61st Pugwash Conference on Science and World Affairs
Nagasaki's Voice: Remember Your Humanity
Nagasaki, Japan
1-5 November 2015

Working Group Seven Report: Civilian Nuclear Energy, Energy Resources, and International Cooperation"

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Summary

Working Group (WG) 7 discussed a wide range of topics. These discussions can be distilled into three central components: the future of nuclear energy, nuclear security and proliferation, and nuclear energy safety. Each section is highlighted in detail below. In addition, two unresolved issues emerged in WG7 that require further study and communication: the humanitarian-societal impacts of nuclear energy, and the transparency and communication of nuclear regulation and safety.

The principle tone of WG7 was to emphasize caution on nuclear energy. Nuclear energy may have a role to play in meeting contemporary energy and developmental needs as a reliable low-carbon energy source. However, countries considering adopting a nuclear portfolio should exercise caution and careful consideration. Frequently, the costs of nuclear energy are underemphasized and their benefits are overemphasized. The risks and responsibilities that come with civilian nuclear energy are multifaceted and long-term. Nuclear energy can mitigate but will not solve the global climate crisis; it is impossible to fully separate energy from military use and proliferation; there are no long-term storage plans for nuclear waste; and the threat of nuclear accidents pose long-term risks to current and future human communities as well as the earth. All of these issues led the working group to advocate for the minimal development of new civilian nuclear energy around the world in favor of alternative energy sources wherever feasible.

It should be emphasized that there are multiple pathways to strengthen nuclear security and safety. Principally, these include the exercise of caution regarding expansion of nuclear energy, the formalization of limits on sensitive parts of the fuel cycle, and a more nuanced assessment of risk. Specific recommendations include a halt on nuclear commercial and military fuel reprocessing, internationalization of the enrichment process, preserving the independence of regulatory authorities, and the adoption of codes of conduct for nuclear actors. In terms of the future of nuclear safety, the working group acknowledged that there are important unresolved

issues, principally the significant humanitarian impacts of nuclear energy and the lack of transparency in nuclear safety and regulation.

The Future of Nuclear Energy: Exercise caution in pursuing nuclear energy

- Before adopting nuclear energy, stakeholders must consider the long-term impacts, including rigid path dependency and the necessary parallel investments in human resources and regulatory framework.
- Voluntary codes of conduct for nuclear actors, while problematic, should be encouraged and adopted
- There is a great need for fully independent regulatory authorities

WG7 emphasized the need for significant caution for stakeholders that are considering adopting nuclear energy. Too often the long-term impacts of nuclear power are minimized while short term gains are emphasized. The Group emphasized the multifaceted nature of long-term nuclear impacts. Nuclear power entails a rigid path dependency. As many participants noted, when choosing to go down the nuclear road, "there is no turning back, ever." This emerges from the need to constantly care for the disposal and security of nuclear stockpiles. Further, nuclear power requires parallel, long-term investment in the training of nuclear experts, the creation and maintenance of a complex regulatory architecture, and the constant assurance of compliance in ever-evolving nuclear security regime.

WG7 reiterated the need for voluntary codes of conduct for all nuclear actors. This includes both importers and exporters of nuclear materials, facility operators, and nuclear regulators. It was acknowledged that some useful examples of ethical codes of conduct already exist, including the Carnegie Endowment for Peace's "Nuclear Power Plant Exporters' Principles of Conduct." It was also acknowledged the difficulties of establishing and ensuring the effectiveness of voluntary codes of conduct, with levels of specificity that provide both clarity and flexibility. In particular, state sovereignty was highlighted as a road block to ensuring uniform levels of adoption and compliance to nuclear safety.

WG7 reiterated a need for the full independence of nuclear regulatory authorities. This includes both political and technical independence. It was acknowledged that given deep personal and political interests that pervade within nuclear industries, ensuring independence is a difficult task. However, to ensure a minimum level of safety standards and to reduce the risk of accidents, fully independent regulatory authorities are required.

Nuclear Security and Proliferation: Formalized limits on sensitive parts of the nuclear fuel cycle

- A global halt to commercial reprocessing
- A global halt to the use of highly enriched uranium for any purpose

- An internationalization of the enrichment process

WG7 had three main recommendations related to protecting sensitive parts of the nuclear fuel cycle. There was unanimous agreement that a global halt to commercial reprocessing of plutonium is needed. This indefinite moratorium should be applied to military as well as commercial reprocessing. Reprocessing is uneconomical, there is no market for the separated plutonium, and it presents serious proliferation risks. Moreover, non-uniform distribution of reprocessing capabilities feeds regional instabilities and motivates the proliferation of this technology despite the lack of technical justification. The working group recognized that there are substantial political roadblocks to ending reprocessing, particularly in Japan. However, the reduction of proliferation risk and the potential improvement in regional stability provide strong justification to push beyond political motivations and institute a moratorium.

