GOING NUCLEAR

There is no clean-energy future without nuclear power, and no new nuclear power without the workforce to build and maintain it.

I've seen the future, neatly packed inside two semi-trailers. Shiny, industrial-looking panels and piping; bright OLED displays; and enough wires to snake from New York to Chicago. No, it wasn't the staging for a top concert tour. It's something you'll begin to see in operation in the US soon: a small nuclear reactor.

The introduction of small modular reactors (SMRs)—or plants with a capacity of less than 300 megawatts—has been driven by increasing demand for decentralization and decarbonization of our energy grid. But you may have seen one in action before. We've been using a version of them nearly as long as their full-scale, land-based cousins, to power submarines and aircraft carriers.

The demonstration reactor stored on the trailers is about as small as they come. But at five megawatts, it can still power more than 1,000 homes, or an entire steel or cement plant. Industrial manufacturing plants carry some of the world's largest carbon footprints. It's unclear exactly where the first SMR will come online in the US, but my money is on colocation with a single massive energy consumer.

The advantages of small-scale fission power are numerous. SMRs carry a fraction of the footprint, cost, risk, and waste of traditional plants while producing carbon-free energy. According to the International Energy Agency, meeting global carbon targets will require not only investments in energy efficiency and renewables but also an 80 percent increase in nuclear power production by 2040.

In 2022, the Associated Press reported that two-thirds of US states had plans for increased nuclear generation in response to climate change. With only one traditional nuclear plant under construction in the country, nearly all of those increases will need to come from SMRs.

Although the Nuclear Regulatory Commission granted approval to the first wave of SMRs four years ago, they face headwinds, from activists to state and local permitting. But perhaps the biggest barrier to their success is that we simply won't have enough people qualified to bring them online and operate them.

I speak frequently with members of the nuclear science and engineering communities. Most are excited about the future of the sector. As a November 2023 *New York Times* article notes, "While many environmental groups still oppose nuclear power, some skeptics are softening." Adding to the momentum: for the first time since the annual UN climate summit began in 1995, the 198 signatory countries at COP28 officially called for accelerating the deployment of low-emission technologies, specifically including nuclear energy. However, reactor vendors I speak with talk about the lack of engineers, skilled tradespeople, and operators needed to staff the increase in power plants ahead.

With human-driven climate change, there is a lag between (in)action and consequence. The same will be true if we fail to create a pipeline of future talent. But I prefer to look at success stories, such as the 1969 moon landing. The "space race" and eventual launch of Apollo 11 drew thousands into the space science and STEM ecosystem—cementing our country's dominance in space for decades to come. That all took a decade of focused effort.

Today, the transition to carbon-free energy is an existential struggle, and nuclear energy is a critical piece of any workable solution. Countries worldwide are competing for skilled nuclear talent, and we can't afford to lose—not just as a nation, but as humanity at large.

A few specific actions will yield the most urgent, positive outcomes:

- **Implement more nuclear engineering and technology programs at universities and technical schools.** This could include expanding existing programs, creating new degree courses around emerging technologies, and offering scholarships for these degree tracks. Associations should also further invest in relevant professional development.
- **Establish global partnerships for training and knowledge exchange in nuclear technology.** Collaborative programs between countries with advanced nuclear capabilities and those developing their nuclear infrastructure could facilitate internships, joint research projects, and exchange programs for aspiring nuclear engineers and technicians to gain practical experience and insights from leading experts.
- **Increase government and private incentives to attract and retain talent.** This could include more competitive salaries, career development opportunities, and benefits such as funding for continuous education and research. Moreover, public awareness campaigns highlighting the importance of nuclear energy in combating climate change could enhance the sector's appeal to potential candidates.

I'm optimistic that, by following this path, we can fulfill our future energy ambitions. But an Apollo moment for nuclear would help address our nuclear workforce challenge. For climate action, that is just the giant leap we need.

Tom Costabile is executive director/CEO of the American Society of Mechanical Engineers (ASME), an international nonprofit professional organization whose mission is to advance engineering for the benefit of humanity. For more information about ASME's work on climate, visit https://www.asme.org/about-asme/climate-change.