

## Call for papers for a workshop and special issue on:

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

#### **Aim:**

The central aim of this workshop is to 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.**<sup>1</sup> Selected papers from the workshop will be published in a special issue of the nuclear engineering journal, *Nuclear Technology*.<sup>2</sup>

#### **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.<sup>3</sup> 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<sup>4</sup> 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

### **Scope:**

We invite papers on three broad themes:

#### **1. Current research on nuclear energy and society: research findings and recommendations for practice**

A number of researchers have recently been leading or have completed research projects with a particular focus on the work of practitioners in the nuclear energy sector.<sup>5</sup> Authors of this set of papers are invited to describe their motivations for embarking on these research projects, describe their research questions, their findings as well as recommendations (if any) for practitioners arising from these findings. Authors are further asked to reflect on and describe their methodologies or approaches for transforming their research findings into lessons and recommendations for practitioners. Papers on this theme are broadly expected to focus on reactor design and development, regulation and nuclear energy policy.

#### **2. The practitioner-social science nexus: challenges and opportunities for transforming the work of nuclear organizations**

In select organizations, social science researchers have been working alongside practitioners. In these settings, insights derived from the work of these researchers have had an impact on the work of practitioners. Authors of these papers are asked to describe how the decisions to embed social science researchers within their respective organizations were made, the work done by these researchers within their respective organizations, how the insights from these researchers have been transformed into recommendations for practitioners, challenges encountered in implementing these insights as well as further opportunities for transforming practice that have not yet been exploited. Authors of these papers may choose to draw on theoretical and methodological resources that examine the intellectual and practical considerations of translating research into lessons and recommendations for practice.<sup>6</sup>

### **3. Opportunities for institutional innovation: current research on innovation and regulation**

Practitioners in the nuclear energy sector around the world are searching for opportunities for innovation in both the technical and the social elements of nuclear reactor systems and their supporting infrastructures. Some examples of the hoped for *non*-technological innovations include new mechanisms for funding the development of nuclear energy technologies, novel mechanisms for financing construction projects and redesign of institutions for encouraging nuclear innovation and regulating nuclear energy technologies. Through these papers we will review and explore current research on regulation and innovation. Wherever possible, authors are encouraged to identify those aspects of their research findings that are generalizable and that might suggest opportunities for institutional innovation in the nuclear energy sector.

#### **Key dates**

July 15, 2019: Submission of abstracts

August 15, 2019: Notification of acceptance for conference

November 1, 2019: Submission of full papers for conference

January 15, 2020: Notification of acceptance for special issue

March 15, 2020: Submission of revised papers for journal publication

July 15, 2020: Submission of final paper and copyright agreements

#### **Organizing committee**

Aditi Verma, NEA

Sama Bilbao y León, NEA

Markku Lehtonen, NEA and Pompeu Fabra University, Barcelona

#### **Guidelines for abstract submission**

Authors are requested to submit abstracts of up to 500 words, along with a title and three keywords by email to Aditi Verma at [Aditi.VERMA@oecd-nea.org](mailto:Aditi.VERMA@oecd-nea.org)

#### **Guidelines for preparation of papers**

Selected papers from the workshop will be published in *Nuclear Technology*, a nuclear engineering journal published by the American Nuclear Society. Authors are advised to prepare conference papers based on journal guidelines, which can be found [here](#).

#### **About the NEA**

The NEA is an intergovernmental agency within the framework of the Organisation for Economic Co-operation and Development (OECD) that facilitates co-operation among countries with advanced nuclear technology infrastructures. The NEA provides authoritative assessments and forges common understandings on key issues as well as input to government decisions on energy policy, nuclear safety matters, advanced research, and environmental stewardship.

#### **About *Nuclear Technology***

*Nuclear Technology* aims to be the leading international publication reporting new information in the practical applications of nuclear science and technology. It is an international research journal of the [American Nuclear Society](#), providing authors an expanded reach to its 11,000

global members as well as dozens of research libraries and institutions. It publishes technical papers, technical notes, critical reviews, rapid communications, book reviews, and letters to the editor on all phases of applications of fundamental research to nuclear technology.

## References

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<sup>1</sup> 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.

<sup>2</sup> 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.

<sup>3</sup> 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-Description 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);

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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.

<sup>4</sup> 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.

<sup>5</sup> One such large-scale research project is the History of Nuclear Energy and Society (HoNESt) program that was funded by the European Commission. This project brought together historians and social scientists to document and analyze the history of the nuclear industry's engagement (since its inception) with the public in 20 European countries. In France, Improvement of Governance of Organizations and Networks of Actors for Nuclear Safety (whose French acronym is AGORAS) is a similarly large-scale project that is a multi-year initiative spanning several research institutions. Elsewhere, universities (particularly in the US) have strong and ongoing programs of research with a policy focus. These include initiatives at Carnegie Mellon and Harvard that have examined the developmental programs of the DOE and a recently completed study at MIT on the Future of Nuclear Energy (the third in its series). The research projects at these three American universities have brought together both engineers and social scientists. For example publications see A. Abdulla et al., "A Retrospective Analysis of

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Funding and Focus in US Advanced Fission Innovation,” *Environmental Research Letters* 12, no. 8 (2017): 084016; John Deutch et al., “The Future of Nuclear Power,” 2003.

<sup>6</sup> See for example Joseph Maxwell, “Understanding and Validity in Qualitative Research,” *Harvard Educational Review* 62, no. 3 (1992): 279–301; Mario Luis Small, “How Many Cases Do I Need?’ On Science and the Logic of Case Selection in Field-Based Research,” *Ethnography* 10, no. 1 (2009): 5–38; Lucienne TM Blessing and Amaresh Chakrabarti, *DRM, a Design Research Methodology* (Springer Science & Business Media, 2009).