THE INEXTRICABLE RELATONSHIP BETWEEN NUCLEAR ENERGY AND THE BOMB

Date: August 15, 2024

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KEY EVENTS

On August 15th, 2024, Dr. M.V. Ramana presented *The Inextricable Relationship Between Nuclear Energy and the Bomb*. The presentation was followed by a question-and-answer period with questions from the audience and CASIS Vancouver executives. The key points discussed were the history of nuclear weapons and the replacement of nuclear energy with renewables as the energy source of the future. Dr. Ramana also addressed the challenges around building nuclear plants and the potential for nuclear weapons proliferation from nuclear energy.

NATURE OF DISCUSSION

Dr. Ramana's presentation focused on issues of nuclear energy, the risks it poses, the factors that make it unsuitable as a source of clean energy across the world, such as the challenge of disposing nuclear waste in a safe and sustainable manner, and the links the technology has to nuclear weapons and proliferation. Dr. Ramana spoke to the probability of states with nuclear energy capabilities pursuing a weapons program with ease, emphasizing the significant overlap between the technology used for nuclear weapons and energy.

BACKGROUND

Presentation

Dr. Ramana identified five key overlaps between nuclear energy and weapons: the technical, historical, geographical, personnel and institutional aspects. The

main technical challenge to make nuclear weapons is obtaining the necessary fissile materials, namely highly enriched Uranium or Plutonium (the most common isotopes used in creating nuclear weapons). Neither is found in nature and have to be produced in special facilities.

The physical process used to enrich uranium can be used to make fuel for nuclear energy and further enriched to make weapons usable grades of enriched uranium. Moreover, replicating enrichment technology is not very difficult, as demonstrated by A.Q. Khan, a Pakistani metallurgist who set up supply network for nuclear technology.

Plutonium is a byproduct of all reactors and can be separated using a chemical process known as reprocessing. It is very difficult to ensure that plutonium is never diverted from reprocessing plants to weapon programs. Even small power plants can produce material for between eight to ten nuclear bombs.

History: The first ever nuclear reactors built were in Washington state and they were used to produce plutonium that was then used in the bomb that destroyed the city of Nagasaki in Japan. Many details about these technologies were later shared as part of the Atoms for Peace program and other international efforts to promote nuclear energy. For instance, India used a reactor imported from Canada to produce plutonium used in the former's first nuclear weapons test in 1974.

Geography: A large fraction of operating nuclear power plants are in countries with nuclear weapons. Another significant fraction of nuclear power plants are in countries that do not have nuclear arms of their own but are part of an alliance (e.g. NATO) that relies on nuclear weapons. In all, there is a large overlap between the geographical distribution of nuclear power plants and nuclear weapons.

Personnel: A case study of Pakistan's acquisition of nuclear weapons highlighted the role of personnel. The south Asian nation first acquired an interest in possessing nuclear weapons in the 1950s with the atoms for peace program but had very limited technical capabilities. An agreement was signed with the U.S. in 1955 to develop nuclear technology and by 1961 a hundred and forty-four scientists and engineers were in training. Another example is that of Iran, who paid the Massachusetts Institute of Technology to allow their students to study nuclear engineering. These students later went back to Iran and established its atomic energy program.

Institutions: India's Department of Atomic Energy was first established to develop nuclear power for peaceful purposes. However, after it played a part in making the nuclear weapon tested in 1974, it gained institutional and political power. A similar overlap existed in the U.S. where the Department of Energy oversees both nuclear energy and weapons.

Expanding nuclear energy will necessarily increase the risk of nuclear proliferation. Nuclear power is expensive and building reactors is a time-consuming process, that has major detrimental consequences for the environment in the event of an accident. It also takes a long time to build nuclear reactors; renewable energy sources can be set up for a fraction of the time and cost. Therefore, it is not feasible to address climate change by expanding nuclear energy.

Question and Answer

Additional Safety & Security always equates to cost, from your experience as Scientist are companies ready to make the spending/add the spending, or are they always focused on cutting costs?

Costs are always a consideration when building nuclear plants. The bottom line for private corporations is profitability and so plant owners are always focused on cutting costs, from the planning and building stages to operation. Corporations prioritize profitability over safety. As such, the very nature of nuclear energy leaves it prone to accidents.

My question is twofold: one, do you then believe that existing nuclear power plants should be dismantled and if so, how do you see this pivot working, as in, what is the best course of action)? I am thinking of the ever-delayed decommissioning of Diablo Canyon Power Plant in California.

In the case of Diablo Canyon, the plan to shut it down was negotiated between environmentalists. Locals, plant operators/labourers, and state regulators. This was driven partly by the operating company, PG&E. The decision to shut down the plant was a result of economic infeasibility due to increasing popularity and cost effectiveness of renewables. The reason for Diablo Canyon to stay open was the result of political considerations. Diablo Canyon also provides a good model to gradually phase out nuclear plants and replace them with renewables which can be replicated. The fraction of nuclear power plants is declining (17.5% in

1990s to 9% in 2023), with energy reliance shifting to renewable sources (15% today), indicating the unviability of nuclear energy.

Does the spike in Nuclear Energy bring more stringent Safety and Security requirements? What are the implications for Security Professionals?

In principle, the spike should bring more stringent requirements, especially as seen in Small Modular Reactors (SMRs), which are supposed to solve the issues traditionally encountered in reactors. However, since they are smaller, more are needed to produce the same level of energy. Moreover, there is no way to reduce costs for SMRs. The nuclear industry argues against necessary safety regulations to reduce costs. These regulations are being loosened in countries such as Canada where SMRs are now exempt from the impact assessment process resulting in a higher risk of accidents.

KEY POINTS OF DISCUSSION

- There are multiple common threads between nuclear weapons and nuclear energy, and countries can make the transition to nuclear weapons from a peaceful program. Such transitions have historical precedent and safeguards.
- Institutions could catalyze using nuclear energy to build nuclear weapons programs.

FURTHER READING

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