Nuclear Mistakes: Risks and Accidents with Nuclear Power Generation

Xinran Zhao [1,*]

[1]*Beijing Normal University-Hong Kong Baptist University Joint International College*
**Corresponding author. Email: p930004046@mail.uic.edu.cn*

ABSTRACT
Nuclear is a significant kind of energy provided in daily lives. However, people tend to be afraid of the risks. For instance, it can cause catastrophic accidents, can lead to thyroid cancer. In fact, if nuclear is simply cut off completely, more deaths will be caused due to its economic value. Government can do more to make the best of nuclear. This article concluded some nuclear accidents, mainly about Fukushima and Chernobyl. It studies what the risks are, and how they impact particularly. Then we will be able to see what we can do to prevent or make the catastrophy the least, and do the best to recover in an effective way. This article provides suggestions to the government and the common people, but the paper is really difficult. The requirements are strict and professionals are required to join the community. All this preparation is also quite expensive. The financial burden will be another drawback of installation precautions.

Keywords: *Nuclear, Risks and accidents, Thyroid cancer, Economics, Preparedness and recovery.*

1. INTRODUCTION

There have been a lot of discussions about whether to utilize nuclear power in a large scale in daily lives. Mainly being worried about the disasters nuclear power plants can bring about. However, nuclear can be a powerful new energy resources. The author would like to arrange the pros over cons as well as the preventive treatment to recommend nuclear. The most researches are focused on one professional field, such as the thyroid gland cancer caused by nuclear, what control steps government has taken, respectively. So the author wishes to make things thorough and help people to make clear choice. This article is about nuclear mistakes, how they occur, what are they, and how will they be controlled. The author concluded some nuclear accidents, mainly about Fukushima and Chernobyl. It studies what the risks are, and how they impact particularly. Then we will be able to see what can do to prevent or make the catastrophy the least, and do the best to recover in an effective way. The author was hoping to introduce nuclear power in a positive way, get our world a new resource.

2. PROS AND CONS

2.1. Advantages of potential inventory nuclear power include

Low Greenhouse Gas emissions.

Low life-cycle carbon emissions.

High power output.

Provides stable base load output.

Inexpensive electricity.

Nuclear energy does not rely on fossil fuels.

economic impact (providing jobs, etc.).

2.2. Shortcomings of potential inventory nuclear power include

Although the advantages of nuclear power are discussed above, nuclear power is full of many major and notorious shortcomings. This includes:

A large number of security and security risks.

An unresolved waste disposal problem.

Ongoing containment issues.

The threat of accidents increases.

Increased likelihood of use in terrorism.

Continuous leakage results in low-level radiation (LLR) in the environment.

Disasters.

Huge water requirements.

It will still lead to carbon dioxide emissions.

Land use and habitat destruction.

Unprofitable plants that cannot be sustained in a changing climate.

Accidents, leaks, and forces that are almost completely beyond human control, such as the Three Mile Island accident, Chernobyl, Dome, Fukushima Daiichi, and many other large-scale disasters that are still occurring, have a long and bleak history. Many nuclear power stations in the United States alone plan for much-needed repair and are behind on safety plans, according to the Union of Concerned Scientists (UCS). Furthermore, these factories are no longer profitable, and many insurance companies refuse to cover them due to the risk of uncontrollable large-scale disasters [1].

For most people, low-level radiation exposure from the environment and medical procedures does not cause any detectable health problems. However, if a person is exposed to a large amount of radiation over a long period of time, the radiation can harm the body's cells and lead to cancer. Radiation illness occurs when a person is exposed to high amounts of radiation in an acute dosage. Radiation sickness is defined as an illness produced by short-term exposure to high amounts of radiation. Skin burns, nausea, vomiting, diarrhea, hair loss, general weakness, and death are all possible symptoms. Exposure of the thyroid gland to ionizing radiation at a young age is a major recognized risk factor for differentiated thyroid cancer. After the Chernobyl and Fukushima nuclear accidents, thyroid cancer screening was mainly conducted on children, leading to case overdiagnosis in South Korea after opportunistic screening (recruiting subjects at medical institutions). Cancer screening aims to reduce morbidity and mortality, but screening can also have a negative impact on health (if overdiagnosed can lead to unnecessary treatment) and quality of life.After the Chernobyl accident, exposure to radioiodine, mainly iodine-131, in childhood was associated with increased risk of thyroid nodules and thyroid cancers in Ukraine, Belarus and the Russian Federation as early as 1991 .