The WG also expressed support for the internationalization of the enrichment process. It did not seek to deny states the right to indigenously develop nuclear energy. However, due to the proliferation risks of enrichment technology, WG7 believed a new norm is needed to protect sensitive parts of the fuel cycle. There was some disagreement as to whether or not multi-lateral approaches should be voluntary or compulsory, and what the regional format should be. The WG also recognized that multi-lateral enrichment facilities introduce their own opportunities for the proliferation of technology and knowledge. However, so long as the logistics of internationalization are carefully considered, the WG expresses optimism that this approach will ultimately reduce the likelihood of proliferation.

The WG discussed other aspects of the fuel cycle as well. There was wide agreement among the WG that there should be a global halt of the production and use of highly enriched uranium. Several member expressed concern at the continued lack of a long-term solution for nuclear waste anywhere in the world and there was some discussion of employing multi-lateral approaches to spent fuel management. In general it was suggested that fuel cycles be designed considering not only technology and economic issues, but also safety and security issues with stockpiles, production, use and disposal of nuclear fuel. A more comprehensive approach to designing fuel cycles might lead to natural movement toward a more secure and sustainable fuel cycle.

Nuclear Energy Safety: A more nuanced approach to assessing risk

- Limit our reliance on probabilistic risk assessments. They do not always encompass the range of dangers associated with nuclear safety and proliferation.
- Encourage a wider community of experts (outside engineering) to identify the diverse risks attendant to nuclear energy

A major theme that emerged regarding operational safety of nuclear power is the need for a more nuanced approach in determinations of risk, both in the regulatory design and in public perception. On the regulatory side, there was a good deal of discussion on the limitations of traditional probability risk assessment (PRA). Members noted that a definition of risk as (likelihood) *(consequence) distorts the impact of low-probability, high-impact "black swan" events or multi-component failures. Moreover, risk assessments should include humanitarian and proliferation concerns in addition to economic and regulatory aspects. Members noted that a single technical perspective will never have sufficient imagination to foresee all possible events, and recommends a technically diverse representation of experts to capture the wide array of risks attendant to nuclear energy.

Members of the WG also noted that while nuclear energy decisions impact communities non-uniformly, the public generally does not have sufficient understanding of the risks and benefits of nuclear energy. Because the potential impacts of a nuclear disaster are not evenly distributed amongst those who benefit from nuclear power, it is important that local communities are able to participate in discussions of nuclear energy. However, public understanding and perceptions of nuclear energy are not well-informed. The public tends to worry most about nuclear waste, then reactor safety, and finally proliferation, while the professional community largely reverses the prioritization of that list. This points to the need for improved education and communication to the public, so that they have the tools to make informed opinions regarding nuclear energy in their communities.

Under-Addressed Issues

The humanitarian-societal impacts of nuclear energy

WG7 emphasized that nuclear energy carries with it deep impacts on local communities and the environment. Often these impacts are minimized by stakeholders who have vested financial and political interests in maintaining existing stockpiles and spreading future sources of nuclear energy. Scientists and policy experts are responsible for providing a balanced narrative that includes examination of safety, reliability and risk.

Further, holders of nuclear technology and policy have a responsibility for their nuclear activities. Too often, nuclear actors overlook the ethical and societal impacts of nuclear technology. This tendency perpetuates dangerous myths that nuclear security is easily achievable and that accidents, mishaps, and proliferation are inconsequential because they are improbable.

It was also emphasized that nuclear risks and benefits are not evenly distributed. Nuclear accidents like Fukushima demonstrate the reality that the debilitating humanitarian impacts that while non-uniform, have both local and global reach.

Further research and public engagement on the humanitarian impacts of civilian nuclear energy is therefore highly advisable.This could include a call for all nuclear actors (including suppliers, operators, etc) to be licensed, trained, verified, and bound by internationally agreed upon ethical codes of conduct.

There are important humanitarian concerns about nuclear energy. However, the deep vested interests of the global nuclear lobby and the often-inaccessible technical discussions in nuclear engineering inhibit honest public debate. An important but unanswered question in the Working Group was, "what should be the role of the local public in nuclear decision-making?"

Transparency and communication of nuclear regulation and safety

The working group identified a cross-cutting issue in the lack of transparency and communication regarding nuclear energy. Many countries that have or are pursuing nuclear energy lack a sufficiently independent and effective regulatory framework. A truly independent regulatory body can be unduly influenced by financial, political, or industry interests. Members of the working group also posed the question: Who should decide how safe is 'safe enough'? What should be the role of the public, government, national and international regulatory bodies in making this decision, which is unique to each individual facility? WG members also called for more communication and transparency between experts and the public in times of crisis, citing the 2011 nuclear disaster in Japan to highlight some shortcomings in the current secretive culture surrounding civilian nuclear energy.