



by Dana Sacchetti

Generation Next

Amid calls for a 'renaissance' in nuclear power, much work needs to be done to cultivate nuclear's future workers.

Booming demand for energy, expanding populations, and growing environmental concerns are all factors leading to renewed interest and investment in nuclear power generation. And with even the most conservative of estimates predicting a doubling of the world's energy needs in the next half-century, many countries are setting aggressive plans in place for their nuclear power programmes. China plans a five-fold increase in nuclear power by 2020, while India plans an eight-fold increase by 2022. Over 34 plants are currently being built globally with scores more currently in various stages of planning.

Yet hidden within these predictions lies a quandary. With such a pronounced pace of nuclear power development on the books for several countries, there is increasing consternation as to how the industry will generate a new generation of workers with the skills and competencies necessary to support this estimated growth.

For years, stagnant growth in nuclear energy set off a chain reaction. As governments scaled back investments in nuclear power, students turned to more promising fields of study. Universities followed suit by scaling back nuclear curricula, leading to downward trends in nuclear education. The US Nuclear Energy Institute has warned that about half the industry's workforce is eligible to retire within the next ten years. And it's not even future plans that are at risk. An ageing workforce can also affect the safety and maintenance of nuclear plants in operation today.

The Organisation for Economic Co-operation and Development's (OECD) Nuclear Energy Agency (NEA) recently warned of the risks associated with an erosion of manpower to ensure the appropriate reg-

ulation and operation of existing nuclear facilities as well as the construction of new ones in those countries wishing to do so.

"We cannot retreat from this problem," said Yanko Yanev, IAEA Head of Nuclear Knowledge Management. "Much of our nuclear workforce is edging towards retirement, and many of today's graduates are being drawn to information technology or business. And in a country such as Germany, there have been recent years where not a single German student graduated with an advanced degree in a nuclear discipline."

With the expected lifespan for nuclear plants estimated at 50-60 years of operation, there is a need for a steady multi-generational stream of competent staff to assure safe operations for a plant. It is incumbent upon governments to invest in education, research, and training for the three to five generations of people who will construct, operate and eventually decommission a plant over the duration of its life cycle.

Additionally, while much of the attention on shortage of staff is focused on engineers and scientists, there is also a need for qualified architects, welders, casters, and other specialized workers. In earlier decades, nuclear countries maintained vocational educational institutions, but many of these programmes have lapsed as the industry has aged.

The UK is a case in point. The country is looking at nuclear power again, but may be hard-pressed to staff its expected expansion plans. A 2005 assessment that polled nuclear employers on the Human Resource (HR) status in the UK industry produced some

nuclear's future

alarming results. Over three-quarters of employers reported skills gaps, meaning that current job holders do not have all the skills required to be fully proficient in their job role. 70% of employers found science and engineering vacancies hard to fill, citing candidates that lacked skills, qualifications or experience. The most common shortages in the COGENT Nuclear Employers Survey were seen in critical areas such as nuclear safety management, safety reliability, and nuclear plant and instrumentation systems.

There are signs, however, that there may be a reversal in this trend. The US has begun to see a minor resurgence in university enrolment trends in nuclear sciences. Though still down from enrolment figures of the early 1990s, a 2006 survey by the Oak Ridge Institute for Science and Education (ORISE) found that degrees granted in nuclear engineering at the bachelor and masters levels has been trending upwards over the past several years.

The study of 31 US academic programmes showed that 346 B.S. degrees were awarded in 2006, up from 166 in 2003. M.S. degrees conferred in 2006 were up to 214, a nine-year high, while Ph.D. degrees have remained roughly in the range of 70 per year over the past half-decade.

Despite these recent improvements, it could be said that the US nuclear education is still in recovery mode. Over 30 nuclear engineering programmes are offered today, but that number is down over 50% from 1980.

Meeting the Problem

Over the last several years, the IAEA has taken remedial action to support the education of nuclear's next generation through a variety of methods.

With much of the forecasted growth for nuclear power taking place in Asia, the IAEA met and consulted with representatives from several Asian Member States on establishing ANENT (Asian Network for Education in Nuclear Technology), a regional network for higher education in nuclear technology. Created in 2003, ANENT establishes a central point for exchange of information and materials for education and training, a base for distance learning opportunities, and a mechanism to support the exchange of students, educators, and researchers. ANENT also helps Asian nuclear education programmes by providing a mechanism for transfer of academic credits and regional recognition of degrees.

Another programme is the World Nuclear University (WNU). Initiated by the IAEA, World Nuclear Association, Nuclear Energy Agency of the OECD,


and the World Association of Nuclear Operators, the WNU was created not only to formalize the passage of knowledge to young professionals, but also to serve as a link between nuclear professionals around the world. Formed in 2003, the WNU also acts as a nuclear advocacy group which promotes greater public awareness and understanding of nuclear technology. WNU facilitates academic cooperation through sharing of information, students and faculty, and hosts a summer leadership institute in London for 100 young professionals from around the world.

Through its Nuclear Knowledge Management section, the IAEA hosts conferences, seminars and workshops throughout the world, encouraging and advising Member States on how to invest in education, learning and information management.

Naturally, the effort to build, manage and preserve knowledge within the nuclear sector is not limited to the IAEA's initiatives. Some organizations focus on bridging the needs of the nuclear industry with the universities that will educate future generations. One such group is the American Nuclear Society (ANS), a group composed of students and professionals within the nuclear sciences. Among its programmes is an effort geared to attract students to the nuclear field.

"One major focus is on the kindergarten through high school educator and student outreach programme," stated ANS Executive Director Harry Bradley. "The very popular teacher workshop programme is aimed at middle school through high school educators and provides demonstrations and assistance in presenting nuclear topics in the classroom. The goal is to encourage students to enter the nuclear engineering career path."

Bradley also noted that courses and programmes are being set up in colleges near nuclear power plants, which encourage students to look into future careers in the nuclear industry. The human resources challenge facing the industry is one that must be met on a global scale. Countries who aspire to initiate or expand their nuclear capabilities need to cultivate the young engineers and scientists who will manage their programmes.

"The human resource issue is approaching a crisis state in some areas," Yanev said. "Yet if we work hard to restore the knowledge process and involve governments and universities, we will be able to produce engineers, physicists and scientists who will form the next nuclear workforce." 

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The number of universities offering higher degree programmes in the nuclear sciences has seen some decline. With dwindling enrolment and a reduction in students pursuing such degrees, universities either diluted their nuclear curricula by combining programmes or offered nuclear-related degrees as part of a more general science programme.



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