The MIT Symposium on Realizing the Value of Nuclear Energy, 26 and 27 March 2018.

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Abstract: The symposium on Realizing the Value of Nuclear Energy was organized in order to focus attention and planning on the question of how needed social support for inclusion of nuclear energy in the technological portfolio responding to climate change can be motivated and organized. The need for such support has become realized from examination of the dynamic in the Western democracies for choosing some technological champions and ignoring others in the face of a substantial threat that logically requires a maximal effort, as opposed to the current one which is much more focused on use of a subset of preferred options. This preference carries with it the much greater risk of failure and consequent worldwide suffering. Thus, if the means can be found for motivating use of a more effective technological response the benefits of such an effort can be profound. Alternatively, The consequences of failing to make the needed effort can be long-lasting and substantially irreversible.

INTRODUCTION

This symposium was held on the MIT campus according to the attached agenda. The purpose was to explore evidence that could be important in making the social case for support of the nuclear energy enterprise, both in the United States and worldwide. The potential benefits of such support could include greater order in the international nuclear enterprise with greater US leadership contributions, increased energy supply security and more successful efforts to decarbonize the global energy economy as a response to climate change. Conceptual emphases of the symposium concerned the prospects for nuclear energy success technologically and economically and barriers to such success, what is known concerning portrayals of nuclear and the other relevant controversial phenomena in western media and society, and examination of what would be involved in trying to create popular support for greater use of nuclear energy..

DESCRIPTION

Symposium attendees were drawn from communities dealing with nuclear energy, with popular communications involving controversial topics including nuclear, and those involved in popular advocacy including non-governmental organizations, philanthropic foundations, and governmental policy agents. The symposium was organized by invitation only, subject to the Chatham House rule on confidentiality concerning discussions of the topics introduced. The public record is now being prepared, and is expected to consist of the papers presented, both as texts and video recordings, accompanied by a summary of the themes and views discussed in a session following the presentation of the respective papers. The Proceedings from the symposium are expected to be come available on the Center for Advanced Nuclear Energy Studies (CANES) website by midsummer 2018.

Attendance at the beginning of the symposium was approximately 90 and at the end approximately 70 participants, present in the meeting room. This is an unusually high number at the end, and reflects the high level of interest and lively discussions sustained throughout the symposium. Reactions expressed to the organizing committee regarding the quality of material of the symposium and level of interest from the various participants were very positive.

SUMMARY

Summary of Symposium Session Presentations and Discussions

Session 1

Nuclear power remains an important source of energy because of the role it can play in global electrification and the fight against climate change.

1 Innovation to reduce costs of nuclear power is essential if nuclear power is to contribute significantly to global energy decarbonization.

Session 2

If we don't assume renewables will be the lowest cost energy alternative, then modeling suggests nuclear is necessary to get to a carbon-free economy.

1 Nuclear could look very different from the way it currently does, especially if we use more advanced fuel, improve design practices, and utilize modular construction techniques.

2 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

Nuclear projects in the US need to reduce risk to become viable; they're consistently over-budget and over-time, because of both the individualistic nature of US projects (lack of continuity and vendor experience) and safety retrofits.

1 Other countries — including Korea, China, and Japan — have projects generally on-time, and on-budget, because they operate in a project delivery culture.

2 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.

3 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 Session:

1 Public fears of nuclear power are long standing and tied to human emotions deeper than those tied to most other modern issues. Nuclear fear is not a new problem.

2 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

1 Governments in developing countries are interested in nuclear power due to the environmental and energy supply benefits but may be hesitant to commit to and begin new plant construction due to public concern over nuclear technology

2 Addressing public concern and misconceptions about nuclear technology (radioactivity, weaponization, nuclear accidents) using trusted independent experts while framing the

discussion in terms of benefits is key to public acceptance. The communication process must be transparent and accessible, or the public will not trust the experts or information given.

3 Providing forums for public discussion or debate over nuclear power is critical to furthering the discussion. If online or face-to-face discussion between community members is about nuclear technology (based both on technical facts and personal feelings) is not facilitated and encouraged, public concern could result in protests or litigation instead of broader consensus.

