

**Nuclear Science
and Engineering**

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The Symposium on Realizing the Value of Nuclear Energy

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Symposium Elements

- International and US attendees*
 - Nuclear energy experts
 - Government officials
 - Public opinion and communication experts, and
 - Representatives of civil society,

Purposes:

- Examination of the case for the 21st century nuclear energy
- Exploration of needed new:
 - technologies
 - business models
 - policy frameworks
- Examination of potential strategies
 - Means of communication
 - Mobilization of public support?

* Approximately 70 invitees, Chatham House rule, Published Proceedings



Symposium on Realizing the Value of Nuclear Energy

- Auspices: CANES Chairman: Jacopo Buongiorno, MIT
- Organizers: Michael Golay, MIT
Kirsty Gogan, Energy for Humanity
Armond Cohen, Clean Air Task Force
- Format: Nine sessions, each session with presenters and complementary papers, and discussion (Chatham House rule), Rapporteur's report, Video of public portions of sessions
- Products: video + electronic copy of Keynote and Complementary papers and Rapporteur's report.



Conference Statement

- As many as 2-3,000 nuclear reactors, up from 450 today – could be crucial in meeting world energy needs and environmental challenges.
- Nuclear energy currently is not poised for such a contribution.
- Nuclear energy's potential role is
 - Not widely understood or accepted
 - Sometimes affirmatively rejected, by
 - ◆ Government decision-makers
 - ◆ Elements of civil society
 - ◆ Media on grounds of safety, cost, waste and security concerns



Session 1: The urgency of nuclear energy in the 21st Century

- Speaker– Jacopo Buongiorno, MIT
- Nuclear energy it is likely to be needed, among other sources, to power global development; for geopolitical leadership; energy diversity and security; clean air and climate change mitigation
- Innovation to reduce costs of nuclear power is essential for nuclear power to contribute to global energy decarbonization.



Session 2: Nuclear in the climate debate: where do we stand?

There are powerful arguments that nuclear is essential for energy growth with environmental quality including climate. Important factors include the following:

- Speaker: Jesse Jenkins, MIT (Electric grid);
- Speaker: Charles Forsberg, MIT (Heat storage, and electricity, including fossil fuel substitutes)
- Speaker: David Petti, INL/MIT (Future nuclear technologies)



Session 2: Nuclear in the Climate Debate: Where do we Stand? Cont'd

- Should renewables not be the lowest cost energy alternative, then from modeling nuclear is necessary to get to a carbon-free economy.
- Future nuclear could be very different from the current form, especially with use of advanced fuel, improve design practices, and modular construction techniques.
- Energy storage on GW-year scales is possible with geothermal storage of heat. Nuclear plants coupled to artificial geothermal systems could help provide cheap storage to match energy demand, in a way not possible with batteries.



Session 3: State of the Industry: Can it Deliver?

- Nuclear energy has been valuable in the past, and holds promise for the industrializing world in complementing renewables as climate solutions. But apart from China- and Russia-led efforts, there is no significant global new build. Costs, commercial risks, and long time to market are key barriers, as well as legitimate concerns about weapons proliferation – not just public opinion ranging from indifference to hostility. What is the vision for the industry that leads to a significant change in this situation by 2030?



Session 3: State of the Industry: Can it Deliver? – Cont'd

Technology and business conditions and performance:

- Speaker: David Mohler, former CTO Duke Energy, Ret., with Eric Ingersoll, Energy Options Network
- Respondent: Nick Irvin, Southern Company
- Can we have a successful communications strategy until we have a very different more relevant industry? Will new nuclear only be viable when built or purchased by States, or is there a path to commercial viability for nuclear energy in liberalizing markets? What changes, if any, need to occur in the global nonproliferation regime to accommodate a large expansion effort?



Session 3: State of the Industry: Can it deliver? – Cont'd

- Nuclear projects in the US need to be economical; they are sometimes over-budget and over-time, because of both the individualistic nature of US projects (lack of continuity and vendor experience), safety retrofits and regulatory inflexibility
- Other countries — including Korea, China, and Japan — have projects generally on-time, and on-budget, because they operate in a stable, cooperative project delivery culture.
- A focus on advanced nuclear technology, smaller projects — especially done outside the US — and imports from other countries could help change the course of the US nuclear industry.



Session 3: State of the Industry: Can it deliver? – Cont'd

Nuclear Expansion and Proliferation Risks:

Ambassador Laura Holgate, Belfer Center, Harvard Kennedy School

Expanded use of nuclear power worldwide will benefit global national security interests but only if the technologies we use are designed from the start to support non-proliferation goals.



Lunch: Speaker: Spencer Wwart, “The History of Nuclear Fear”

- Public fears of nuclear power are long-standing and tied to human emotions deeper than those of most other modern issues. Nuclear fear is not a new problem.
- Nuclear communicators can't rely on education alone to address public concern and fears over nuclear power. Instead, they must listen to the public and learn to acknowledge and more directly address people's fears over nuclear power.



