "It wasn't as formal as it is today, and it had a heavy emphasis on athletics," he said. Kelly became the student section's athletic director, a job that involved registering teams for various intramural sports. "Intramurals were really big, and we would try to field teams in all the sports, whether it was soccer, ice hockey, softball, or basketball—you name it," he said. Kelly even organized the Nuclear Science and Engineering Department's annual faculty-student golf outing, allowing him to rub shoulders with department head and Red Sox fan Norman Rasmussen, who led the landmark WASH-1400 Reactor Safety Study.

As Kelly was working diligently on earning his Ph.D., the unexpected occurred—the partial core meltdown of Unit 2 of the Three Mile Island nuclear plant on March 28, 1979. The accident shook Kelly and his classmates. "As a group of nuclear engineers who were working toward our doctorates, we were shocked at what was going on. We had invested all this time in our careers, and we wondered if there was going to be a nuclear industry when we graduated," he said. Having specialized in nuclear safety, however, Kelly felt he still could have something to contribute. "Maybe we didn't know everything we needed to know, and maybe there would be some opportunities," he said.

Safety research at Sandia

In September 1980, the same month he received his Ph.D. from MIT, Kelly joined the staff at Sandia National Laboratories in Albuquerque, N.M. Kelly had interviewed at a number of national labs, finally narrowing his search down to Los Alamos National Laboratory and Sandia. Being a confessed "big city guy," Kelly said that the remoteness of Los Alamos made him apprehensive about moving there. Kelly's friend and former MIT classmate Michael Corradini (ANS president, 2012–2013), who grew up in Albuquerque, also influenced Kelly's decision to join Sandia.

Playing softball at Sandia National Laboratories, Kelly takes a swing.

Moreover, Kelly was drawn to the work just beginning to be undertaken at Sandia. Prior to the Three Mile Island accident, Sandia had been primarily a nuclear weapons laboratory, with a focus on weapons safety. Following the accident, Sandia became a multiprogram research facility and branched out into commercial reactor safety research. At about this time, the Nuclear Regulatory Commission chose Sandia as one of its research laboratories for nuclear power plant safety testing and analysis. "With my interest in safety and this big program that was developing at Sandia, it seemed like an ideal match for me," Kelly said.

Recruited by Nester Ortiz, Kelly began working in Sandia's nuclear safety program, developing computer codes and tools to do thermal hydraulics and severe accident analyses. One of Kelly's first bosses at Sandia was Bill Camp, who later pioneered massively parallel computation research at the lab.

After seven years of being a "doer," Kelly was promoted to supervisor of Sandia's Thermal Hydraulics Department. As part of its responsibilities, the department developed the MELCOR computer code for the NRC, which uses the code to model the progression of severe accidents in nuclear power plants. "Those years in the nuclear safety field led me to understand all the dimensions of severe accident phenomena," Kelly said. "It was a very interesting time."

Later, Kelly took an assignment in Washington, D.C., to work on the New Production Reactor Program. "It was still safety related, but we were looking at new reactors to make tritium for the weapons program," he said. Returning to Sandia in 1991, Kelly continued his involvement in tritium production in various other capacities.

Then, around 1999, as government funding in civilian reactor research was bottoming out, Kelly had the opportunity to become the deputy program manager for Sandia's nuclear weapons supercomputing program, called the Accelerated Strategic Computing Initiative (ASCI). Working closely with the Los Alamos and Lawrence Livermore labs, Kelly's team helped build the ASCI computer codes to analyze the safety and performance of nuclear weapons.

With its many programs, activities, and departments, Sandia provided Kelly with many opportunities to delve into new projects. "The nice thing about Sandia is that it's a big enough organization that you can change jobs but not leave the company," he said. For example, in the fall of 2001, Kelly moved to the lab's Technology Transfer Department to lead the work being done in licensing and industry relationships. "I had a team of great people who would work with inventors, taking their patents and licensing them for industrial applications," he said. After about three years in that position, Kelly returned to work in Sandia's nuclear energy program, where he became heavily involved in advanced nuclear technologies, including small modular reactors and Generation IV advanced reactors.

