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The Ethics Issues of Nuclear Energy: Hard Lessons Learned from Chernobyl and Fukushima

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Abstract

The Japan nuclear disaster once again raised the ethical issues of nuclear energy programs. Nuclear energy is considered as a sustainable energy source that reduces green house gas emission and produces far less wastes than conventional energy. On the other hand, nuclear fuel and wastes are highly radioactive, posing many threats to public health and the environment. Nuclear accidents are catastrophic and have a far-reaching impact on global health. Based on the ethical principles of utilitarianism, nonmaleficence, beneficence, justice, disclosure, and autonomy, mankind needs to take a more stringent approach on nuclear programs. Steps to be taken include improving nuclear safety, enhancing risk management, requiring full disclosure of facts, pushing for open communication with the public, and through developing alternative green energies, such as wind, solar, and geothermal energy.

KEYWORDS: nuclear energy, ethics, nuclear accident, global health, ethical analysis

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The Ethics Issues of Nuclear Energy: Hard Lessons Learned from Chernobyl and Fukushima

The ongoing nuclear disaster at Fukushima Daiichi Nuclear Power Plant in Japan has resulted in serious cascading crises with impacts on public health, the environment, food safety, and psychosocial effects on a global scale (Becker, 2011). The nuclear emergency has prompted another round of intense debate on the ethical issues of nuclear energy and its impact on global environment and health. Nuclear power uses sustained nuclear fission to generate heat, which is converted to other forms of energy, such as electricity. Currently, nuclear power provides approximately 6% of the world's energy and 15% of the world's electricity. According to the International Atomic Energy Agency (IAEA) (2009), there were 439 nuclear reactors in operation in 31 countries in 2009, 339 of which were more than 20 years old. In addition, more than 60 countries are interested in pursuing nuclear power programs.

The development and use of nuclear power has been hotly debated for decades. Nuclear energy is considered as a sustainable energy source that reduces green house gas emission and produces far less wastes than conventional energy. On the other hand, nuclear fuel and wastes are highly radioactive, posing many threats to public health and the environment. Safety is another big concern, since most of nuclear power plants are located in densely populated areas. Nuclear accidents are catastrophic on a global scale, which has caused public fear of nuclear power. Is nuclear energy really a green option? What are the impacts of nuclear energy programs on global health? What are the ethical values and principles that should be considered when making decisions on nuclear energy? This paper discusses the ethical issues of nuclear energy and proposes policy changes to protect public health at global scale.

The Ethics Issues of Nuclear Energy

The ethical issues of nuclear energy focus on the comparison between the of benefits and the hazards of nuclear power, the catastrophic impact of nuclear accidents, fact disclosure, and safety regulations and violations. These issues have a great effect on global health. They are discussed individually in the following paragraphs.

Impact on Environment: There are pros and cons on this aspect. On one hand, nuclear energy is sustainable, does not emit green house gas, and generates far less wastes than conventional energy. With increased demand for energy and diminishing fossil fuel supplies, nuclear energy, a sustainable alternative compared to wind and solar energies, seems a feasible option to replace fossil fuel energy. Opposingly, nuclear energy is not green; it involves mining and refining of radioactive raw materials and disposal of radioactive wastes, which damage the environment and brings health risks to nearby residents.

Nuclear Accidents are Catastrophic: To date there have already been several major nuclear accidents, such as the Kyshtym accident (level 6), Three Miles accident (level 5), Chernobyl disaster (level 7, the highest ranking for nuclear disasters), and the ongoing Fukushima disaster (level 7), according to IAEA (2008). In the 1986 Chernobyl disaster, large amounts of radioactive particles and gas were released into atmosphere, and spread throughout Europe. In addition to death and mutations in humans, animals and plants, the long-term effect involved prolonged low dose radiation (I-131, Cs-134 and Cs-137, etc.) over large population in Europe, which increased risks for cancer and other diseases (Hatch et al., 2005). The study results varied on the long-term health effect. Some studies, such as the Chernobyl Forum report by IAEA/World Health Organization (WHO), estimated that the disaster will result in a total of 9,000 excess cancer deaths, but other estimations (by International Physicians for Prevention of Nuclear Warfare (IPPNW), The Other Report on Chernobyl (TORCH), and Greenpeace, for example) are far larger (Hatch et al., 2005;

