A Christian Ethics consideration on Nuclear Energy

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Abstract

Based on ethical, ecological, and economics considerations, the writers conclude that it is not acceptable to consider nuclear energy as part of national's energy mix, especially for developing countries, because of many reasons, including: radiation risks of radioactive waste, the capital-intensive development cost of a NPP which may cause heavy foreign loan to that nation, and also the risks of contamination of water and environment during uranium mining and spent fuel storage.

Because of the above mentioned reasons, Christian people and common people should suggest to their governments to push forward the use of renewable energies especially WWS. For the short term, coal and natural gas can be considered as a temporary alternative.

1. Introduction

As we all know, the world oil reserve is depleting rapidly, and it is predicted to reach an end of oil reserve within few decades, that is why many countries started to think about how to anticipate this coming energy crisis before it takes place, in order to secure the energy supply for those countries.

For many countries, their oil supply largely depends on the oil delivered from foreign countries, especially from Middle East region. If something happens to this region that will stop the oil supply, then the dependant countries will face a severe crisis. That is why many countries begin to contemplate on how to find a way to get out from this kind of oil dependence, and to achieve energy independence.

One of the recent trends in many countries including developing countries in order to achieve energy independence is by introducing nuclear energy into their energy mix for the future. That is why many countries begin to consider nuclear energy seriously for their future energy, and this trend is pioneered by many nuclear experts who promote nuclear as a safe, cheap and clean energy option. See for instance a book by Eerkens, which emphasizes that nuclear option is imperative for USA and other countries.[3]

Nevertheless, one should also remember that nuclear energy is not without its own dangers and risks, for example:

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[3] Eerkens, J.W., The Nuclear Imperative: A Critical Look at the Approaching Energy Crisis (More Physics for Presidents), Second Edition. Dordrecht: Springer Science+Business Media B.V., 2010.

- There is dependence to uranium fuel supply from other (developed countries), because those developed countries own the enrichment facilities.
- Nuclear power plant is capital-intensive, and often it requires foreign loan to finance it. And for developing countries the use of foreign loan will mean that development of nuclear power plant will make a large burden for a developing country's economy.
- There is risk of radiation leak at the nuclear power plant itself which may cause cancer to many people in the nearby area and also there are other harmful effects.[4]
- There is a necessity to take care of radioactive waste for hundreds of thousand years. Up to this time, there is no clear solution on how to reprocess this radioactive waste in order to reduce their very long time of decay period, other than to keep this radioactive waste in underground storage.
- The mining process of uranium requires plenty of water in order to separate uranium from dirt, and it also can induce radiation. This is potentially to intoxicate the environment.
- There is growing protest from many people who don't agree with nuclear power plant (NPP), especially those people who live in the areas nearby of a NPP.[5]

The above mentioned points are some objections against the use of nuclear power, for other reasons the reader is advised to read a report elsewhere.[6] We can also point out that several developed countries including Germany have decided to phase out from nuclear energy in 2011, especially after its government consider the aftermath of nuclear power plant disaster in Fukushima, Japan, in March 2011.[7],[8]

In other words, nuclear energy is a dilemmatic option for energy mix in the future. At one side, it seems that nuclear energy is a promising choice to bring energy independence from oil. But at the other side nuclear energy imposes many risks and dangerous problems that need to be considered seriously. That is why this issue needs an ethical consideration. In this paper, we will discuss this nuclear energy issue from a Christian ethics' perspective.

[4] Elektrizitätswerke Schönau, 100 Good Reasons Against Nuclear Power.
[5] Ramana, M.V., Nuclear Power and the Public, Bulletin of the Atomic Scientists 2011 67:43.
[6] Elektrizitätswerke Schönau, 100 Good Reasons Against Nuclear Power.
[7] Ethics Commission for a Safe Energy Supply, Germany's Energy Transition: A Collective Endeavor for the Future, Berlin, May 2011
[8] Taebi, B., Ethics of Nuclear Power: How to Understand Sustainability in the Nuclear Debate, Nuclear Power - Deployment, Operation and Sustainability, Dr. Pavel Tsvetkov (Ed.), ISBN: 978-953-307-474-0, InTech, 2011, p. 129