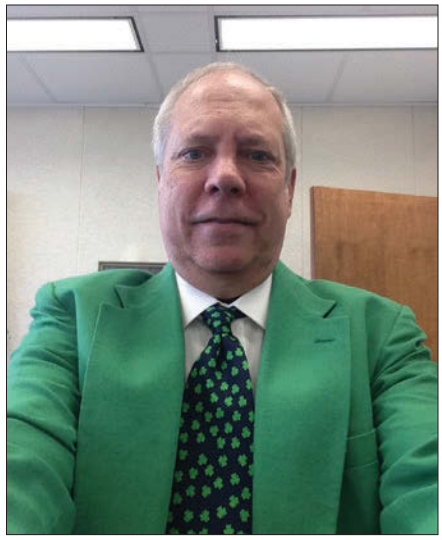
In early 2010, Kelly's friend and colleague Peter Lyons, who was then the principal deputy assistant secretary of the Department of Energy's Office of Nuclear Energy, informed Kelly that the office was reorganizing and was in search of someone to lead a new research program in nuclear reactor technologies. "At that time, my children were all finishing up their [advanced] degrees, and I could see that this was a good time where I didn't have any obligations anymore, so when the posting came out, I applied," Kelly said.

Over that winter, however, Kelly heard nothing from DOE headquarters and had all but forgotten about the job. Then, in June 2010, he got a call to fly out to Washington, D.C., for an interview. That fall, 30 years after starting at Sandia, he became the deputy assistant secretary for nuclear reactor technologies for the Office of Nuclear Energy. "It was a fortuitous day: 10/10/10 was my official start date," he noted.

Continued

Kelly with son Jack and daughter Julie

Kelly and his son Mike take part in security exercises during Sandia Family Day in 1999.



Kelly celebrates St. Patrick's Day in his kelly green jacket, a Kelly tradition, at the DOE offices in March 2015.

The DOE and Fukushima

Kelly was just settling into his position at the DOE when on March 11, 2011, the Tohuko earthquake occurred off the coast of Japan, causing a tsunami that would cripple the Fukushima Daiichi nuclear power plant. Kelly said that the DOE went into emergency mode after the accident, setting up a 24-hour emergency response center and preparing daily reports for the White House.

The events at Fukushima were still unfolding when Kelly went to Wilmington, N.C., for the 2011 ANS Topical Meeting on Probabilistic Safety Assessment and Analysis, at which he had been invited to speak. "I arrived at the conference, and everybody was shocked at what was going on, and these are people who are experts in the field," he said. While at the conference, Kelly was able to visit General Electric's Wilmington offices and obtain blueprint copies of the Fukushima boiling water reactors. The large, wall-size blowups of the reactor drawings helped immensely to explain to DOE's senior leadership what was going on in Japan, Kelly said. "A picture says a thousand words," he said.

With his background in severe accident analysis, Kelly became integral to the DOE's response to Fukushima. On March 17, 2011, St. Patrick's Day, Kelly was meeting with staff at the DOE's offices in Germantown, Md., when he received a call to attend a meeting with Energy Secretary Steven Chu at the department's headquarters in downtown D.C. Kelly admitted that he was not completely prepared for the meeting. "I have a tradition that on St. Patrick's Day, I wear my kelly green blazer to work," he said. "It is very distinctive, needless to say."

Unable to decline to show up for the meeting, Kelly arrived wearing the bright green jacket. In addition to Secretary Chu, assembled for the meeting were senior DOE and White House officials, including John Holdren, President Obama's science advisor. "By the end of the meeting, everyone knew my name," Kelly said, adding that he got more than a few comments on his jacket. Afterward, Kelly was briefing Secretary Chu twice a day on Fukushima and was directing a laboratory staff of a few hundred people. "It was quite an operation," he said.

While the Fukushima accident greatly shaped his career at the DOE, Kelly said he is proud of the work he did in helping to launch the department's small modular reactor program. This led him to testify before the U.S. Senate in June 2011 on the DOE's progress on SMR development and on two SMR-related bills then under consideration. "We now are on a path to seeing SMRs get licensed, and I'm very pleased," he said. "I expect we will build them in the next decade."

In addition to the DOE's SMR program, Kelly became heavily involved in the research and development of Generation IV reactors. Kelly said that his office pushed to involve industry more in the development of advanced reactors through cooperative agreements, while also working with the NRC on crafting the regulatory framework for the eventual licensing of the reactors. "I think we made excellent progress on both fronts," Kelly said. "When I started, there were only a few companies that were talking about advanced reactors, and now there are more than 20."

Kelly poses with a dorado he caught while deep sea fishing in Florida in 2001.

Left: Kelly visits the National Radio Astronomy Observatory's Very Large Array in central New Mexico in 2007.

Below: Kelly, pictured with Janelle Eddins, of the DOE's Office of Nuclear Energy, visits the Korean Demilitarized Zone in 2012.

On the international stage, Kelly led the U.S. delegation to the Generation IV International Forum on advanced reactors and served as chairman of the International Atomic Energy Agency's Standing Advisory Group for Nuclear Energy from 2012 to 2015. Kelly chaired the Generation IV International Forum from 2013 to 2015 and was recently named chair emeritus of the forum.