IPPNW, 2006; Greenpeace, 2006). The Fukushima disaster occurred as the nuclear power plant was struck by a series of natural disasters (a magnitude 9.0 (M_w) earthquake and up to 10 m high tsunami wave)(BBC News, 2011). The disaster attained the same accident level as the Chernobyl disaster, releasing a radioactive plume all over the world and more than 100,000 tons of radioactive water into the Pacific Ocean (Biggs & Humber, 2011; Collins, 2011). Like the Chernobyl disaster, the Fukushima accident has resulted in cascading crises with impacts on public health, the environment, food safety, and psychosocial effects throughout the world. The health effect on global health remains to be elucidated.

Impact on Local Residents: As mentioned previously, nuclear power requires mining, enrichment, transport, and disposal of radioactive materials, and many nuclear power plants locate in densely populated areas. Residents near these activities are put under increased risk for cancer and other health problems due to long-term exposure to low-level radioactivity; a nuclear accident will elevate such risk to another threshold. This is against the principles of non-maleficence and justice. After the funding for the Yucca Mountain (Nevada) nuclear waste repository was terminated this year (Northey, 2011), nuclear wastes are now stored temporarily at each nuclear power plant site, which increases the risk to nearby communities and may have potential security risks. So far, there is no permanent solution on nuclear waste disposal.

Fact Disclosure: Full disclosure on potential risks, prompt information sharing and training on self-help methods could help to save lives, reduce injuries, and smooth public panic, particularly in case of nuclear accidents. In contrast, governments and industry often downplay the potential risks, or do not release the full facts to the public. The Fukushima disaster was a good example. The Tokyo Electric Power Company (TEPCO) has been accused of falsifying data and covering up safety risks (Biggs & Humber, 2011; Collins, 2011). When the disaster happened, the information from TEPCO and the Japanese

government were contradictory and misleading, which intensified psychosocial effects around the world. The only ethical way to address public concerns is to release accurate and objective information to the public in a timely fashion.

Safety Regulations and Violations: Historically, the safety measures were not followed and regulations were not enforced in many nuclear power stations. For example, in a 2007 investigation report, TEPCO admitted misconduct by falsifying data to cover up safety risks during nearly 200 periodic safety checks on the three TEPCO nuclear power plants (including Fukushima Daiichi) in the years between 1977 and 2007. Potential safety problems were not corrected, but rather covered up in order to avoid disruption of operation (Public Intelligence, 2011; White, 2011). Therefore, the conformity of all nuclear power programs to stringent safety regulations and the prosecution of regulation violators should be ranked as the highest priority; without a doubt, the lack of regulation or the unpunished misconduct of a program has the largest potential to do far-reaching and catastrophic damage to a local area (and beyond). With 439 reactors worldwide and majority of the reactors being over 20 years old, nuclear power regulators and industry should continuously adopt new approaches to further improve the safety and security of nuclear materials. The nuclear facilities need to be better prepared for the unexpected and complicated situations, such as natural disaster-induced nuclear accidents. Otherwise, nuclear accidents are inevitable.

Ethical Analysis and Proposals for Change

In order to resolve the ethical issues, nuclear power regulators and industry should follow the ethical values and principles to make decisions in order to maximize the benefits and minimize the harm. Different stakeholders may have different opinions on nuclear energy due to different values and principles, different facts and information they have on nuclear energy, and different perceptions on the outcome of the decisions. In addition, development in science and technology could change the ethical issues (Yanke, 2011).

