NuClean
CENTER OF EXCELLENCE

A Center of Excellence for Nuclear Waste Safety and Remediation

NuClean Workshop: On Nov. 7, 2013 at American Institute of Chemical Engineers (AIChE) Annual Meeting in San Francisco, AIChE's Center for Energy Initiatives hosted the *NuClean* Workshop to bring key stakeholders together to clarify and focus *NuClean* efforts on key information gaps and needs, and to formulate a plan of action for *NuClean* implementation.

Goals: To establish *NuClean* as a nuclear waste management center of excellence to leverage chemical engineering expertise on nuclear waste management and engage with broader professional efforts on underlying multi-disciplinary public and technical community information, research, outreach and education needs.

NuClean ***will*** be an unbiased forum for multiple stakeholders to develop a common understanding of concerns and expectations associated with nuclear waste management, from both commercial and defense activities, legacy and present, and to encourage education and professional development of stakeholders with respect to these topics.

NuClean ***will*** be a source for best practices in risk assessment, education and development and application of technologies for protecting human health and the environment related to nuclear waste management and disposal, as well as potential 'sustainable' nuclear fuel cycle technologies. *NuClean* potentially can host applicable communities of practice.

Approach: To accomplish this *NuClean* must be collaborative, cross-disciplinary and cross-sectoral, with experts from technology, public health, social sciences, business, academic, government, community and NGOs working together. Current efforts to address community concerns are fragmented, so there is a need for an inclusive, holistic and integrated effort to bring together the best solutions to be transferred widely.

Rationale: Globally, concerns over safety of nuclear waste are driving peoples' perception of the risks posed by nuclear power. There is a need for a neutral professional, public voice that can provide trusted, factual information to diverse stakeholders and communities regarding safety issues and uncertainties associated with management of nuclear waste from both defense legacy and civilian energy to improve understanding of the issues, drive development of solutions, and increase confidence in nuclear waste processing, storage and handling. Furthermore, there have been clearly identified shortfalls in current and projected future availability of professionals educated in critical areas supporting national needs in nuclear materials processing and waste management that align well with core chemical engineering expertise, including process safety, process development, analysis and simulation, chemical separations, waste treatment and environmental remediation. These two needs, sources of reliable factual information accessible to the public, and, workforce/education provide the basis for greater emphasis and initiatives by AIChE on these topics.

Background: By way of an example, many communities downstream of Los Alamos National Laboratory have concerns about migration of toxic and radioactive materials as a result of long-term nuclear waste storage. With increasing wildfires around LANL and subsequent erosion from flooding, there are growing concerns regarding the migration of legacy waste into drinking water, onto agricultural lands, and into the tissue of humans and other members of affected ecosystems. Not only is quality of life affected by these concerns, but also economic development may be impacted.

New Mexico stakeholders, however, are not unique in their concerns about the risks posed by nuclear waste management. Similar perceptions exist at Hanford, WA, Savannah River, NC and in Idaho, as well as with respect to decommissioning of civilian power reactors. As the nation responds to a growing energy demand in a climate neutral way, a population exists that must be informed of the safety and environmental risks of nuclear waste and how they can be mitigated. However, current issues about the safety and environmental security of nuclear waste need to be addressed responsibly today for future generations.

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NuClean Nov. 7, 2013 Kick-Off Workshop Summary

Objectives: 1) To bring together stakeholders primarily from the chemical engineering community to clarify and focus NuClean efforts on key information gaps and needs, and to formulate an implementation plan for NuClean; 2) To form the basis for a future workshop to continue to engage the chemical engineering community, as well as a broader cross section of stakeholders, in developing an implementation plan for a nuclear waste safety and remediation center of excellence.

Beth Beloff of Beth Beloff and Associates introduced the NuClean Kick-Off workshop. She said NuClean was working through AIChE because waste treatment processes are chemical processes and AIChE is in a position to provide unbiased, professional information to tackle the challenges. She also said NuClean wants to engage not only chemical engineers but also the broader community, including social scientists, epidemiologists and public policy professionals. Beloff emphasized that this workshop is for participants to help define the scope of NuClean and identify its path forward. Further, she introduced the agenda and speakers for the workshop.
www.slideshare.net/ChEnected/beloff-nuclean-ppt

In the overview presented by David Kosson, Cornelius Vanderbilt Professor of Engineering at Vanderbilt University and Director of Consortium for Risk Evaluation with Stakeholder Participation (CRESP), the amount of legacy nuclear waste that exists and the challenges in cleaning it up were described. Kosson suggested that focusing more people with expertise in the challenge areas might help. Through the discussion, he also identified gaps between academic nuclear and chemical engineering: chemical engineers tend to defer all nuclear-related topics to nuclear engineering, but nuclear engineering programs typically do not have coverage of waste processing since it is a chemical process. Therefore, participants agreed there needs to be a focus on education; nuclear-related, chemical engineering-applicable topics should be introduced in the chemical engineering curriculum. It was also suggested to target universities close to nuclear sites. Prof. Kosson also emphasized the need to engage all stakeholders in developing solutions to nuclear waste issues.
www.slideshare.net/ChEnected/kosson-nu-clean112013rev11

Stuart Arm presented on risk and response management (the presentation was prepared by Ed Jones, from LLNL, who could not attend due to a personal emergency). He emphasized the need for thoroughly understanding risks. For example, there is an old graph that shows how safe nuclear power plants are, but it may not necessarily present the whole picture. The presentation emphasized the need to adequately manage false positives and false negatives in risk management. It is important to not only understand the risks, but to also develop a risk mitigation plan.
www.slideshare.net/ChEnected/ed-jones-llnuclean20131

