Invitation to attend an NEA workshop on

The nuclear and social science nexus: challenges and opportunities for speaking across the disciplinary divide

Invitation:
The NEA Division of Nuclear Technology Development and Economics is pleased to invite members of the Steering Committee for a workshop on nuclear energy and the social sciences. This workshop will explore how insights from the social sciences and humanities can be used to inform the decision-making of practitioners in nuclear energy organizations. The workshop will be held at NEA Headquarters in **Paris** on **December 12-13, 2019.**[1] Selected papers from the workshop will be published in a special issue of the nuclear engineering journal, *Nuclear Technology*.[2]

Background:
Nuclear energy's challenges are frequently described as having a significant 'social' dimension. These challenges include failures to site nuclear power plants and used nuclear fuel repositories, or, more broadly, secure support and approval for sustaining or expanding the use of nuclear energy. A negative perception of nuclear energy is frequently cited by nuclear engineers as the source of these challenges. Still other problems are believed to be the result of institutional failures and managerial difficulties. These include delays in construction projects and escalation of plant costs, the slow pace of development and commercialization of new nuclear energy technologies and failures of regulatory institutions.

In spite of, or perhaps because of these challenges, organizations in the nuclear energy sector have proved to be rich research sites for scholars in the humanities and social sciences. In a significant and growing base of scholarship, researchers – political scientists, sociologists, anthropologists and Science and Technology Studies (STS) scholars – have used a diverse and rich set of theoretical and methodological approaches to examine the work of practitioners in nuclear organizations.[3] Some concepts developed by social scientists have proved to be pivotal for the work of practitioners. For example, the idea of an organization that is capable of rapid and continuous learning (operationalized by INPO and WANO for the nuclear industry) comes from a long line of sociological and management research on "High Reliability Organizations". Further, the idea that culture can play an important role in ensuring safety also finds its basis in a long tradition of sociological and anthropological research on culture. However, these concepts are often not used as the social scientists intended. They undergo modification in their translation from research to practice[4] and their uptake and use by practitioners has largely been serendipitous. Finally, while social science scholars have produced a growing and increasingly relevant literature, it has not received significant attention from academic and practitioner nuclear engineers.

Through this workshop, and the broader NEA project, of which this workshop is a part, we seek to examine the challenges associated with and the opportunities for speaking across the nuclear energy/ social science and practitioner/academic divides.
More specifically, through the workshop and the corresponding special issue, we seek to:

- Map the current state of humanities and social science research with a focus on nuclear energy and the implications of the findings from this research for practice
- Explore the development of a methodology (or a set of methodologies) for translating research (especially qualitative research) into lessons and recommendations for practitioners
- Identify 'best practices' for and challenges encountered in adopting these recommendations in practitioner settings
- Identify possible opportunities for institutional innovation in the nuclear energy sector by surveying current research on innovation and regulation

Presenters at the workshop:

Abstract submissions closed on July 30, 2019. Over 60 abstracts were submitted by researchers from a wide range of NEA member countries. We have accepted 36 submissions for full paper presentations. A further 10 submissions have been invited for presentation at an early career research colloquium to be held the day before the workshop. Presenters at the workshop have a range of intellectual backgrounds and are predominantly distinguished faculty from around the world. A final agenda describing the composition and themes of the sessions will be circulated in late Fall. The broad themes that will be addressed from a social science and humanities perspective at the workshop are the formulation of energy policy, reactor design and development, management of radioactive waste, safety culture and engineering pedagogy.

Participation in the workshop:

We hope that many of you will consider joining us for the workshop. We would also be grateful if you could share this invitation with senior colleagues in the nuclear energy sector in your respective countries who might be interested participating. Please confirm your participation and address any questions you might have about the workshop by writing to Aditi Verma Aditi.VERMA@oecd-nea.org

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References

Akrich, Madeleine. "The De-Scription of Technical Objects." In *Shaping Technology/Building Society. Studies in Sociotechnical Change*, edited by Bijker, W. & Law, and J., 205–24. MIT Press, 1992. https://halshs.archives-ouvertes.fr/halshs-00081744.

Hecht, Gabrielle. *The Radiance of France: Nuclear Power and National Identity after World War II*. MIT Press, 2009.

Hughes, Thomas P. "The Evolution of Large Technological Systems." *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, 1987, 51–82.

Jasanoff, Sheila, and Sang-Hyun Kim. "Containing the Atom: Sociotechnical Imaginaries and Nuclear Power in the United States and South Korea." *Minerva* 47, no. 2 (2009): 119.

———. *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*. University of Chicago Press, 2015.

Johnston, Sean. *The Neutron's Children: Nuclear Engineers and the Shaping of Identity*. OUP Oxford, 2012.

Josephson, Paul R. *Red Atom: Russia's Nuclear Power Program from Stalin to Today*. University of Pittsburgh Pre, 2005.

Perin, Constance. *Shouldering Risks: The Culture of Control in the Nuclear Power Industry*. Princeton University Press, 2005.

Rubio-Varas, M. d Mar, and Joseba De la Torre. *The Economic History of Nuclear Energy in Spain: Governance, Business and Finance*. Springer International Publishing, 2017.

Schmid, Sonja D. *Producing Power: The Pre-Chernobyl History of the Soviet Nuclear Industry*. MIT Press, 2015.