Session 4: Nuclear Power in the Developing World: Prospects and Obstacles

- What nuclear capacity is projected in national energy plans and INDCs of the developing world, and global studies? How realistic are these projections, and what are the technical and institutional barriers? Are the public acceptance issues materially different from in the West?



Session 4: Nuclear Power in the Developing World: Prospects and Obstacles – Cont'd

- Developing countries are interested in nuclear power for environmental and energy supply benefits
- They may hesitate to begin new plant construction due to public and governmental concerns over nuclear technology
- Addressing public concerns and misconceptions about nuclear technology (radioactivity, weaponization, nuclear accidents) is essential using trusted independent experts while emphasizing benefits is key to public acceptance.
- Communications must be transparent and accessible, or the experts/information will not be trusted



Session 4: Nuclear Power in the Developing World: Prospects and Obstacles – Cont'd

- Forums for public debate over nuclear power is critical to building trust. If online or face-to-face discussions between community members about nuclear technology (based both upon technical facts and personal feelings) are absent public concern can result in protests or litigation instead of broader consensus.



Session 5: Historical Background and Approach to Nuclear Communications

Historical and Social Context

- Opening Speaker - Ted Nordhaus, Breakthrough Institute, **Moving Beyond Technology Tribalism**
- Nuclear projects are controversial, making them difficult to manage partly because of the complexities of stakeholder acceptance. Public concerns- about safety, waste, proliferation-risk undermining global deployment of nuclear to the extent needed. What is the state of the debate and how can we influence it?
- Challenges to successful nuclear communications include public understandings of economics; public safety, waste and nonproliferation risks; deeper value differences, and social identifications.
- This is affected by norms concerning government authority, technological opacity, and centralization of power.
- People often answer factual questions not simply based on what they know scientifically, but in ways aligned with their tribal identities: e.g., where they fall on the conservative-liberal spectrum.



Session 5: Historical Background and Approach to Nuclear Communications – Cont'd

- Scientists are more analytical and judgmental than the public, which creates difficulty in communicating effectively across these groups.
- Communicating with the public about the safety precautions of nuclear can create suspicion, rather than reassurance.
- Communicating with the public needs to be direct — both in wording and via people sharing their own experiences.



Session 5: Historical Background and Approach to Nuclear Communications – Cont'd

The risk debate: Speaker: Malcolm Grimston, Imperial College, London

The Science of Science Communication, and Cultural Cognition: Climate Change and Nuclear: Speaker: Dan Kahan, Yale University

- Both Kahan and Grimston's mental models regarding communication with the public (or lack thereof) may be correct. Both advocate for improving acceptance by improving social license (either directly; or indirectly by reducing the unintentional anxiety caused by dominating attempts at nuclear communication).
- The panel and audience differed in how important they felt elites and the public, or perhaps more specifically, the public engaged in advocacy work, to be in influencing political outcomes. What contexts may favor the importance of one group over the other remain to be explored.
- The panel was divided regarding whether changing the opinion of elites leading environmental organizations would matter to the public.



Session 6: Key Communication Strategy Issues

Lessons from an analogous area: GMOs

- Speaker: Mark Lynas, Cornell Alliance for Science
- People can change their tribe — by, for example, identifying as pro-science — to support unpopular technologies, such as GMOs.
- Elite opinion is less strident against GMOs.



Session 6: Key Communication Strategy Issues – Cont'd

Framing alternatives to elicit more deliberate energy preferences

- Speaker: Douglas Bessette, Michigan State University
- Games that help people align their choices with their values or objectives can be a way of effectively communicating: they get to discover for themselves the benefits of nuclear.
- People trust the energy portfolio-building game as reflecting reality.
- It's unclear whether touting the recyclability of waste or advanced nuclear builds support among the public. Some personal experience of a panelist suggests it does not. However, another panelist commented that “low carbon” may be an effective messaging strategy.
- How much public opinion matters is unclear. Public opinion has surprising influence in countries such as China, though much less in India.



Session 7: Risk, Trust and Credibility Among the Public and Elites, and How it Plays Out in the Political Arena

- **Reflections from Japan and Elsewhere: Lady Barbara Judge**
- **"We were wrong. Get the women."**
- In Japan, a safety myth prevented action toward actual safety precautions.
- When communicating crisis, you need a good narrative with context. You need to tell people why what's being done is being done and how it is better than any other option.
- A top-down political backlash against nuclear can be the result of handling a crisis poorly, rather than because of the risks of radiation.
- Because the most vocal critics appear to be highly educated women, it's imperative to have highly educated women be on advisory boards, and teach them about the benefits and safety of nuclear.



Session 7: Risk, Trust and Credibility Among the Public and Elites, and How it Plays Out in the Political Arena – Cont'd

Public Understanding of Risk

- Speaker: Richard Clegg, Lloyd's Register Foundation
- People misjudge risk by its familiarity; we underestimate familiar risks, (driving and flying), and overestimate exotic risks, (nuclear radiation)
- People appear to largely reject nuclear accident radiation comparisons to those of bananas, cigarettes, or flying, because they have choice in whether to eat, smoke, or fly, but not in whether they have a nuclear plant close by. Individual agency should be respected when communicating risk.
- Trying to assuage people by equating the radiation in bananas to radiation released in the Fukushima accident is misguided. The benignity of bananas is incongruous with the extreme measures — including evacuation and ripping out top soil — that happened in Fukushima.