2. A summary of different opinions

a. IAEA as the international body that controls the use of nuclear energy all over the world expresses its opinion that the nuclear industry cannot rely only to its safety record to justify its present action and future plans: "*The nuclear industry cannot afford merely to point to a very creditable safety record in justification of its present action and future plans*."[9] Besides, IAEA also emphasizes about the principal perceived technological risks which include several aspects including:[10]
   i. of improper storage of high-level radioactive nuclear wastes;
   ii. of catastrophic accidents, principally to nuclear reactors;
   iii. of the effect of a multiplicity of low-level releases of radioactivity during normal operation, from various parts of the nuclear cycle;
   iv. of possible accidents in fuel reprocessing plants.

b. According to Damveld and Jan van den Berg, the storage of radioactive waste can cause damage in the future. This makes the application of justice principle is difficult: "*Storage of nuclear waste can cause damage in the future. This makes the application of the principles of justice difficult: future generations will carry the burden, but did not benefit from the advantages. Justice means that we are willing to have a responsibility for the consequences of our actions. For nuclear waste, it is a long-term responsibility*."[11] They also state that nuclear energy cannot help to solve the greenhouse effect, and economically nuclear energy is not efficient because the proven amounts of uranium are limited: "*We do not think that nuclear energy can contribute seriously to prevent the greenhouse effect and give some arguments: nuclear power is not totally CO2-free; from the viewpoint of economics it is not an efficient means; the proven amounts of uranium are limited*."[12]

c. According to Taebi, there are two possibilities to use fission nuclear energy, i.e. by using the closed-cycle and the open-cycle. In the closed-cycle, the uranium fuel which has been used is reprocessed in order to produce radioactive waste with shorter decay time, but this reprocessing is relatively expensive. In the open-cycle, the uranium is used only once and then it is put into radioactive waste storage with decay time up to hundreds of thousand years. "*In the open fuel cycle, spent fuel is considered as waste. After irradiation the fuel in the reactor, the spent fuel, will be kept in interim storage on the surface for a couple of decades basically to let it cool down) and it will then be disposed of in deep underground repositories. Since the fuel will be irradiated*

[9] IAEA, Public Acceptance of Nuclear Power - Some Ethical Issues, IAEA BULLETIN-VOL.19, NO.6, p. 49
[10] IAEA, Public Acceptance of Nuclear Power - Some Ethical Issues, IAEA BULLETIN-VOL.19, NO.6, p. 50
[11] Damveld, H., & Jan van den Berg, R., (2000) Nuclear Waste and Nuclear Ethics, p. 6
[12] Damveld, H., & Jan van den Berg, R., (2000) Nuclear Waste and Nuclear Ethics, p. 7

only once, this cycle is referred to as a once-through or an open fuel cycle. The disposed of waste should be isolated from the biosphere for the period that it constitutes a radiation risk; for an open-fuel cycle this is about 200,000 years".[13] These two options are shown in the following diagram:[14]

