

Session 04
Panel: Preserving Worldwide Nuclear Competency:
Where Education, Institutional Knowledge, and Industry Meet

Panel Reporter: Tjalle T (“Chuck”) Vandergraaf, Providence College (Canada)

The topic for this panel had its origin in the premise that an anticipated renaissance of the nuclear industry may be thwarted by a rapidly aging workforce and a perceived decrease in nuclear-related education.

The following invited individuals participated in the panel

- Shirley Gill, AREVA NP Inc., Lynchburg, VA
- Kevin Kostelnik, CAES, Idaho National Laboratory, Idaho Falls, ID
- George Bereznai, University of Ontario Institute of Technology, Oshawa, ON
- Mark Landry, Fluor, Irving, TX
- James Clarke, Vanderbilt University, Nashville, TN
- John Till, Risk Assessment Corporation, Neeses, SC

The panel was co-chaired by Ian Scott Hamilton, Foxfire Scientific, and Tjalle T (“Chuck”) Vandergraaf, Providence College

The panel was asked to address the following questions:

- Is your organization able to recruit personnel with the required nuclear expertise?
- What skill mix is needed?
- What are your projections over the next, say, six years? (six years is an estimate of the time required to get suitable programs going if they are needed and to get the first batch of students ready for the job market)
- How can the need be met? (what is there in the way of educational programs)
- What is the role of universities and what is the role of private educational organizations?
- Can we get by with "supplemental training" (for example, have a chemist take radiochemistry courses, or engineering with supplemental nuclear science courses) or do we have to stay with more formal training at universities?
- What can/should be done or what is being done to interest students in nuclear science and engineering before they graduate from high school?

Shirley Gill expects a major shortfall in the nuclear industry, with 40% of the staff eligible for retirement in the next five years. There is a demand for 90 000 new employees over the next ten years. AREVA alone expects to require 1000 new hires by 2010. The nuclear industry is not alone in recruiting new employees; it has to compete with other organizations, such as NASA and the medical industry for highly trained staff. Not only does the nuclear industry have to hire new employees, it has to retain its current staff. AREVA focuses, in part, on keeping its staff by offering flex time and in-house training of new hires and upgrading the skills of its established workforce. One approach used to attract new employees is to work closely with the local communities. Another approach is the establishing of a “virtual university” that includes a college intern program, college and university scholarships, and the sponsoring of research projects in various universities. AREVA is also investing in

technologically advanced facilities. In summary, AREVA has reacted to the looming shortage of scientific, engineering and technical staff by developing an in-house training program and cooperating with educational institutions.

Kevin Kostelnik pointed to the proud partnership between Idaho National Laboratory (INL) and a number of universities that has led to the establishment of the Center for Advanced Energy Studies (CAES). He echoed Shirley Gill's concern about competition for new staff from other nuclear and non-nuclear organizations. CAES has been developed with three Idaho universities, Boise State University, the University of Idaho and Idaho State University, and with a national university consortium to address culture transformation, workforce supply, wider educational needs and university engagement of INL. CAES provides education, research, and training and policy studies with its main focus graduate studies. The scope of the research is not only limited to nuclear energy but includes fossil fuel and renewable energy as well. To address the current problem that high schools are failing to prepare adequate numbers of students for science and engineering programs, INL has established a regional network with K-12 students and a program to deliver strategies that attract high-ability students to develop the educational foundations needed for engineering and science careers.

George Bereznai presented the topic from a Canadian perspective. He pointed out that the nuclear industry in Canada is multi-faceted, from mining and fuel manufacturing to nuclear power generation and the generation of radioisotopes for use in health care and various industrial purposes. Common to all these industries are a waste management component and a requirement for health physics. The manpower situation in Canada reflects that of the United States in that the rising demands coincide with the approaching retirement age of the majority of the current workforce. Since nuclear power plants are concentrated in Ontario, the key utilities, Ontario Power Generation, Bruce Power and the federal crown corporation, Atomic Energy of Canada Limited, established an \$8M fund to create a University Network of Excellence in Nuclear Engineering (UNENE). An interesting development was the establishment of the University of Ontario Institute of Technology (UOIT), located within 25 km of 12 CANDU nuclear reactors. One of the mandates of this institute is to offer "market-orientated programs" and to produce "job ready graduates." To achieve this, opportunities were created for graduates of community colleges to receive credits towards a degree from UOIT and to encourage these transfers, UOIT was located at the same site as a community college. UOIT offers both nuclear engineering and health physics and radiation science programs. In 2007 June, the first class of 40-45 students is expected to graduate and many students have already received multiple job offers.

