TOPICAL MEETING

Young Professionals Congress

ANS's Young Members Group and the North American Young Generation in Nuclear sponsored a full day of sessions geared toward young nuclear professionals.

The 2017 Young Professionals Congress was held on October 28 in conjunction with the ANS Winter Meeting in Washington, D.C. Opening the meeting was Piyush Sabharwall, of Idaho National Laboratory, chair of the ANS Young Members Group, which organized the meeting along with the North American Young Generation in Nuclear.

"We need to continue to deliver and remember that people and their actions are what define an organization," Sabharwall said. "We have to be focused on outcomes that matter and be ready to make changes and adapt if needed." He suggested steps that policymakers could take to ensure that nuclear power will be part of the energy mix in the future, including zero-emission credits, and asked the audience to consider how advanced reactors can play a role and compete in the current market structure.

Sabharwall

"Today, we have an opportunity to learn from each other as young professionals and from team panelists about nuclear policy, economics, and regulatory roles," he said. "If you get an opportunity, learn from people who are working in policy and economics, and see what the challenges are. See where we fit in, what role we can play as a faculty member, as a student going forward, because we cannot deny those things. It's better to learn, adapt, and take action."

The keynote speaker at the event was John Kotek, vice president for policy development and public affairs at the Nuclear Energy Institute and previously acting assistant secretary for the Office of Nuclear Energy at the Department of Energy. "I was studying nuclear engineering in the '80s, a couple of years after Three Mile Island, and Chernobyl happened when I was in undergrad," he said. "At the time, it was said that the plants aren't safe, we had cost overruns befalling plants that were under construction, and folks were asking, 'Why do you want to stick with nuclear?'" Despite these challenges, Kotek remained optimistic about the nuclear industry. "As someone who got into nuclear in the '80s and who is still in it today, I'm glad I stuck with it," he said. "I see a tremendous future for nuclear in the U.S. and globally in the decades to come, and I'm really excited for you all. You're on the front end of what I think is going to be a really exciting time to be a nuclear professional."

Kotek

Kotek went on to address what keeps him optimistic, but also what he believes needs to happen to ensure a strong future for nuclear power. "What you've seen is markets evolve in a way where nuclear's attributes are undervalued," he said. "We know there have been debates at the national level over putting a price on carbon for more than a decade, and that hasn't happened. . . . You've got this situation where other technologies are benefiting from market structures in a way that nuclear isn't. When gas prices were high, when renewable penetration was low, nuclear plants were doing fine. Now that those factors have changed, you're starting to see pressures put on nuclear plants that are causing state and federal policymakers to take notice."

Kotek provided examples from Illinois, New York, and Connecticut of positive actions taken to value nuclear power for its zero-carbon emissions, emphasizing that nuclear professionals can be of great assistance in helping change policy. "The fact that we understand the attributes that nuclear brings to electricity markets and how important that is to a safe, secure, reliable, increasingly clean electric grid—that's a story that we know better than anybody, we can tell better than anybody," he said.

The vast majority of nations recognize the need for a cleaner energy future and a decarbonized electricity sector, Kotek said, and more policy analysts are willing to say that to get to that future, nuclear is necessary. "That means preserving what you've got today, but it also means creating a pathway to new nuclear build," he said. "How are we going to get to new nuclear build and continue innovation?" Part of what it will take, he continued, is stronger public-private partnerships, along with bipartisan support for moving forward with small modular reactors and other advanced reactors.

Continued

"Going back 20 years, you didn't have these dozens of small companies out there that are trying to drive innovation in the advanced nuclear space," Kotek said. "The fact that you've got people who made their millions or billions in high-tech industries—Microsoft and Apple and Google money, and other wealthy people's money—going into advanced nuclear tells policymakers there's something there."

Public-private partnerships also take the government out of the role of trying to lead technology development and into the role of trying to enable that development, Kotek said. In addition to such partnerships, he noted the need for more flexibility, in terms of both operation and product output, for load-following capabilities, and for expansion into other markets, such as using nuclear for hydrogen production or desalination. "Bringing the benefits of nuclear into other energy markets can be a game changer for nuclear technologies," Kotek said. "There's all of this promise out there. The government has invested strongly, historically, in bringing advanced nuclear technologies to market. I think there's a strong case to be made for it to continue making those investments."