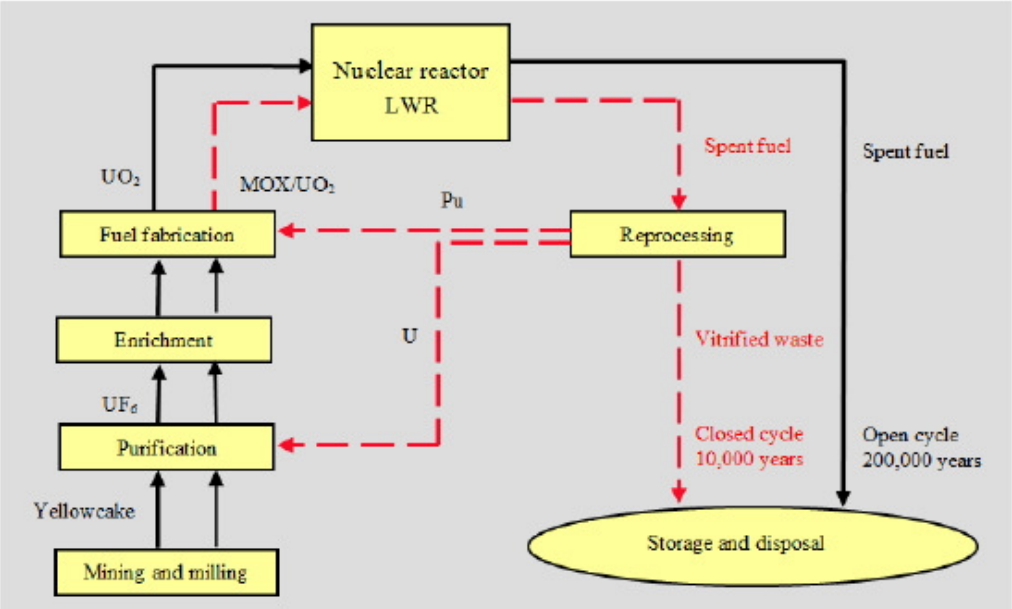

Fig. 1. Schematic representation of open and closed fuel cycles, together with the forecast waste life-times. The black solid lines represent the open fuel cycle and the red dotted lines illustrate the additional steps taken in the closed fuel cycle.

d. According to M.V. Ramana, many opinion polls in several countries show tendency of decreasing public support for the use of nuclear energy. This decreasing public support is stimulated by public perception on the disaster risks, for instance by looking at what happens in Fukushima, Japan. "*Opinion polls show that public support for nuclear power has declined since the Fukushima crisis began, not only in Japan but also in other nations around the world. People oppose nuclear power for a variety of reasons, but the predominant concern is the perception that it is a risky technology.*"[15] "*Even in France, which relies on nuclear power for about three-quarters of its electricity, one poll found that a majority (57 percent) were in favor of abandoning nuclear energy.*"[16]

[13] Taebi, B., Ethics of Nuclear Power: How to Understand Sustainability in the Nuclear Debate, Nuclear Power - Deployment, Operation and Sustainability, Dr. Pavel Tsvetkov (Ed.), ISBN: 978-953-307-474-0, InTech, 2011, p. 138.
[14] Taebi, B., Ethics of Nuclear Power: How to Understand Sustainability in the Nuclear Debate, Nuclear Power - Deployment, Operation and Sustainability, Dr. Pavel Tsvetkov (Ed.), ISBN: 978-953-307-474-0, InTech, 2011, p. 138.
[15] Ramana, M.V., Nuclear Power and the Public, Bulletin of the Atomic Scientists 2011 67:43, p.1
[16] Ramana, M.V., Nuclear Power and the Public, Bulletin of the Atomic Scientists 2011 67:43, p.3

e. An ethical commission in Germany gives recommendation to government to phase-out the nuclear energy within 1 decade: "*The Ethics Commission is of the firm conviction that phasing out the use of nuclear energy is possible within a decade with the measures for an energy transition presented here. … Phase out is necessary and advisable to eliminate in the future the risks associated with nuclear energy in Germany. Phase out is possible because there are less risky alternatives*."[17]

f. Alvin Weinberg wrote a paper in 1971, calling the nuclear energy as a Faustian Bargain: "*The two elements of the Faustian Bargain were both present in the early nuclear enterprise: the temptation of the easy, carefree life it offered (electricity too cheap to be metered), and the bargain it struck (continuous striving was promised). The service electricity provides could be used to pursue progress in all kinds of ways, as long as the obligation was kept to look after the nuclear waste (and, for that matter, other fissionable material as well). If the obligation were shirked, it could, in an extreme scenario, mean the end of humankind*."[18]

g. According to Benjamin Hale: "*The Fukushima Daiichi disaster raises numerous questions about the future of nuclear power*."[19]

h. Another article reports that: "*Nuclear energy often subjects minority and low income groups to disproportionate environmental and health risks when it comes to uranium mining, enrichment, and waste disposal*."[20] "*In the life cycle of the nuclear power process- from extraction of the fuel to the disposal of waste- it is often the most marginalized individuals that are forced to carry the majority of the burdens that this energy source generates*."[21]