Mark Landry also reflected on the greying workforce, the competition for employees and the incentives needed to retain employees. He pointed out that the nuclear industry is not the only one affected by the current demographics and cited the US petroleum industry as facing the same challenges. A bright point is a modest increase in nuclear engineering degrees in the US since 2001. Fluor's approach to maintaining an adequate workforce includes a "college relations program" consisting of strategic partnerships with universities, which involves providing financial support and includes academic collaboration. Fluor has also embarked on a more aggressive recruiting cycle by offering internship programs and signing students early on in their

program. Fluor is also making inroads into high schools by various programs including “Project Lead the Way” and the “Career Clusters Institute.”

James Clarke listed eight essential elements of a well-rounded nuclear curriculum: nuclear engineering, materials science, health physics, earth and environmental science, environmental engineering, risk analysis, risk communication and social, political, economic and cultural factors. This practical, integrated view is also incorporated into the Transdisciplinary Initiative on Environmental Systems, a collaborative effort involving several schools and departments within Vanderbilt. This Vanderbilt initiative includes a “capstone course” on the deep geologic disposal of nuclear waste that brings together experts in various areas including nuclear power, hydrogeology, risk analysis, waste forms, geology, and includes lectures on the ethics of waste management and field trips to WIPP and Yucca Mountain.

John Till recalled the fact that the nuclear industry in the US has traditionally relied on the Navy Nuclear Propulsion Program for much of its trained staff. The rigorous in-depth training of the Navy program has produced a very highly qualified workforce. Military institutions have the leverage to demand a higher commitment and more intense training than more traditional educational institutions. However, it is recognized that the nuclear industry can no longer rely on the military to meet its current and anticipated demand. The Risk Assessment Corporation (RAC) that John Till founded has taken an approach similar to that of the US Navy by taking individuals with two key credentials: (1) solid fundamental training in hydrology, chemistry and mathematics, and (2) communication skills, including strong writing abilities, to generate individuals who can perform risk analyses. Each member of the RAC team is required to explain the results of these risk analyses to the general public. This not only forces each student to present his or her research in terms that are understandable to the general public but also builds communication bridges between the scientific community and the general public and, more importantly, trust.

The attendance at Session 04 was considered good, with about 40 people present at both the start and at the end (note that numbers are usually lower at these time periods due to transfers between other scheduled sessions), while a total of 80 attended most of the session. The panel session competed with two directly related panels (one an inside look at DOE from senior Headquarters managers, historically a major draw for U.S. participants, and the other on global nuclear partnerships, a major draw for industry and international participants). While attendance was therefore affected, the discussions were strong, and many attendees continued informal discussions with the panellists afterwards – as a clear indication of the interest in this important topic of ensuring an adequate supply of trained staff in all facets of the nuclear industry.

It is clear from the presentation by the panellists and the feedback from the audience that both the academic world and the nuclear industry are modifying their approach to ensure an adequate supply of scientists, engineers, trades people and technical staff in anticipation of the impending retirement of a considerable fraction of the current workforce. Another welcome development is the recognition that, as in many industries, science and engineering do not function in a vacuum but in a social context and that both a multidisciplinary approach and successful communication with the general public and with individual stakeholders is essential to the future of the nuclear industry. These developments are encouraging. However, considering the

importance of this topic, it is recommended that the issue of staffing be considered for a future panel session, for example, in about five years. In the meantime, papers on this topic should be elicited by the organizers of this conference series.