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Regarding the opportunity for policy changes, Kotek noted that from what he has witnessed from the five presidents who have been in office during his time as a nuclear professional, "no administration comes into office . . . with a firmly cemented plan as to what they're going to do about nuclear. But the longer you govern, the more you recognize why nuclear matters, why nuclear is different, and why the government has played and needs to play a strong role in nuclear."

When the United States enters into an agreement to sell nuclear technology to another country, Kotek said, that agreement gives the U.S. government rights as to how the recipient nation uses the technology or nuclear material provided, which is a tremendous tool for preventing the spread of nuclear weapons. "When we sell a nuclear power plant to another country, we enter into what can be a century-long relationship with the recipient nation," he said. "The process between the actual sale, the licensing process, construction, 60–80 years of operation, decommissioning—that can be a century, give or take. And over that time, we're building relationships with that recipient nation across a range of sectors."

Kotek wrapped up the opening session with continued emphasis on a positive outlook for the industry's future. "There are a lot of things that point to a potentially helpful set of policies forthcoming over the next several years to get us to an increasingly strong nuclear industry," he said. "I've got another 15 to 20 years to go, and I'm sticking with it. We have a lot of hard work ahead of us, but I think we've got a bright future and can get there if we all work together to make it happen."

Nuclear policy

Continuing with the legislative focus, the next YPC session featured three panelists equipped to provide insight into how nuclear fits into the national energy policy. Mike Twomey, vice president of external affairs at Entergy, began with an overview of the wholesale market restructuring in the northeastern United States that occurred in the late 1990s and early 2000s, contrasting the wholesale, or nonutility, market structure with that of a utility-regulated market.

"For a traditional, vertically integrated utility like Entergy, as a company we do planning for customer needs 10 years into the future," Twomey said. "We generate all the power ourselves and then we buy whatever we need, then we transmit the power over resources that we own, we distribute the power to customers, and we send them the bill," he said of Entergy's fleet in the southern United States, which includes Arkansas Nuclear One-1 and -2, Grand Gulf, River Bend, and Waterford-3. "If you contrast that with the Northeast, where this wholesale market has been created, you have one set of owners for the generation assets. . . . Then there's a different set of owners that owns the transmission facilities, and then there's a third group of owners that own the distribution networks."


Twomey

The way that Entergy's assets in the Northeast—FitzPatrick, Indian Point-2 and -3, and Pilgrim—operate is fundamentally different, Twomey said. "When you're a regulated utility, you have an obligation to serve," he continued. "The idea is that if I'm Entergy in Louisiana, I have an obligation to produce electricity for customers at an affordable rate. . . . The regulator is focused on keeping pressure on the utility to ensure that customers have power when they need it, and that they have power at a price they can afford to pay. . . . That means that they're going to be working closely with the utility to ensure that those utility companies have a good mix of resources to achieve their objectives."

Twomey contrasted this environment with the wholesale markets in the northeastern United States, such as the New York Independent System Operator or the PJM regional transmission organization, that were created to "facilitate the ownership of the generation, transmission, and distribution assets being divided" and to ensure that the system runs reliably. "They put in place a model to ensure that the prices were competitive," he said. "The bottom line is you try to match the load with the generation, and in creating this generation stack, the pricing model will fill in the bottom with the lowest incremental cost assets and build up until you get enough generation to meet the load. . . . These markets that we're creating, we create to facilitate this notion of a competitive market, but the focus on the pricing is only on how much it will cost to produce energy in the next hour or the next day."

The formula does not look at things like zero-carbon emissions, Twomey said, and the wholesale market was not designed to address fuel diversity, fuel security, or the economic consequences of losing a nuclear power plant. "There's been a disconnect between certain public policy goals that many people think should be achieved and the functioning of the markets," he said. "From a nuclear perspective, it's been a little bit one-sided in terms of this conversation because while we've been working through these markets, operating these units reliably, and steadily losing money, there's a little thing happening on the other side called the renewable portfolio standards and renewable energy credits."

Nick Thompson, a postdoctoral research associate at Los Alamos National Laboratory, spoke next about his experience with the Environmental Protection Agency's Clean Power Plan (CPP) and New York's Clean Energy Standard (CES). As chair of the Nuclear Engineering Student Delegation in 2014, he met with the EPA to discuss how the CPP would affect nuclear. "The next year, the final rule ended up coming out, and a few months later, FitzPatrick announced that it was going to close," Thompson said. "Some of us at ANS tried to work on this . . . and focus on how to save some of these nuclear plants." What came out of this effort in 2016 was the Nuclear in the States Toolkit on the ac-

tions that states could take to help demonstrate the value of nuclear.