3. Biblical and ethical principles

a. Bridger develops a Christian ecology ethics which is based on eschatology. The treatment of ecology has centered almost exclusively on refining and developing a stewardship ethic based on the concept of dominion found in the creation narratives and worked out in Old Testament social legislation.[22] However, there is another approach that is the eschatological approach, which looks into the future that there will be continuation between the new creation and the old creation. The old creation is a prototype of the new

[17] Ethics Commission for a Safe Energy Supply, Germany's Energy Transition: A Collective Endeavor for the Future, Berlin, May 2011, p. 2-3
[18] Spreng, D., Marland, G., & Weinberg, A.M., CO2 capture and storage: Another Faustian Bargain?, *Energy Policy* 35 (2007) 850-854
[19] Hale, B., *Ethics, Policy and Environment* Vol. 14, No. 3, October 2011
[20] NC State University, Nuclear Energy
[21] NC State University, Nuclear Energy
[22] Bridger, F., Ecology and Eschatology: A Neglected Dimension, TYNBUL 41:2 (NA 1990), p.1

creation. "*We are faced, then, with two significantly different approaches. One would ground ecological ethics in the preservation of the created order commanded in the creation narratives and required by the role of vicegerent given to human beings through the bestowal of the imago dei. The other would accept this but interpret it from an eschatological perspective so that the original creation is seen as a prototype of the new creation. Ecological ethics on this account is rooted in the kingdom which is to come: it is anticipatory*."[23] Two passages which embody this line of theological reasoning are Romans 8:18–30 and Colossians 1:15–20. "*The primary argument for ecological responsibility lies in the connection between old and new creation outlined in the previous section. We are called to be stewards of the earth by virtue not simply of our orientation to the Edenic command of the Creator but also because of our orientation to the future. In acting to preserve and enhance the created order we are pointing to the coming rule of God in Christ. What we do ecologically, therefore, acts as a sign: the preservation of creation is no longer an action that has a significance of its own. . .it is rather itself an action pointing towards a goal which has its direction, its meaning and its value in its indication of the hope for the world which God will realize*."[24]

b. Butler develops a Christian ethics viewpoint for nuclear energy. He writes that Christian ethics has a great deal to say about nuclear power: "*From this perspective, Christian ethics has a great deal to say about nuclear power -- its potential to destroy life and to poison the earth. Christians often use the word "stewardship," but most often in a narrow sense, in connection with the practice of tithing one's worldly goods. True Christian stewardship embraces the larger meaning found in the ancient creeds: all of life, "the world and they that dwell therein*.""[25] Besides, it is generally agreed that high-level waste poses risks. "*What of the danger to life and to the earth from high-level radioactive waste? It is generally agreed that high-level waste poses risks. Industry spokespersons say, however, that it can be safely dealt with. Other scientists, including Linus Pauling, predict genetic damage to millions yet unborn. Even a 1 per cent addition to the natural background radiation of the earth, says Dr. Pauling, means thousands of additional defective children born, and thousands more cases of cancer*."[26] Moreover, according to Miller who is an economist, to rely on nuclear fission as primary energy source constitutes economic lunacy: "*The most thoroughgoing and trenchant economic analysis of nuclear power available is to be found in Saunders Miller's book The*

[23] Bridger, F., Ecology and Eschatology: A Neglected Dimension, TYNBUL 41:2 (NA 1990), p.1
[24] Bridger, F., Ecology and Eschatology: A Neglected Dimension, TYNBUL 41:2 (NA 1990), p. 6
[25] Butler, J.G., Christian Ethics and Nuclear Power
[26] Butler, J.G., Christian Ethics and Nuclear Power