Silbey, Susan S. "Taming Prometheus: Talk About Safety and Culture." *Annual Review of Sociology* 35, no. 1 (2009): 341–69.

Starr, Chauncey. "Social Benefit versus Technological Risk." *Science*, 1969, 1232–1238.

Wellock, Thomas R. "Engineering Uncertainty and Bureaucratic Crisis at the Atomic Energy Commission, 1964–1973." *Technology and Culture* 53, no. 4 (2012): 846–884.

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[1] The workshop and special issue are part of a broader NEA project that explores what practitioners in the nuclear energy sector can learn from the social sciences and humanities. As part of this project, the NEA will also carry out a survey of its member countries to learn which countries have organizations in the nuclear energy sector that employ social scientists in a research capacity, and the impact of these researchers on the work of the practitioners in their respective organizations.

[2] Acknowledging that academic and practitioner nuclear engineers and humanities and social science researchers have not previously successfully engaged with each other and also acknowledging that initiating a conversation between these intellectual communities is a worthwhile endeavor, we have partnered with a nuclear engineering journal for the special issue so that it is read widely in the academic nuclear engineering and practitioner communities.

[3] Some examples of work in this vein include Gabrielle Hecht's history of the French nuclear program, Sonja Schmid's book on the history of the Russian nuclear energy program and a recent edited volume on the economic history of nuclear energy in Spain. See Gabrielle Hecht, *The Radiance of France: Nuclear Power and National Identity after World War II* (MIT Press, 2009); Sonja D. Schmid, *Producing Power: The Pre-Chernobyl History of the Soviet Nuclear Industry* (MIT Press, 2015); M. d Mar Rubio-Varas and Joseba De la Torre, *The Economic History of Nuclear Energy in Spain: Governance, Business and Finance* (Springer International Publishing, 2017). Other scholars have studied the emergence and development of scientific and expert communities and the forms of knowledge used by them to design, develop and regulate nuclear energy systems. See for example Thomas R. Wellock, "Engineering Uncertainty and Bureaucratic Crisis at the Atomic Energy Commission, 1964–1973," *Technology and Culture* 53, no. 4 (2012): 846–884; Constance Perin, *Shouldering Risks: The Culture of Control in the Nuclear Power Industry* (Princeton University Press, 2005); Paul R. Josephson, *Red Atom: Russia's Nuclear Power Program from Stalin to Today* (University of Pittsburgh Pre, 2005); Sean Johnston, *The Neutron's Children: Nuclear Engineers and the Shaping of Identity* (OUP Oxford, 2012). Each of these studies can be situated in a much broader and extremely rich literature of sociological and historical analyses of complex technological systems and the expert communities that conceive, build and operate them. STS scholars have long been developing new conceptual and theoretical frameworks with which to analyze large, technical systems. Thomas P. Hughes, "The Evolution of Large Technological Systems," *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, 1987, 51–82; Madeleine Akrich, "The De-Scription of Technical Objects," in *Shaping Technology/Building Society. Studies in Sociotechnical Change*, ed. Bijker, W. & Law, and J. (MIT Press, 1992), 205–24. A recently developed and particularly impactful conceptual framework is that of the *sociotechnical imaginary*. See Sheila Jasanoff and Sang-Hyun Kim, *Dreamscapes of Modernity:*

Sociotechnical Imaginaries and the Fabrication of Power (University of Chicago Press, 2015); Sheila Jasanoff and Sang-Hyun Kim, "Containing the Atom: Sociotechnical Imaginaries and Nuclear Power in the United States and South Korea," *Minerva* 47, no. 2 (2009): 119. Although several universities around the world have dedicated STS departments, faculty from such departments also increasingly have joint appointments in science and engineering departments. Two examples are David Mindell and David Kaiser (both at MIT). Kaiser's work includes quantitative studies of how new ideas spread and sociological analyses of how theoretical models in Physics were differently adopted by physicists in different countries. Kaiser is professor at MIT and has joint appointments in the Physics and STS Departments. Mindell studies the design and history of space systems and deep-sea exploration vehicles. Mindell has joint appointments in the Aeronautics and Astronautics and STS departments at MIT. Such joint appointments of tenured faculty between engineering and social science departments, though not yet the norm, are increasing in frequency across the domains of science and engineering.

[4] For example, for a commentary on safety culture, see Susan S. Silbey, "Taming Prometheus: Talk About Safety and Culture," *Annual Review of Sociology* 35, no. 1 (2009): 341–69. Another example of impactful research carried out using methodologies from the social sciences is found, for example, in studies of risk perception. In an initial publication which launched this line of work, Chauncey Starr explained how the public perceives risks (see Chauncey Starr, "Social Benefit versus Technological Risk," *Science*, 1969, 1232–1238.). Starr finds that the public will demand higher levels of safety (and lower levels of risk) for those activities that present involuntary risks even if the associated risks are extremely low — nuclear energy being the exemplary example. In this paper Starr proposes that the solution is to either design significantly safer technologies or to educate the public. These findings are of course now well known in the nuclear industry. The framing of the reactor safety study (WASH 1400) was influenced by these findings (particularly the executive summary which sought to compare the risks associated with operating nuclear reactors to those associated with other activities). Starr's proposal of educating the public has also been followed more or less to the letter by the nuclear industry. Starr's work also launched a long and extremely influential line of research on the perception of risk. The literature on risk continues to move forward but the more recent findings have remained outside the canon of academic nuclear engineering and practice.