Around the same time, Thompson continued, New York was considering putting policies in place to get the state's energy portfolio to 50 percent renewables, but it was unclear whether nuclear would be included. "A few months later, through a lot of hard work from people at ANS and others . . . New York decided that they were going to add nuclear in as part of the Clean Energy Standard," he said. "They said that nuclear is important because . . . it doesn't produce any carbon emissions when it operates, and because of that we should value this attribute of nuclear. That effectively saved the plants in upstate New York."

Thompson

Steve Nesbit, director of nuclear policy and support at Duke Energy, wrapped up the session with a discussion of regulated markets. "One of the key things you have to do when you're a vertically integrated utility [in a regulated market] is to keep the public utility commission happy, because they're the ones that set your rates, and that determines how much money you make," he said. "We're allowed to charge a certain amount of money for each kilowatt-hour of electricity we sell. That is established by the public utility commission [PUC], or in some states the public service commission [PSC], based on a public process that allows us to recover our reasonable and allowable costs for producing that electricity and earn a rate of return on our capital investment." Nesbit noted that revenue is determined by how much electricity a company sells and at what price, based on the last rate case with the PUC or PSC. "If you can do it for less money, then you get to pocket the difference," he said. "That's why we're under constant pressure to lower our costs."

Nesbit

Nesbit explained that a regulated utility decides which type of power generation to install based on what the future demand will be, what the cost will be for alternative power generation sources, and how best to meet the demand during peaks in the summer and winter months. The utility must then go through a process with the PUC/PSC to enter the new generation source into the rate base in order to recover costs. The decision to retire a generation asset is similar, he said, and takes into account the utility's need for power, the reserve margin, and the cost of power. "When we're looking at the cost of power, we don't just look at the fuel cost," he said, listing other factors, including refurbishment and repair costs, environmental compliance costs, and the cost of alternative generation sources. "Economics is the bottom line. . . . You have to make the decision that makes the most sense for you and your customers."

Returning to the subject of policy, Nesbit said, "If you're dealing with a policymaker that has 10,000 other issues, energy is a small slice. The other issue is that the antinuclear sentiment has been around since the 1970s. It is very difficult for us to combat that because it takes about 10 seconds to say, 'That nuclear plant is not safe,' and it takes me an hour to explain all the reasons why it is. . . . When you're dealing with policymakers, they may not have the resources to dig into the details. It can be an uphill battle."

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Nuclear economics

The YPC's third session featured three panelists who discussed the economics of the commercial nuclear power industry, including current market conditions, the effects of decommissioning, and the economics of advanced nuclear energy.

Matt Crozat, senior director of business policy at the Nuclear Energy Institute, spoke first on the difficulties of economically supporting the current fleet, let alone advanced reactor technology. "While these issues might have been more at the forefront of the policy discussion five years ago and aren't quite as central today, they matter," he said. "They matter a lot, and the future of the technology is going to depend not just on what happens with, say, Millstone, but how we develop the next generation of technologies and how we deploy them abroad.

Crozat

We also need to work on creating a regulatory environment that can sustain the reliable operation of these plants. There has been a great deal of work done around the innovation of new technologies in the nuclear space. I think that's going to be one of the key drivers for the technology."

Crozat divided the current fleet into four categories: (1) those that have announced that they will close and do not expect any legislative action to reverse that decision (e.g., Pilgrim); (2) those that have announced that they will likely close but would like to see action taken to prevent their closure (e.g., Three Mile Island); (3) those that have not made public statements but that Crozat believes to be at some risk of closure; and (4) the rest of the operating fleet that does not currently face the same pressures as those mentioned in the previous categories.

Crozat moved on to discuss the current policy environment as it relates to nuclear power plants and what this and economic pressures may mean for the future of the industry. "When I look forward, just for the next 15 years or so, I can see a scenario where many of these plants for which there is concern, there's a real risk that there are going to be a number of closures," he said. "The economics don't get fixed, the policy environment does not evolve, and the gap between these two scenarios [current and future] is about 12,000 megawatts of power by 2025."