Economics of Nuclear and Coal Power (Praeger, 1976). An investment banker, Miller is also an economist whose field is economic risk analysis. After examining nuclear power solely from the perspective of profit and loss, he concludes that "from an economic standpoint alone, to rely upon nuclear fission as the primary source of our stationary energy supplies will constitute economic lunacy on a scale unparalleled in recorded history, and may lead to the economic Waterloo of the United States.""[27]

c. According to Parkins & Haluza-DeLay, a clear problem with the production of nuclear energy is the intergenerational equity that is equity between generations. One of the biggest unsolved problems related to nuclear energy is its radioactive waste. Intergenerational equity makes us questioning whether it is ethical to spread responsibility to take care radioactive waste over hundreds of thousand years, especially if only generations who will come in the next few decades who will benefit from the nuclear energy.[28]

4. The writer's viewpoint

There are several aspects which need to be considered in relation to the use of nuclear energy to generate electricity/energy, for example:

a. From the viewpoint of stewardship ethics, it is not acceptable to contaminate the environment with the radioactive sludge/mud while doing uranium mining or to store radioactive waste in the ground for 200 thousand years. The radioactive waste someday can leak and then it may contaminate the surrounding environment of a large area including water supply and river.

b. Ecology ethics based on eschatology also instructs us to preserve the environment/nature with as small harm as possible, because the old creation will continue to become the new creation. Therefore the use of massive nuclear power is not acceptable, because of the risks of reactor disaster which may be caused by natural accidents like earthquakes or by core melting.

c. From the economic viewpoint, it is also not acceptable to build one or two nuclear power plants (NPP) which require billion of US dollars, which may cause heavy loan to a nation's account. For example, a few years ago the Phillipines built a NPP in Bataan, but after presidential change it has never been used until now. In the meantime, that NPP project creates a huge amount of foreign debt to Phillipines which approaches about 20% of its GDP until now.

[27] Butler, J.G., Christian Ethics and Nuclear Power

[28] Parkins, J.R., & Haluza-DeLay, R., Social and Ethical Considerations of Nuclear Power Development, 2011, p.25

5. Some practical applications

There are several things that public in general and many Christian people can do in order to avoid the negative effects of using fission nuclear energy, for example:

a. To suggest to national government to not to take into consideration nuclear energy in their future's energy mix.
b. To suggest to national government to push forward the use of renewable energies in the national energy mix, for example by promoting WWS (wind, water and sun). If many governments and common people push forward to use of renewable energies, then it is possible that within a few decades WWS can be a solution to replace the depleting oil.[29] A summary of wind energy cost estimate can be found elsewhere.[30] However, there is also a recent report by Adam Smith Institute which suggests that wind energy has limit;[31] this problem needs to be addressed properly.
c. To suggest to national government to give fiscal stimulus like tax cut and other incentives to corporate who pioneer the use of renewable energies and/or do research on renewable energies.
d. To motivate all people in each nation to save oil, and to begin transition to renewable energies (sustainable energy).[32]
e. For a review of some problems with nuclear energy development in Asia, the reader is referred to another report.[33]

6. Concluding remarks

Based on ethical, ecological, and economics considerations, the writers conclude that it is not acceptable to consider nuclear energy as part of national's energy mix, especially for developing countries, because of many reasons, including: radiation risks of radioactive waste, the capital-intensive development cost of a NPP which may cause heavy foreign loan to that nation, and also the risks of contamination of water and environment during uranium mining and spent fuel storage.

Because of the above mentioned reasons, Christian people and common people should suggest to government to push forward the use of renewable energies especially WWS. For the short term, coal and natural gas can be considered as a temporary alternative.

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[29] Jacobson, M.Z., & Delucchi, M.A., Providing all global energy with wind, water, and solar power, Part I, *Energy Policy* 39 (2011) 1154-1169

[30] Lantz, E., Hand, M., & Wiser, R., The past and future cost of wind energy, Conference paper NREL/CP-6A20-54526, August 2012

[31] Korchinski, W., The limits of wind power, Adam Smith Institute, Policy Study 403, February 2013

[32] http://en.wikipedia.org/wiki/Sustainable_energy

[33] Christianto, V., Some problems of nuclear energy development in Asia, February 2013

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