Session 7: Risk, Trust and Credibility Among the Public and Elites, and How it Plays Out in the Political Arena – Cont'd

Lessons from a Sampling of Recent Elite Opinion and Public Polling

- Speaker: Kirsty Gogan, Energy for Humanity, **“We can talk to people.”**
- Nuclear advocates should
 - Demythologize the idea that low doses of radiation are as proportionately harmful as large doses.
 - Put the radiological risks into context
 - Communicate in terms people understand, not jargon.
 - Assume little understanding of statistics in the lay public.
 - Run briefings to journalists to communicate issues broadly



Session 7: Risk, Trust and Credibility Among the Public and Elites, and How it Plays Out in the Political Arena – Cont'd

- People support nuclear as part of a low-carbon energy mix, when framed this way.
- Recommendations:
 - Don't bash renewables (the left hate it).
 - Be inclusive (all of the above for low carbon energy).
 - Target your message to your audience. Climate doesn't work for everyone; health, cost, security of supply are other potential benefits of nuclear.
 - Be empathetic. Be authentic, create safe spaces free of conflict, and rely on shared outcomes we all want.
 - Be inspiring.



Session 7: Risk, Trust and Credibility Among the Public and Elites, and How it Plays Out in the Political Arena – Cont'd

Reflections from the Congress

- **Speaker: Aaron Goldner, Energy Policy Advisor, Officer of Senator Sheldon Whitehouse**
“Work with the government.”
- There is less division over nuclear in Congress than perhaps on the ground or among environmental groups.
- Progress on incorporating pro-nuclear legislation into bills has been achieved through informative discussion, relying on data and science, and hearing legitimate concerns.



Session 8: Elements of Success

- **Speaker: Suzy Hobbs Baker, Third Way and Laura Hermann, Potomac Communications**
- Communication is based on building trust relationships and community, not exchange of information. Building these relationships is a long-term process that requires establishing trust with communities (outside of the single issue you're trying to change their position on), and listening to and addressing their concerns.
- Communication with the public is not a trivial problem. If communication efforts or advocacy are done poorly or are rushed, they can significantly damage existing relationships and sabotage efforts at building future relationships.



Session 8: Elements of Success – Cont'd

- Successful communication is based on identifying specific audiences within a community, figuring out how to address communities, and determining the best messages (and messengers) to engage with the community and adjusting messages based on the community. The strategy will vary for every community and care must be taken to build relationships with new communities.
- Nuclear must find a way to eliminate false empathy from messaging. It is extremely damaging, especially when communicating with historically underrepresented or disadvantaged communities. We must do better to identify with and include people of different backgrounds and experience. A communication strategy perceived as patronizing or dishonest will widen the trust deficit and make it even harder to build future relationships and communities for nuclear.



Lunch Interview/Fireside Chat: Perspectives from a Foundation and a Clean Energy NGO

- **Moderator: Armond Cohen, Clean Air Task Force**
- **Discussants: Matt Baker, Hewlett Foundation and Michael Noble, Fresh Energy (Minnesota)**
- In order to achieve zero emissions, nuclear has to be a part of the energy system.
- Current charitable funding for nuclear is small, but likely to rise.



Open Discussion: What does this all amount to? Where should things be headed?

Nuclear energy and the future:

- **Speaker: John Kotek, Nuclear Energy Institute**
- The long term success of nuclear will not be based on the safety of the technology but on the public's view of nuclear benefits. The public's view of nuclear will manifest in government policies to reduce carbon emissions, federal or state support to include nuclear as a green or clear energy source, and federal support for advanced nuclear.
- Nuclear has a unique combination of positive attributes that must be communicated with public. It also has unique combination of actual risks and perceived risks, both of which must be taken seriously when communicating with the public.



Open discussion: What does this all amount to? Where should things be headed? Cont'd

- Success in communicating the risk of radiation is critical. It is a unique hazard of nuclear power and the current way that we discuss it is not clear to other communities. The communication strategy must be improved even if we do not fundamentally alter our scientific understanding.
- Building communities is key to changing public opinion. While the information deficit model of public acceptance has been largely disproven, it is still important that we effectively communicate the facts to the public. Education and other outreach efforts must be targeted to ensure that the right audience receives the right message in the right way from the right messenger at the right time. All of these must be carefully considered when communicating with the public. Bad advocacy will harm the enterprise badly.



Open Discussion: What does this all amount to? Where should things be headed? Cont'd

- We must work to remove barriers to public adoption of nuclear. We cannot force the public to build nuclear but instead we must highlight the attributes that make nuclear a valuable generation source in future electrical systems. Nuclear must be “pulled” onto the grid by the public and business and “pushed” onto the grid by nuclear advocates.