Chris Whipple of Environ then presented "Assessment and Perception of Risks Associated with Nuclear Waste." He recommended getting spent nuclear fuel put into dry cask storage as a temporary means of addressing the associated risks while a long term solution is developed. Whipple also said there is often a negative trust issue between the public and Congress, so the Blue Ribbon Commission on America's Nuclear Future (BRC) should identify entities that the public trusts to communicate with the public to correct mis-conceptions, e.g. present complete facts about nuclear power (such as nuclear power plants emit few pollutants compared to fossil fuel plants and they cannot explode like nuclear weapons) and nuclear waste. He continually emphasized the need to find technical solutions that have public consensus.
http://www.slideshare.net/ChEnected/whipple-nu-clean20131

Many of those points were reemphasized in the presentation by Per Peterson of UC Berkeley titled "Next Steps for U.S. Nuclear Waste Policy." Peterson said the Yucca Mountain Project had taught the need for a consent-based approach to siting and development of nuclear facilities. He also said there is a movement to restart a nuclear waste program with a new government administrator for nuclear waste. During the discussion following his presentation, some participants echoed Chris Whipple's comments that spent fuel should not be stored at shutdown reactors but rather moved to centralized dry cask storage facilities.
www.slideshare.net/ChEnected/per-peterson-postblueribboncommissionupdates117131

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Workshop Summary, continued:

Steve Krahn, professor of the practice of nuclear environmental engineering at Vanderbilt University, presented on R&D at the nuclear/chemical engineering interface from a programmatic standpoint. He discussed various opportunities for research and spoke in detail about undergraduate level courses offered at Vanderbilt University combining chemical and nuclear engineering principles with emphasis on nuclear waste remediation.
www.slideshare.net/ChEnected/steve-krahn-vanderbiltpresentation1

Finally, Marian Naranjo presented. She is founder and director of Honor Our Pueblo Existence (HOPE), an indigenous community-based organization located at Santa Clara Pueblo, New Mexico close to the Los Alamos National Laboratory, (LANL). She presented the Pueblo viewpoint on the nuclear waste issue. LANL is located within their ancestral homelands. She commented that, with consent, some nuclear waste is being transported from LANL to the Waste Isolation Pilot Plant (WIPP, a geologic repository for defense-related non-High Level Waste)which has been viewed positively, so far. She also said that government-to-government communications (between the Pueblo government and the U.S. government) are difficult. Her organization has been trying to assess the risk of nuclear waste contamination to their pueblos for many years; she feels that a neutral organization like that which NuClean wishes to establish would be an excellent vehicle to help provide reliable information and answers to the many questions posed by her community to inform them on how to create satisfactory solutions.
www.slideshare.net/ChEnected/naranjo-nu-cleanpresentationfinalfinal1

After the presentations, participants discussed gaps and needs in nuclear-waste related topics. Two major points emerged: 1) Without input from all stakeholders, technological solutions to the nuclear waste problems are not solutions at all if they do not account for social needs and/or the public does not believe they will solve the problem. 2) Engineers, scientists and other professionals know how to work inside the boxes, but they are less engaged on how to work between them; the greatest need is at the interfaces between the boxes, in the effective flow of information, communications, and appreciation of public perception of risk and of social impacts. This requires working with social scientists, public policy developers, epidemiologists, and communities.

There is a lack of education, a declining workforce, and a lack of efficiency in solving legacy nuclear waste/repository problems. Therefore, it is necessary to educate physical and social scientists, engineers, policy makers, the public, and responsible government agencies to help solve these problems. There is an intersection between nuclear and chemical engineering, but chemical engineering faculty and other researchers do not see the nuclear industry as relevant to chemical process engineering, and process-related subjects (e.g. process safety) is not covered in nuclear engineering curricula. NuClean (via AIChE) may be able to coordinate development of standardized modules and stand-alone courses to include in chemical engineering curricula and encourage universities to offer such content. NuClean could also encourage integration of research combining nuclear and chemical engineering. Since AIChE is a technically unbiased organization, NuClean can act as a provider of information credible with the public, the workforce, and the government. With the facts and an understanding of the risks, Congress would be in a better position to enact enduring legislation on nuclear waste issues and be reinvigorated to support them.

The outcomes for NuClean were also discussed. In a self-sustaining form, NuClean can act as an information clearing house or data repository. It could also produce white papers and design guidelines. NuClean can provide advisory functions to various communities or forums for exploring issues from multiple perspectives. It can also convene other workshops or niche conferences on specific issues in a timely manner.

Participants discussed how to fund NuClean. Additionally, if a niche conference is developed, revenues from registration fees could help fund NuClean. A steering committee for NuClean was formed. Next steps identified for NuClean are: 1) clarify the direction for NuClean identified at the workshop; 2) redefine the mission, vision, and objectives accordingly; 3) set meeting times and agendas for the steering committee; 4) establish funding for and convene a larger workshop/conference (2.5 days in Oct. 2014 in DC area) to focus the technical and social issues, making them relevant to a broad spectrum of stakeholders; and 5) define a path toward consensus-based issues resolution.
http://www.slideshare.net/ChEnected/nu-clean-workshop-discussion-summary-final

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