

APS journal article

International scientific collaboration: the Gulf Nuclear Energy Infrastructure Institute

By Dr. Amir Mohagheghi, Mr. Adam Williams, Dr. Phil Beeley, Dr. Alex Solodov

The Gulf Nuclear Energy Infrastructure Institute (GNEII) was established collaboratively by Sandia National Laboratories, Texas A&M University, and the United Arab Emirates' (UAE's) Khalifa University of Science, Technology and Research in 2011 to provide a regional mechanism for developing responsible nuclear energy infrastructure. By combining education and research, GNEII helps increase knowledge and expertise about nuclear energy infrastructure—including safety, safeguards, and security—among Gulf and Middle East professionals working in regional nuclear-power programs. GNEII has been recognized by the White House as a major achievement in enhanced science and technology partnerships with the developing world.

Background

GNEII's mission is to engender a responsible nuclear-energy culture through professional development and education of decision-makers from Gulf-region nuclear-energy programs. GNEII constitutes a strategic partnership among several entities in the UAE and the United States. In the UAE, these are the Federal Authority for Nuclear Regulation (FANR), the Emirates Nuclear Energy Corporation (ENEC), the Critical Infrastructure and Coastal Protection Authority (CICPA), and the Khalifa University. In the US, the partnership includes support from the Department of Energy's National Nuclear Security Administration Office of Nonproliferation and International Security and the Department of State's Partnership for Nuclear Security. Sandia National Laboratories and Texas A&M University's Nuclear Security Science and Policy Institute (NSSPI) are the US implementers working with Khalifa University. By 2017, GNEII's UAE partners will assume responsibility for GNEII operations, making it a fully indigenous regional institute.

As implementing partners, Khalifa University, Sandia, and NSSPI—with support from key UAE stakeholders and US government sponsors—have developed the curriculum, established the facilities, provided the instructors, and are preparing Khalifa University staff and GNEII program alumni to become permanent GNEII faculty. The strategic partnership of the primary implementers—Khalifa University, Sandia, and NSSPI—has successfully leveraged diverse technical expertise to produce a well-respected and successful regional institute helping to develop a strong culture of integrated safety, safeguards, and security while promoting international norms and standards in nuclear energy infrastructure.

Foundational pillars

GNEII was founded on the three strategic pillars of proficiency in education, research, and technical capability.

Education

GNEII Fundamentals Course

The GNEII Fundamentals Course introduces participants (known as Fellows) to critical thinking, systems thinking, and the scientific method, providing a framework in which they can learn about interrelated elements of a responsible nuclear-energy program. The Fundamentals Course begins with a survey of the technical and operational aspects of nuclear energy, including nuclear and radiological sciences, power-plant operations, nuclear-material controls, and the international nonproliferation regime. The survey is followed by focused instruction on nuclear safety, security, and safeguards, emphasizing the way these three components interrelate and interact as a system. This integrated “3S” approach is a fundamental framework for implementing a responsible national nuclear-energy program.

The Fundamentals Course includes lectures, classroom exercises, and case studies. A crucial component is the Capstone project— independent research analyzing a regionally relevant nuclear-energy issue. The GNEII Fellows present their Capstone projects as written papers and oral presentations to an open audience at the conclusion of the course.

The Fundamentals Course is the first and most developed component of GNEII’s education pillar; however, effort continues in developing additional course offerings and materials, with an expanded curriculum expected to become available as demand dictates. Initial efforts are focused on integrating GNEII’s curriculum with course offerings and expertise at Khalifa University, including the Nuclear Engineering Department and potential involvement of the Institute of International and Civil Security.

GNEII Fellows have come from Gulf Cooperation Council (GCC) countries and other countries in the region. In the coming years, GNEII expects to progressively expand its reach to include all GCC countries and other Arabic-speaking countries in the region.

Research

GNEII aspires to be a regional center for collaborative research in 3S—including integrating 3S into national nuclear programs. GNEII’s research component is led by a Senior Research Fellow who examines technical, social, and political aspects of nuclear safety, safeguards, security, and nonproliferation. The Senior Research Fellow also coordinates collaborative research projects among GNEII, Khalifa University’s graduate programs, and regional and international institutions. Research-oriented papers by GNEII Fellows and the Senior Research Fellow have been submitted to peer-reviewed journals and published in conference proceedings.

Technical Capability

Along with academic courses and research, GNEII includes practical exercises and hands-on instruction that provide Fellows with knowledge about instruments, simulators, computer codes, and related technical tools used in the nuclear industry. In addition to access to laboratory facilities in Khalifa University's Nuclear Engineering Department, GNEII is developing a technology-demonstration area where nuclear safety, safeguards, and security equipment will be displayed and available for use.

GNEII Operations and Management

GNEII is a strategic partnership with a long-term vision of developing a responsible nuclear energy safety and security culture in leaders and decision-makers within Middle Eastern nuclear energy programs. GNEII is managed through its affiliation with Khalifa University. GNEII's educational and research strategy, long-term goals, and progress are periodically reviewed during annual meetings of the GNEII Steering Committee, which consists of Khalifa University, FANR, ENEC, CICPA, Sandia, and Texas A&M's NSSPI.

For more information, visit the GNEII website at <http://www.kustar.ac.ae/pages/gneii>.

Dr. Amir Mohagheghi is a Distinguished Member of the Technical Staff at Sandia National Laboratories¹. He currently provides strategic guidance for Sandia's regional programs in the Middle East, North Africa, and support for South Asia and East Asia regional programs on Arms Control, Nonproliferation, and Regional Security. Amir serves as the Sandia GNEII Program manager and received his doctorate in experimental high energy atomic physics from the University of New Mexico.

Mr. Adam Williams is a senior R&D systems engineer at Sandia National Laboratories. He is currently involved in numerous nuclear security-related projects, including conducting vulnerability assessments, designing physical protection systems and planning other international security engagement projects in support of Department of Energy and State missions. Adam also serves as the Sandia GNEII project manager and is currently a PhD candidate in the engineering systems division at the Massachusetts Institute of Technology.

Dr. Philip Beeley is a Professor of Practice and Program Chair for the Department of Nuclear Engineering at Khalifa University of Science, Technology and Research. In addition to managerial duties, he currently teaches courses in reactor physics and radiation metrology as well as oversees research related to reactor design, experimental reactor physics, computational reactor design methods and neutron spectrometry. Philip received his doctorate in nuclear chemistry and nuclear physics from McGill University in Canada.

Dr. Alexander Solodov is an assistant professor in the Department of Nuclear Engineering at Khalifa University of Science, Technology and Research. His course teaching responsibilities includes international safeguards and nonproliferation, nondestructive assay (NDA) of nuclear materials and nuclear security and his research covers NDA, radiation detection instrumentation and safeguards systems and implementation. Alexander has also served as both a lecturer and Faculty Coordinator for

the GNEII Fundamentals Course and received his doctorate in nuclear engineering from Texas A&M University.

¹Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy under contract DE-AC04-94AL85000. SANDXX-XXXX.



GNEII Graduating Class 2014