Crozat then discussed the reality that the decision to continue operating reactors in regulated markets is driven by the expected revenues, but nuclear reactor operators in these markets are not going to change whether they run their plants based on a market price because it takes them a significant amount of time to bring the reactors back up to operating power after shutting them down. "As we begin to look at the policies here and the impact they have on these markets, there are challenges of who is going to succeed, who is going to be rewarded, who is going to be disadvantaged—that's part of the politics," he said.

Speaking next was Harsh Desai, manager of energy and economic analyses at NEI and founder and president of Energetic Solutions. "There are three main aspects that go into calculating the cost [of nuclear power plants]," he said. "You've got the fuel cost, the capital cost, and the operations and maintenance (O&M) cost. . . . What we care about are capital and O&M costs." In competitive markets, owners and operators are trying to lower

the costs associated with their plants, Desai continued, and they spend money only if they "absolutely need to in order to run." Costs can go down as capacity factors increase, thereby increasing the reliability of a plant. From 2012 to today, capacity factors have increased from about 86–87 percent to 92 percent, according to Desai. He also attributed decreasing costs to the Delivering the Nuclear Promise strategic plan, published by NEI in February 2016 to identify efficiency measures and adopt best practices and technology solutions to improve operations, reduce generation costs, and prevent premature reactor closures. "People are working very hard to figure that out and trying to make sure our costs are as low as possible so that we can be as competitive as possible and can play in the competitive markets," Desai said. "It's not that this issue boiled up today. It's that it has been boiling up for a while, and even though we've reduced costs significantly . . . we're still talking a lot about revenue streams and competitive markets."

Desai

"We have never built a commercial nuclear power reactor in the United States on budget, and I think we are long overdue to have a serious conversation within our industry about this problem."

Following Desai was Daniel Curtis, a research assistant in energy economics and policy at the Massachusetts Institute of Technology, who opened with a poll of the audience on what they believe is the biggest challenge facing nuclear today. Answers included public perception, production costs, capital costs for new construction, waste management, competition from other power generation sources, and a lack of demand. Curtis then offered his suggestion. "We have never built a commercial nuclear power reactor in the United States on budget," he said. "It is really hard to imagine an industry surviving under conditions like this, and I think we are long overdue to have a serious conversation within our industry about this problem."

Curtis presented a 1986 report from the Energy Information Administration on cost data for nuclear power plants, which he held was still "perfectly relevant because we haven't added much to the data since then." The data show that realized costs for nuclear power plant projects were 200–300 percent more than the original cost estimates. "A lot of folks like to say the Nuclear Regulatory Commission and Three Mile Island caused our capital cost problems, that we've been overregulated since Three Mile Island, that the cumulative impact of regulation has increased," he said. "I want to dispel the idea that there was ever a golden age where we got this right. We did not, even back in the beginning. Even plants that were completed back in the '60s were routinely 100 percent over budget. It's hard for us to expect anyone to buy our product when we can't even tell them what it is going to cost, so we need to have a hard conversation about why this happens and how we're going to fix it. . . . I believe one of the underlying worries that makes us so afraid of losing the existing plants is that we know that it is too expensive and too uncertain to build any new ones to replace them."

Curtis finished his talk with an examination of the grid resiliency rule proposed by Energy Secretary Rick Perry to the Federal Energy Regulatory Commission on September 29 (*NN,* Nov. 2017, p. 28). "The proposed rule has less than one total page of regulatory language," he said. "The regulatory language only really tells us about three things: It tells us a possible definition of resilience—90-day fuel supply on site—and it tells us a bit about what kinds of costs resilient generators should be allowed to recover." Curtis noted that since FERC is an independent regulatory commission, it does not have to do what the DOE or Perry requests. "What Secretary Perry did . . . is he has said, 'I'm going to put a clock on you,' because one of the key things about provision of law is that unlike anything else that's put before FERC, if the secretary puts it there, FERC has to take a final action in a quick period of time—60 days," he said. (This deadline has since been extended by 30 days; see page 32, this issue.)

"There are three choices that FERC has now," Curtis added. "It can accept the rule as written, it can reject the rule outright, or it can set a third course, say, something like 'This is an issue that matters. We don't like this solution, so let's figure out the path to find a more reliable one.'. . . As we look toward a future with less diversity, more reliance on a natural gas system that wasn't particularly designed to be relied upon in the way we're heading toward, we need to think this one through."—*Kaitlin Schuler*