The average dose of thyroid gland in children tends to be high: more than 116,000 children aged 0-7 years were evacuated. The average dose of thyroid gland in 1986 was 1.8 Gy; Epidemiological Study of Young People in the Most Contaminated Areas of Three Countries 0.2-0.8 Gy; The highest dose recorded in Belarus and Ukraine exceeded 10 Gy [6].

In addition to personal health issues, there are also environmental health issues related to nuclear power generation. The plant uses water from local lakes and rivers for cooling. Local water sources are used to dissipate this heat, and excess water used to cool the reactor is usually released back into the waterway at very hot temperatures. Such water can also be contaminated with salt and heavy metals, and these high temperatures and water pollutants can destroy the life of fish and plants in waterways.

There is no doubt that the main drawback of nuclear energy is the possibility of a nuclear accident. Although nuclear power plants are safe and nuclear disasters are not common, once they occur, the consequences can be very serious.

In addition, it is important to know that not all nuclear accidents occur in nuclear power plants. Many applications of nuclear energy use radioactive sources, which can lead to uncontrolled radioactive emissions.

3. DEFINITION OF NUCLEAR ACCIDENT

Researchers define a nuclear accident as an accident that occurs at a nuclear power plant or facility where nuclear technology is used. These accidents may be caused by technical or man-made failures, characterized by the release of radioactive products into the environment in the form of radioactive materials or radiation. A nuclear accident is an event that emits a certain amount of radiation that may endanger public health.

Radiation accidents, from a more technical standpoint, are defined as the loss of control of ionizing radiation sources due to equipment failure, incorrect employee (people) behavior, natural disasters, or other factors that may expose the above-mentioned persons to radiation. Environmental pollution due to established norms or radioactive contamination [2].

What types of nuclear accidents exist?

Different types of nuclear accidents can be classified based on their severity. The International Nuclear Accident Scale (also known as the INES Scale) was created to determine the severity of the accident.

A nuclear accident is, in fact, a type of nuclear mishap. Nuclear accidents are split into two categories based on their severity: nuclear accidents and nuclear accidents. Nuclear and radioactive mishaps are included in this classification. To clarify, a nuclear accident is defined as the failure of a nuclear power plant reactor, whereas a radiation accident is defined as the discharge of a radioactive source into a river. Although the most famous nuclear accidents occurred at nuclear power plants, they may also occur in other centers that use nuclear energy, such as hospitals or research laboratories.

Unexpected Effects of Stopping Nuclear Power Production: Evidence from the Fukushima Daiichi Nuclear Power Plant Accident.

Reducing nuclear energy production is not without costs: electricity prices are rising. In order to meet the demand for electricity, the decline in nuclear energy production was offset by an increase in fossil fuel imports, which increased electricity prices by 38% per cent in some areas. These higher electricity prices lead to a decrease in electricity consumption, especially during the year when heating demand increases.

We then interact with the price of electricity to explore how the price regulates the relationship between temperature and mortality. We found an increase in the impact of extreme cold weather on mortality, suggesting that rising electricity prices led to reduced electricity consumption and increased mortality. Our findings are robust for testing on a variety of specifications. To put these estimates in context, we calculated that higher electricity prices resulted in at least an additional 1,280 deaths between 2011 and 2014. Since our data covers the 21 largest cities in Japan, representing 28% of the total population, the overall impact on the country as a whole is even greater (more than 4,500 deaths in 2011-2014). In contrast, the number of deaths from the Fukushima Daiichi accident is much lower, with an estimated cumulative death toll of 130 from radiation exposure[5].

1. Support emergency response, clinical decision-making and dose assessment after nuclear emergency to long-term follow-up nursing population.

2. Improve the living conditions of the affected population, respond to their needs and involve them in the monitoring plan.

