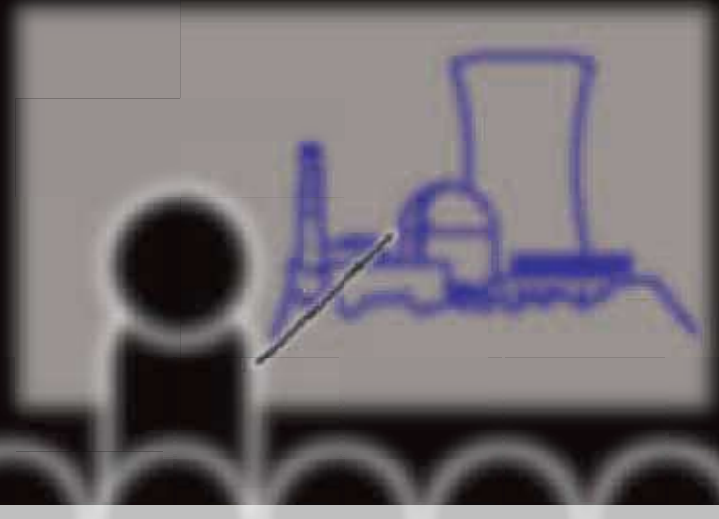
Nuclear News Special Section:

# Education, Training & Workforce Issues



# GoNERI offers a new direction for nuclear energy education in Japan

BY RICK MICHAL

*A program at the University of Tokyo uses a systematic method to incorporate liberal arts with social and technical subjects as they relate to the use of nuclear technology.*

WHAT IS BILLED as a first-of-a-kind program for post-graduate and doctoral nuclear energy education is being offered by the University of Tokyo (UT). The program, known as GoNERI (**G**lobal Centers of Excellence Program **o**n **N**uclear **E**ducation and **R**esearch **I**nitiative), uses a systematic method in its teaching and incorporates liberal arts with social and technical subjects as they relate to the use of nuclear technology. GoNERI, which was introduced at UT last year, is not a separate series of classes within the university's Department of Nuclear Engineering and Management, but is a new teaching direction that encompasses that department and other university branches.

GoNERI is the brainchild of a UT team led by Yoshiaki Oka, a professor in the Department of Nuclear Engineering and Management and UT's Graduate School of Engineering. Oka explained that mankind has had an increasing effect on the environment through greenhouse gas emissions, and that nuclear power can be used to reduce emissions. GoNERI's goal, then, is to cultivate students who understand the connection between energy production, society, and the environment.

Oka

Students who participate in GoNERI will be ready to move into the nuclear industry's workforce equipped with certain capabilities, according to Oka. They will be prepared to study nuclear energy's regulatory system, identify problems, and find solutions; will have the necessary expertise to serve in policy-making roles; and will be able to communicate with the public on the social aspects of nuclear power. "We will prepare next-generation researchers to grasp the perspectives of complicated and divergent fields of nuclear energy," he said.

The program's research projects and educational focuses are "well rounded," Oka stressed, in that they involve subjects that are tied to the use of nuclear technology, such as protecting the global environment, supplying safe and stable nuclear energy, and applying radiation for healthy, productive, and prosperous lives.

By employing a new approach, GoNERI aims to fill the gaps that exist in traditional programs, where students learn about nuclear power engineering but may be lacking in their knowledge and understanding of human and social sciences. "If we want to seek new development of nuclear power, we cannot avoid this problem," said Satoru Tanaka, a nuclear engineering professor at UT and a leader in the development of GoNERI.

Tanaka

Oka added that efforts continue in honing GoNERI, mainly in the fields of humanities and sciences. Specialists in humanities are working on promoting the program, while professors and researchers primarily from the humanities and sociology fields have been employed in GoNERI's education courses and research programs. In addition, dozens of people from the nuclear industry, research institutions, and the Japan Atomic Energy Agency have cooperated with GoNERI in various ways.

GoNERI was created under Japan's Global Centers of Excellence (COE) program, which was established in 2002 by the Japanese government. According to the Japan Society for the Promotion of Science, COE provides funding to elevate the international competitiveness of Japanese universities. Through the funding, COE seeks to strengthen and enhance the education and research functions of graduate schools and to foster highly creative young researchers who will go on to become world leaders in research in their respective fields.

The GoNERI program was approved as a COE initiative in June 2008, and it received funding for its establishment in September. Besides GoNERI, COE programs have been established at UT for life sciences, materials sciences, electrical and electronic engineering, humanities, and interdisciplinary areas.