Kelly considers one of the highlights of his DOE career the work he did in support of NASA. While at Sandia, Kelly was involved in the safety analyses of NASA missions involving nuclear materials, including the New Horizons space probe, which was powered by a radioisotope thermoelectric generator (RTG). Using that experience, Kelly oversaw the RTG program at the DOE, becoming responsible for the DOE's contribution to NASA's Mars Science Laboratory, which launched the rover Curiosity to Mars in November 2011. Kelly noted that he fondly remembers joining NASA personnel at Cape Canaveral in Florida and the Jet Propulsion Laboratory in California for mission launches and landings.

Bridge, bowling, and cars

Kelly retired from the DOE at the end of 2017 as the Office of Nuclear Energy's chief technology officer, responsible for establishing the strategic technical direction of the office's research, development, demonstration, and deployment portfolios. These days, in his spare time he likes to play bridge, bowl, or play a round

Kelly with Black Beauty, his 2007 Shelby GT500 Mustang.

of golf, even though he admits to not being an exceptionally good golfer.

Being a child of the Motor City, Kelly said he also likes to work on his cars. Currently, he has two Ford Mustangs in his stable, including a 2007 Shelby GT500 he calls "Black Beauty." One of the last designs Carroll Shelby worked on with Ford, the GT500 is powered by a 500-horsepower supercharged 5.4-liter V-8 engine. "Zero to 100 in 6.4 seconds, and it actually does it," Kelly said.

Growing up in Dearborn, just down the street from where Mustangs were built, Kelly always appreciated the sporty cars. But when the GT500 came out in the fall of 2006 in a limited production run, Kelly almost missed the chance to own one. Fate, however, would once again provide Kelly the opportunity to take advantage of a bad situation and turn lemons into lemonade. "When I went to the dealer in 2006, they told me that I would be number 40 on the waiting list and that they were expecting to get only about four cars, and that I would have to put down a $10,000 deposit," Kelly said. "I said, 'No thank you.'" Then the recession happened. "I went back in the summer of 2007. The markets had collapsed, and the car was still available. So I bought it."

Kelly is the father of three grown children—Julie, Jack, and Mike—and has four grandchildren. Julie lives in Albuquerque, where she is an interior designer for the architecture firm Dekker/Perich/Sabatini. Jack, who lives in Cincinnati, is a patent attorney for GE Aviation. And Mike lives in Wilmington, Mass., where he is a mechanical systems design engineer for Desktop Metal, a 3-D metal printing company.

ANS: Developing leaders

Kelly said he is honored to be the new ANS president and looks forward to serving. In looking back, he said that he owes much to former ANS president Tom Sanders (2009–2010), whom Kelly has known since his days at Sandia. "Tom has always been by my side, and I appreciate his getting me more involved in ANS," he said.

One issue that Kelly said resonated with him as ANS vice president/president-elect is the society's role in leadership development. "Developing the future leaders in nuclear is something that weighs heavily on my mind," he said. "We have been doing a lot in the way of professional development for our younger members, but we need to be thinking about leadership development as well." Kelly added that he sees a lot of opportunity within ANS for younger members to develop their leadership skills and move into positions of influence as their careers progress.

Kelly also said he hopes to continue to advocate and push for the development of advanced reactors. "We are getting ready to set up the President's Special Committee on Advanced Reactors, and I would like to personally make sure that it goes in the right direction," he said. If the potential of advanced reactors is to be realized, he added, the United States needs to begin investing in the technology today. This includes investing in reactor development and demonstration, as well as the regulatory framework and infrastructure needed to support them.

In regard to regulations, Kelly said that he is heartened by President Trump's efforts to streamline nuclear regulations with the goal of reinvigorating the nuclear industry, adding that he would like ANS to play a technical role in supporting the president's policy reviews. "How we make it happen is not clear to me, but that is one of the things that I will want to push for," he said.

In the meantime, Kelly stresses the importance of maintaining the nation's current fleet of power reactors. Losing the revenue stream generated by operating reactors would jeopardize the nuclear supply chain, he said, which in turn would jeopardize the nuclear workforce. Pointing out that the problem is based more on market structures than technical issues, Kelly said that he would like to see better strategies for helping states keep their power reactors up and running.

Kelly also commends the work that ANS does in public communications and education, adding that he would like to further strengthen the society's communication capabilities, particularly in the context of social media. "The nation looks to us to be the accurate conveyer of information about nuclear energy and technology," he said, "and we need to be prepared to do that." NN