3. To improve the population's estimation of radiation-induced risks, where feasible, for radiation protection and communication with affected populations.

4. EVACUATION AFTER A NUCLEAR ACCIDENT: A CRITICAL REVIEW OF PAST NUCLEAR ACCIDENTS AND RECOMMENDATIONS FOR FUTURE PLANNING

International agencies such as the International Atomic Energy Agency (IAEA) and the International Commission on Radiological Protection (ICRP) have published standards and guidelines for nuclear accident preparedness and response. These principles have been used to construct emergency response plans and address radiation protection, health management, and communication with affected communities. The program is implemented in the event of an accident to give steps to protect the safety of communities in the area of the nuclear power station where the accident happened. The terms "evacuation," "evacuation," and "relocation" come to mind. Emergency protective actions such as evacuation and evacuating are implemented in the hours and days following an accident and continue as long as radioactive material is emitted. If the radiation dose is expected to be relatively low, it is sufficient to shield during the passage of the plume. It is adequate to protect throughout the passage of the plume if the radiation dose is projected to be relatively low. If the expected dose is high (i.e., a reference level or higher) and expected to last for days or weeks, the affected population should be evacuated as soon as possible, preferably before the radionuclide plume reaches their home; if this is not possible, evacuation is required to reduce radiation exposure until the plume passes through and can be evacuated. Temporary relocations, on the other hand, are persons who aim to relocate for an extended length of time (ranging from a few weeks to several years, depending on the situation). This is done to avoid exposure to deposited or suspended radioactive material, or in cases where vital food and water contamination levels are high and alternate food and water is difficult to get.

While there are technical and radiological standards for evacuation, evacuation, and relocation, studies have shown that evacuation and relocation can have significant health repercussions, which should be considered in future catastrophe planning and response. Evacuations at Fukushima, for example, resulted in the tragic and needless deaths of inpatients and residents of care institutions while in transit and shortly after arriving at their destination transportation, support, and facilities for patient and aged care. The risk of evacuation certainly surpasses the possible long-term health advantages of minimizing accidental radiation exposure for these people. Long-term relocation has been shown to cause psychological distress due to loss of home, social relationships, and jobs, difficulties in adapting and fear of radiation-induced illnesses, mental health problems (including depression and suicide), and a negative impact on overall well-being, particularly for vulnerable people such as the elderly.

4.1. Preparedness

Plans for radiation shielding and disaster prevention in the aftermath of prior nuclear disasters.

It has been pointed out that realistic evacuation plans are reasonably achievable by communities and are based on local resources, social context, and geographical factors . Prior to the TMI accident in the United States, Dove County, Pennsylvania, where the TMI Nuclear Power Plant (NPP) is located, developed an emergency response plan that met the requirements of the Pennsylvania Emergency Management Agency in accordance with the requirements of the U.S. Nuclear Regulatory Commission. The plan established emergency evacuation procedures for areas within a 5-

mile (8 km) radius of the reactor However, at the time of the accident, no community in the area had an emergency response plan in place. On March 28, 1979, the reactor cooling system was notified of a failure and recommendations were made for the evacuation of pregnant women and preschoolers living within 5 miles of the plant, and for 76,000 residents living within a 10-mile (16-kilometer) radius to stay indoors. Two days later, contingency plans were in place to expand the evacuation zone to a radius of 10 miles (16 kilometers) and 20 miles (32 kilometers) from the factory; the evacuation plan covered the population from 27,000 within a 5-mile radius to 700,000 within a 20-mile radius. Although nearly 200,000 residents voluntarily evacuated, the plan was not implemented.

The Chernobyl nuclear power plant disaster occurred on April 26, 1986, in the Ukrainian Soviet Socialist Republic; it was the biggest such disaster in history. The evacuation strategy, however, may or may not be included in the contingency plan. In truth, the Chernobyl disaster contingency plan has been executed, but there are still flaws, such as a lack of preparation for a large-scale nuclear disaster (Ministry of Ukraine of Emergencies, 2011).

During prior nuclear disasters, emergency evacuations encountered a variety of issues. During the Chernobyl disaster, inhabitants were evacuated using government-provided buses, trucks, and trains, but they were not given proper information about the event or radiation. Because the most vulnerable are evacuated first, many children are separated from their families and sent to summer camp facilities.