Session 5

1 In proposing a low-carbon energy future, proponents must address the underlying fears and norms surrounding government authority, technological opacity, and centralization of power.
2 People answer factual questions not simply based on what they know scientific evidence suggests, but in ways aligned with their tribal identities: e.g. where they fall on the conservative-liberal spectrum.
3 Scientists tend to be more analytical and judgmental than the public, which creates difficulty in communicating effectively across these groups.
4 Communicating with the public about the safety precautions surrounding nuclear creates more suspicion, rather than reassurance.
5 We should communicate with the public in a more direct way — both in wording (i.e. like a utility) and with people sharing their own experiences.

Session 5 Panel

1 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 dominant attempts at nuclear communication).
2 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.
3 The panel was divided regarding whether changing the opinion of elites leading environmental organizations would matter to the public.

Session 6

1 People can change their tribe — by, for example, identifying as pro-science — to support unpopular technologies, such as GMOs.
2 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.

Session 6 Panel

1 People trust the energy portfolio-building game as reflecting reality.
2 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.
3 Elite opinion is less strident against GMOs.
4 How much public opinion matters is unclear. Public opinion has surprising influence in countries such as China, though much less in India.

Session 7

Barbara Judge - "We were wrong. Get the women."

1 In Japan, a safety myth prevented action toward actual safety precautions.
2 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.
3 A top-down political backlash against nuclear can be the result of handling a crisis poorly, rather than because of the risks of radiation.
4 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.

Richard Clegg - "Risky to talk about risk. Give people choices."

1 People misjudge risk by its familiarity; we underestimate more familiar risks, such as driving and flying, and overestimate more exotic risks, such as nuclear radiation.
2 People appear to largely reject nuclear accident radiation comparisons to 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.
3 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.
4 Nuclear advocates should
1 demythologize the idea that low doses of radiation are as proportionately harmful as large doses.
2 put the radiological risk into context
3 communicate in terms people understand, not jargon.
4 assume little understanding of statistics in the lay public.
5 run briefings to journalists to communicate issues broadly

Kirsty Gogan - "We can talk to people."

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

Aaron Goldner - "Work with the government."

1 There doesn't seem to be as much division over nuclear on the Hill as perhaps on the ground or among environmental groups.
2 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

1 Communication is based on building 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.

2 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.

3 Successful communication is based on identifying specific audiences within a community, figure out how to address communities, and determine the best messages (and messengers) to engage with the community. Adjust messages based on the community. The strategy will vary for every community and care must be taken to build relationships with new communities.

4 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 Day 2:

1 In order to achieve zero emissions, nuclear has to be a part of the energy system.

2 Current charitable funding for nuclear is small, but projected to rise.

Session 9

1 The success of nuclear power in the coming decades will not be based on the safety of the technology but on the public's view of nuclear. 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.

2 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.

3 Figuring out a better way to communicate the risk of radiation is critical. It is a unique hazard of nuclear power and the current way we discuss it is not clear to other communities. The communication strategy must be readdressed even if we do not fundamentally alter our scientific understanding.

4 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 burn the industry badly.

5 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.

Table 1, Symposium Agenda

Symposium on Realizing the Value of Nuclear Energy

March 26 & 27, 2018
MIT Ray and Maria Stata Building
32 Vassar Street, Room 32-155,
Cambridge, MA 02139 USA

Conference statement: Many studies suggest that a marked increase in nuclear energy -- as many as 2-3,000 nuclear reactors, up from 450 today – could be a critical element of a successful strategy to meet growing world energy needs and address environmental challenges. But nuclear energy, under the current technology, business and policy model, is not poised to make such a contribution. Moreover, nuclear energy's potential role is not understood or accepted, and is in some cases affirmatively rejected, by many government decision-makers, as well as elements of civil society and media on grounds of safety, cost, waste and security. This symposium brings together nuclear energy experts, government officials, public opinion and communication experts, and representatives of civil society, from around the world to examine and test the case for nuclear energy in the 21st century, explore what changes in the industrial technology and business model and policy framework will be necessary to realize its potential, and identify strategies for addressing the many issues raised by relevant publics. All sessions in the symposium will be interactive, and the symposium will aim to produce concrete action plans to ensure success in this endeavor.

Auspices: CANES Chairman: Jacopo Buongiorno, Organizers: Michael Golay, Kirsty Gogan, Armond Cohen

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.