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## Program components

The GoNERI program includes instruction in the following components:

■ *Nuclear energy sociology:* Oka said that nuclear energy sociology—"the social and human sciences of nuclear energy"—aims to reduce the risks and uncertainties associated with the use of nuclear power. The component consists of three core fields—nuclear law/legislation, nuclear nonproliferation, and public communication—and deals with key issues associated with the use of nuclear power from legal, political, and public awareness perspectives.

**GoNERI involves subjects that are tied to the use of nuclear technology, such as protecting the global environment.**

Regarding nuclear law and legislation, the Japanese government's regulatory agency enforces laws and regulations but has not discussed their adequacy in recent years, according to Haruki Madarame, a nuclear engineering professor at UT. At the same time, Japanese universities are required to discuss and review whether the laws should be improved to facilitate progress in relevant technologies and their applications. To repair the disconnect in this process, GoNERI will collaborate in discussions and law reviews with faculty members from UT's graduate schools of Laws and Politics.

Madarame

Regarding nuclear nonproliferation, Tanaka said that because there are very few Japanese specialists in this area who can play a leading role in international organizations, GoNERI's aim is to develop students who can go on to address nonproliferation issues on a global level.

The third core field, public communication, delves into the misunderstanding that is rooted in the relationship between scientific technology and society. Oka said that there are many factors associated with the level of public understanding of nuclear power. For example, while risk communication requires expertise in conveying safety information, crisis communication (for when an accident occurs) requires a different response for the public. "When an accident happens, an engineer is responsible for explaining the situation," said Oka. "The engineer may use the word 'scram,' meaning an automatic shutdown of a nuclear reactor, which will also be used in a press release. Ordinary Japanese people may confuse 'scram' with 'scrum,' a term used in rugby, and may get the impression that the reactor has collapsed."

Because terminology has made public communication difficult, UT has sought the advice of an American communications specialist, who has recommended that the wording "an automatic shutdown of a nuclear reactor" be used instead of "scram," and that expressions be made easy for ordinary people to understand. For example, when announcing the amount of radioactivity that has been leaked—for example, in an accident situation—it should be reported as "the dose of radioactivity contained in three glasses of wine" instead of as a given numeric value.

■ *Nuclear energy:* The second component of GoNERI divides the issues associated with the use of nuclear power into three groups: those of the past, the present, and the future. Issues categorized in the past are those associated with the past use of nuclear power, which are the recycling of spent fuel and the treatment of radioactive waste. Issues categorized as in the present are those associated with the safe and stable operation of existing nuclear power plants, which GoNERI calls "nuclear power plant maintenance issues." With the past and present taken into account, the future looks into the continued safe and stable operation of nuclear plants and the establishment of new scientific frontiers.

**Public communication delves into the misunderstanding that is rooted in the relationship between scientific technology and society.**

The nuclear energy component also looks at the nuclear fuel cycle and waste disposal, both of which need to win the confidence of the general public before nuclear power can advance, according to Tanaka. To gain this confidence, engineers must understand social issues in the relevant field and the methods that are needed to solve problems that may occur. Under consideration for GoNERI in this regard is a social science educational program that covers the nuclear fuel cycle and waste disposal.

■ *Radiology and radiation applications:* Oka thinks that more emphasis should be placed on radiation applications, which is why the GoNERI program focuses on medical physics, which is a field of study that applies physics to cancer treatment. A project under way at UT is the development of an accelerator that is sized to be installed in small hospitals. Another area covered in this component is radiation chemistry, where emphasis is placed on interdisciplinary efforts.

## International activities

GoNERI is making progress in branching out to other parts of the world. For example, an exchange office has been set up on the campus of the University of California at Berkeley, where graduates from UT serve as professors and where a young Japanese researcher is stationed to serve as a liaison between the two universities. Communication with Tokyo is done by e-mail and by video-conferencing.

Currently, the liaison is Daisuke Kawasaki, an assistant professor in nuclear engineering at UT hired under the GoNERI program. "A liaison's job is to keep people connected by communicating with both sides, to help organize GoNERI-related events at Berkeley, and to gather information about innovative education systems in the United States," he said.

Kawasaki

"One of the topics that I am engaged in is social science for radioactive waste disposal, as social science is one of the topics emphasized in GoNERI," said Kawasaki, whose expertise is in radioactive waste management. He works closely at UC–Berkeley with Joonhong Ahn, a UT nuclear engineering graduate who received a Ph.D. from UC–Berkeley and now teaches courses there in waste management.

The exchange of researchers has been reciprocal. "I stayed at the University of Tokyo in June and July 2008 to give a series of special lectures on geologic disposal and the nuclear fuel cycle," Ahn said.