The evacuation challenges of hospitals and elderly homes were obvious following the nuclear disaster. In the case of the TMI disaster, hospitals that want to widen the evacuation zone must arrange their own transportation without the help of the local government or fire service. Furthermore, numerous hospital employees fled for fear of radiation exposure, resulting in a drop in clinical performance in emergency cases needing quick hospital evacuation.

Shelters are simple to set up, but they should not be used for more than two days or for long periods of time. However, following the evacuation order, delivery staff stopped delivering daily essentials in the region because to concerns about radiation exposure. Areas of 20 to 30 kilometers have become isolated. Most residents had left the area willingly by March 15, although hospitals and nursing homes remained open. The asylum order was lifted on 22 April 2011. The extension of asylum orders has led to serious social disruption[4].

4.2. Recovery phase

Residents' emotional health is affected by their perception of radiation exposure. Following the catastrophe, changes in the living environment began to influence not just the evacuees, but also others.

Mental health is the most serious public health issue following the Chernobyl disaster, contributing to disability, physical morbidity, and mortality. In both TMI and Chernobyl, moms of young children who believed their health had not been harmed had considerably greater anxiety, despair, and hostility scores, as well as a lower rating of their health than those who did not believe their health had been harmed.

Aside from TEPCO compensation, Fukushima Prefecture also offers different forms of living security, such as housing assistance. Fukushima Medical University offers phone counseling as part of the Fukushima Health Management Survey (FHMS), and Fukushima Prefecture established the Fukushima Disaster Mental Health Center (FCDMH) to assist evacuees and residents. Preparations have been taken to rescind the evacuation order in this circumstance. Environmental purification and the building of living infrastructure, are among these preparations. Simultaneously, the evacuation municipality undertook a questionnaire poll of citizens' intents and needs for returning home[4].

5. CONCLUSION

Nuclear is a significant kind of energy provided in daily lives. However, people tend to be afraid of the risks. In fact, if nuclear is simply cut off completely, more deaths will be caused due to its economic value. Government can do more to make the best of nuclear. For example, better communication devices, wise arrangements. The risks include substantial safety and security risks, increased threat of accidents, disasters. Furtherore particularly the risks include health problem, physically and mentally. Also during recovery phases, if the citizens were not properly treated, more harm can be caused. This articles stresses two most famous accidents-Chernobyl accident and Fukushima disaster.

REFERENCES

[1] Keynes, S. (2021, June 19). Nuclear Power: Risk Analysis. A warning from scientists. Retrieved 1 January 2022, from https://www.scientistswarning.org/2020/06/04/

[2] Oriol Planas-Industrial Technical Engineer. (2010, 26 March). Encody. Nuclear energy. Retrieved 1 January 2022, from https:// nuclear-energy.net/nuclear accident

[3]What are the effects of nuclear accidents?world nuclear.(n.d.).Retrieved January1,2022,from https://www.world-nuclear.org/nuclear-

essentials/what-are-the-effects-of-nuclear-accidents.aspx

[4] Bus, T., Tanigawa, K. Liutsko,L.(2021). Evacuation after a nuclear accident: a critical review of past nuclear accidents and recommendations for future planning. Environment International, 148,106379. https://doi.org/10.1016/j.envint. 2021.106379

[5] Neidell,M.,Uchida,S. Veronesi,M.(2021). Unintended effects of halting nuclear power production: evidence of the accident at the fukushima daiichi nuclear power plant. Journal of Health Economics, 79,102507. https://doi.org/10.1016/j.Jheleco. 2021.102507

[6]Cléro,E.,Ostroumova,E.,Demoury,C.,Grosche,B.,Kesminiene,A.,Liutsko,L.,Motreff,Y.,Oughton,D.,Pirard,P.,Rogel,A.,Van Nieuwenhuyse,A.,Laurier,D. Cardis,E. (2021). Lessons from Chernobyl and Fukushima on thyroid cancer screening and recommendations for future nuclear accidents. Environment International, 146,106230. https://doi.org/10.1016/j.envint. 2020.106230