Day 1

07:45 – 8:30 Registration

08.30 – 08:45 Opening remarks and welcome
Speaker - Michael Golay, MIT

08.45 – 09.15 *Session 1*: The urgency of nuclear energy in the 21st Century
Energy to power global development; geopolitical leadership; energy diversity and security; clean air and climate change mitigation
Moderator: Michael Golay, MIT
Speaker– Jacopo Buongiorno, MIT

09.15 – 10:30 *Session 2*: Nuclear in the climate debate: where do we stand?
Moderator: Kirsty Gogan, EFH
The climate debate: There are powerful arguments that nuclear is essential to squaring global energy growth with environmental quality including climate. What are the key arguments, challenges to those arguments, and how is the debate playing out?

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

Break 10:30 - 10:45

10:45 – 12:00 *Session 3*: State of the Industry: **Can it deliver?**
Moderator – Michael Golay, MIT
Nuclear technology has demonstrated high value in the past and continues to have great potential to provide energy for the industrializing world and complement renewables as a climate solution. But apart from China- and Russia-led efforts, there is no significant global build. Costs, commercial risk, and time to market are key barriers, as well as legitimate concerns around 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? Can we have a successful communications strategy until we have a very different and therefore 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? And what changes, if any, need to occur in the global nonproliferation regime to accommodate a large expansion effort?

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

Nuclear energy expansion and proliferation risks:
Speaker: Amb. Laura Holgate, Belfer Center, Harvard Kennedy School

12:00– 1:15 Lunch: Guests relocate to Stata 4th floor R&D Commons, Room 32-G401
Speaker: Spencer Weart, "The History of Nuclear Fear"

1:15 – 2:30 *Session 4:* Nuclear power in the developing world: prospects and obstacles
Moderator: Karl Hausker, World Resources Institute

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?

Asia case studies

- Southeast Asia: Public opinion and communication channels
  Speaker: Shirley Ho, University of Singapore
- India – prospects and politics
  Speaker: Jai Asundi, Center for the Study of Science, Technology and Policy (India)

2:30 – 4:00 *Session 5*: Historical Background and Approach to Nuclear Communications
Moderator: Myrto Tripathi**,** The Business and Climate Summit, France

This session will consider challenges to successful nuclear communications including public understandings (correct or incorrect) of economics; concerns around public safety, waste and nonproliferation risks; deeper value differences and social identifications; and other factors. How can we think more constructively about meeting these challenges? And what can we learn from history on this topic?

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?

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

Break 4:00 – 4:30

4:30 – 5:45 *Session 6*: Key communication strategy issues
Moderator: Elizabeth Dalton, Aspen Institute

This session will sharpen the discussion from Session 5 and discuss some practical lessons from case studies and research.

Lessons from an analogous area: GMOs
Speaker: Mark Lynas, Cornell Alliance for Science

Framing alternatives to elicit more deliberate energy preferences
Speaker: Douglas Bessette, Michigan State University

6:00 Guests to relocate to Samberg Conference Center, Chang Building, 50 Memorial Drive

6:15 Cocktail Reception and Dinner: Celebration of Michael Golay's work
MC: Jacopo Buongiorno,
Speaker: Michael Golay: A career at the socio technological frontier

Day 2

7:45 – 8:30 Registration

8:30-10:30 Session 7: Risk, Trust and Credibility Among the Public and Elites And How it Plays Out in the Political Arena: Some Further Observations

Moderator: Lady Barbara Judge, Institute of Directors, UK

Initial Remarks- Reflections from Japan and Elsewhere: Lady Barbara Judge

Public Understanding of Risk
Speaker: Richard Clegg, Lloyd's Register Foundation

Lessons from a Sampling of Recent Elite Opinion and Public Polling
Speaker: Kirsty Gogan, Energy for Humanity

Reflections from the Congress
Speaker: Aaron Goldner, Energy Policy Advisor, Officer of Senator Sheldon Whitehouse
Respondent: Andrew Zach, House Energy and Commerce Committee Staff

10:30-10:45 Break

10:45-11:45 Session 8: Elements of Success

Moderator: Kirsty Gogan, EFH
Speaker: Suzy Hobbs Baker, Third Way
Laura Hermann, Potomac Communications

11:45-1:00 Lunch: Guests relocate to Stata 4th floor R&D Commons, Room 32-G401

After-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)

1:00 – 2:30 *Session 9*: Open discussion What does this all amount to? Where should things be headed?
Moderator: Michael Golay, MIT
Nuclear energy and the future: John Kotek, Nuclear Energy Institute

2:30 Closing Remarks
Speaker Michael Golay, MIT

2:45 Adjourn