Others from UC–Berkeley have been sent overseas, too. "We do have several graduate students participating in this

# Collaborative activities across the ocean

During its inaugural year in 2008, the University of Tokyo's GoNERI program had an active relationship with the University of California at Berkeley, as follows:

### Nuclear Technology and Society—Needs for the Next Generation

The joint international workshop, held January 6–9, 2008, at UC–Berkeley, hosted 13 UT faculty members along with researchers from the United States.

### UC–Berkeley Forums and Workshops

GoNERI and UC–Berkeley collaborate to hold forums and workshops at UC–Berkeley to address the key issues for sustainable nuclear energy in the future. The second forum, on sustainability, safety, and security of nuclear technology, was held June 12–13. The third forum is planned for this year, with the title "Nonproliferation in the Global Nuclear Renaissance."

### Advanced Summer School on Radiation Detection and Measurement

About 50 participants listened to 19 lecturers during this session held July 21–25 at UC–Berkeley.

### GoNERI International Symposium

The symposium, held on October 10 at UT, included lectures on experiences in nuclear education and research, as well as a panel discussion on nuclear education in universities. Jasmina Vujic and Joonhong Ahn, professors at UC–Berkeley, were invited speakers.

### UC–Berkeley Nuclear Engineering Colloquia

Weekly sessions held at UC–Berkeley are broadcast to UT using video-conferencing devices. The sessions are now provided as a course with units in the UT graduate program. Researchers from around the world are invited to give technical presentations. On November 3, Prof. Ying Chen of UT was invited to give a talk on the computational study of defects in ceramic fuels.

### Joint Seminars on Reactor Physics and Thermal Hydraulics

The first meeting of the monthly joint seminars on the subject was held on November 6. The seminars consist of three-way video-conferencing that connects UC–Berkeley and UT's Tokyo and Tokai campuses. Participants include professors Yoshiaki Oka, Ehud Greenspan, Per Peterson, Jasmina Vujic, and postdoctoral and graduate students from the three locations.

### Seminars on Social Science for the Nuclear Fuel Cycle and Radioactive Waste Disposal

This series of seminars with invited lecturers from Japan and the United States is held twice a month by use of video-conferencing devices to connect UT and UC–Berkeley. The goal is to construct a social science educational program for nuclear engineering graduate students.

### Liaison Office at UC–Berkeley

A GoNERI liaison office has been established within UC–Berkeley's Nuclear Engineering Department. Young researchers from UT serve there as UT representatives in the management of collaborative activities.

Ahn

Vujic

program," said Jasmina Vujic, chair of UC–Berkeley's Department of Nuclear Engineering. "One of our doctoral students spent a year in Japan, and others have attended workshops in Japan." Vujic and Ahn last year also attended an international symposium on nuclear issues in Japan.

The cooperative effort with UC–Berkeley has certain advantages for UT, according to Oka. "I believe that the University of California offers a lot for national universities in Japan to learn about the management of education and research," he said. Since UC–Berkeley is on the west coast of the United States, Oka noted that the time difference does not hinder online communications with Japan. Another advantage, he said, is that the two universities can share an interest in Asian countries, where the use of nuclear power is expected to increase significantly in the future.

The two universities last year also held a symposium and workshop at Berkeley on general issues concerning nuclear power, designed to help doctoral students plan their future careers (see sidebar). Exchange programs that followed the symposium included an international summer school on radiation detection and measurement, which was held mainly for faculty members from the two universities. Also, an Asia-Pacific forum on the sustainability, safety, and security of nuclear technology was held in June, hosted and organized by UC–Berkeley, cosponsored by UT, and financially and administratively supported by GoNERI, among other institutions. The third Asia-Pacific forum will be held in Berkeley in June, with a focus on nonproliferation in civilian nuclear energy. UT will again participate as a cosponsor.

Other activities include classes at UC–Berkeley that are transmitted online weekly to the GoNERI project office in Japan; UT reciprocates by offering online information to UC–Berkeley. Also, online seminars on radioactive waste issues are held regularly and include the participation of faculty members and researchers in the field of nuclear energy sociology. A goal of UC–Berkeley is to establish a nuclear research institute similar to GoNERI.

**GoNERI has an exchange office at the University of California at Berkeley, where graduates from the University of Tokyo serve as professors.**

The spread of GoNERI is not stopping at the West Coast. Exchange programs with other universities in the United States, France, South Korea, and the United Kingdom have already begun, and jointly organized symposia and workshops have been established with China's Tsinghua University, Shanghai Jiao Tong University, and Xi'an Jiaotong University. NN