In the Western world, utilitarianism is a dominating theory that values the maximal well-being for the most people. If one applies the utilitarianism view to the nuclear energy program, the key questions are, does the nuclear energy program maximize the well-being to most people and are there alternative options to accomplish the same outcome? The proponents of nuclear energy, including many governments around the world and international organizations, emphasize that the nuclear energy is sustainable, clean, and generally safe, thus should be developed to replace fossil fuel energy (Newton-Small, 2005). They contend that the accidents are isolated cases that should not dissuade mankind from using nuclear energy. They contest that the public over-reacted about the damaging effect of nuclear accidents. Therefore, the governments often assure the public that nuclear power is clean and safe. They emphasize that the safety of nuclear technology has improved significantly in the past several decades. These governments cite that the troubled nuclear reactors in Fukushima used technologies in the 1970s, which had safety concerns even before the accident occurred.

The opponents of nuclear energy, including organizations such as Greenpeace and IPPNW, question whether the nuclear energy program is really clean. Despite no green house gas emissions, nuclear reactors produce nuclear wastes through the mining of radioactive ore, refining it into nuclear fuels, and transporting both the fuels and wastes to different locations. The impact is huge and irreversible. The 439 nuclear reactors produce about 130,000 cubic meters of low level and intermediately radioactive wastes and 13,000 tons of highly radioactive waste (Yanke, 2011). Nuclear wastes could remain radioactive for hundreds of thousand years. Currently there is no permanent solution for waste disposal. In the case of a major nuclear accident, tens of millions of people could be affected. As natural disasters and technological disasters become increasingly linked, their compounded effects will have broad and complex impacts that could cascade into crises around the globe. The

global community will be unprepared if action is not taken now. The possible damage is so immense that, in the authors' opinions, it outweighs the benefit. Before such issues are solved, it seems to be unethical to develop nuclear programs. Thus the nuclear industry have to further improve the nuclear safety, minimize the impact on environment and health, and should take more stringent approach with new and existing nuclear power programs.

Based on the ethical principles of utilitarianism, non-maleficence, beneficence, and justice, disclosure, and autonomy, the following changes are proposed: 1) improve the safety standard of nuclear technology to minimize the harm to the environment and global health by implementing more stringent safety checks and review measures and by decommissioning aging plants and those that fail to address safety concerns; 2) enforce safety regulations to ensure full compliance, shut down the plants with identified safety risks and hold the responsible persons liable; 3) mandate the sharing of timely, accurate, clear, and credible information with the public in order to reduce the damages of radiation emergencies and maintain public trust and confidence; 4) enhance international cooperation between governments, international organizations, and industry on guidance/regulations, law enforcement, radiation monitoring, and follow-up on potentially affected populations; 5) integrate medical care and psychosocial support for high risk populations after nuclear accidents to help reduce the psychosocial damage on the public.

In terms of roles and responsibilities of different stakeholders, nuclear power regulators, i.e., governments and international agencies, should conduct thorough and systematic reviews on the pros and cons of nuclear programs, tighten safety laws and regulations, and hold violators and other responsible parties accountable. The industry and government should disclose the facts and warn the public on potential risks. Healthcare professionals play vital roles in providing guidance to the public on how to respond to different levels of radiation exposure and in alleviating public fear concerning radiation risks.

The public should receive training on nuclear hazard and self-protection at emergency situations.

Conclusion

This paper discussed the ethical issues surrounding nuclear energy programs. While nuclear energy is regarded as a sustainable energy that helps green house gas reduction, it generates highly toxic radioactive waste, irreversibly damages the environment and public health. Any nuclear accident has a far-reaching impact on global health. Based on the ethical principles of utilitarianism, nonmaleficence, beneficence, justice, disclosure, and autonomy, authorities and nuclear industry need to take a more stringent approach on nuclear programs, improve nuclear safety, enhance risk management, require full disclosure and open communication to the public, and develop alternative green energy, such as wind, solar, and geothermal energy.

Please note that the opinions expressed by the authors represent those of the authors and do not reflect the opinions of the Online Journal of Health Ethics' editorial staff, editors or reviewers.

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