

Towards “Value Judgment” Discussion

–Cases of Nuclear Safety, High-level Radioactive Waste Management and the Role of AESJ–

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The Fukushima Nuclear Accident has shaken many of the assumptions that nuclear experts and society as a whole used to take for granted. Fundamental questions are being raised with respect to the manner in which various matters are arranged (or not arranged as the case may be).

Nuclear experts need to leave aside their assumptions and participate in social debates and the decision-making process while fulfilling their accountability based on their own value judgments and the reasoning behind them. Engaging in the discussion of value judgments actively and sincerely in this way is an essential process for nuclear experts to regain society’s trust.

I. Introduction

The use of nuclear energy has been debated with increasing frequency throughout society since the Fukushima Daiichi Nuclear Power Plant, which is operated by the Tokyo Electric Power Company, suffered an accident (hereinafter referred to as the “Fukushima Nuclear Accident”). The focus of such debates has obviously been on the questions posed directly by the accident, such as the fate of nuclear power, the development of a roadmap for decontamination and decommissioning, the implementation of measures to ensure and enhance the safety of existing facilities, and the adoption of necessary regulatory reforms.

In addition, the heightened public interest in the use of nuclear energy due to the accident has stimulated further discussions of how highly radioactive waste (high-level waste) should be handled. The accident sparked debates within the Atomic Energy Society of Japan (AESJ) regarding their expected roles and responsibilities, which led to the recent amendment of their articles of association.

With their varied natures and different dimensions, debates such as these have not been listed here just on a whim. They are commonly concerned with the question of value judgments, which defy conclusive decisions based exclusively on technical and specialized discussions.

This commentary considers the deep involvement of value judgments, which defy scientific conclusions in a classic sense even in discussions of science and technologies. To this end, the

DOI : 10.15669/fukushimainsights.Vol.3.60

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Originally published in Journal of the Atomic Energy Society of Japan (ISSN 1882-2606), Vol. 55, No. 10, p. 582-586 (2013) in Japanese. (Japanese version accepted: July 30, 2013)

present study focuses on three example issues; namely, nuclear safety, high-level waste disposal, and the expected roles of the AESJ.

II. Value Judgments, and Science and Technologies

Even today, scientific knowledge is commonly believed to offer a unique and optimal solution to the making of judgments and decisions related to science and technologies. This idea seems to be deeply ingrained among experts from the nuclear energy and other fields, politicians, administrators, and citizens throughout society.

However, this assumption cannot be taken for granted in discussions of how society deals with modern science and technologies. This is the basic stance taken in the author's specialist area of science and technology studies.

In almost every discussion of this topic with stakeholders in the nuclear sector, the author cites *Science and Trans-Science*¹⁾, a paper by A. Weinberg, a former long-serving director of the Oak Ridge National Laboratory in the United States. This groundbreaking paper is frequently cited in discussions of trans-science in science and technology studies. These citations typically advocate the incorporation of dialogues with society, civic participation, and other such elements in decision-making by society with respect to modern science and technologies that defy scientific conclusions without taking into consideration the inalienable question of values (politics)²⁾.

There is one more point that we must quickly make before we introduce the concept of trans-science. Importantly, this concept does not argue that scientific knowledge is growing less important or less credible. Nor does it carry any unscientific implications that deny the existence of clear-cut scientific truths. Essentially, Weinberg points out that we cannot make decisions by relying on science alone. This is hardly an agnostic statement like saying "scientific decisions cannot be made" or "nothing can be scientifically explained" to find an easy way out.

With these points in mind, this commentary moves on to address the following core questions. What types of matters cannot be decided solely based on science and in what circumstances? Why are value judgments an inalienable part of decision-making? Why do technical experts have to bear these considerations in mind?

III. Significance of Value Judgments Today

Nonetheless, such discussion would be nothing new among members of the AESJ, so why does the author refer to such a worn-out story here?

Again, this is closely related to the Fukushima Nuclear Accident and the ensuing social debates.

As pointed out earlier, science and values (politics) are inseparable in terms of the humanities and social sciences. This proposition often serves as the basis for encouraging scientists and engineers to consider issues from the perspectives of the humanities and social sciences. However, there is another implication. If we assume that science and values have always been indivisible, any past scientific or expert judgments naturally involved (political) judgments on values as well.

More specifically, it can be reasoned that certain value judgments have inevitably involved

various expert judgments in relation to the design, operation, maintenance, and regulation in the nuclear field.

This fact obviously does not disqualify expert judgments. Expert judgments involving value judgments can be effective as long as they maximize the public interest and do not cause significant inconvenience. It takes time and effort for society as a whole to make judgments through exhaustive discussions. Worse still, it may not be possible to form a consensus and the mistakes resulting from mob rule cannot be excluded. The public trusts experts and is willing to delegate many decisions to them as long as they always make universal value judgments based on their expertise.

Before the Fukushima Nuclear Accident, the relationship that the Japanese public had with nuclear experts and engineers could be described in this way.

However the legitimacy of judgments made by experts on the public's behalf was swept away in the wake of the Fukushima Nuclear Accident. The way that the accident unfolded is not the only reason for this. The loss of confidence owes a great deal to the failure of experts to provide adequate explanations of how and why they made their judgments (i.e., lack of accountability). Furthermore, even people who did not specialize in nuclear energy also found the assumptions that they had hitherto taken for granted when making value judgments were shaken to their very foundations or completely replaced (e.g., the unanticipated M9 earthquake that really happened and subsequent tsunami that exceeded their imagination). Suddenly, accumulated expert judgments lost the legitimacy and assumptions that had been endorsed by the public.

In other words, the fundamental question of why a judgment should (or should not) be made in a particular manner was raised with respect to matters that had been held in little doubt and so required no discussion. Examples of these matters include envisaged earthquakes and tsunamis, plant designs, and relevant standards and plans. Assumptions such as these that served as the basis for validating a certain condition all came under scrutiny.

This is the moment when value judgments became necessary and important again. Experts rely on their scientific knowledge to make judgments about matters such as whether a certain assumption is acceptable, why Design A should be adopted instead of Design B for a specific part, and why the deployment of only two rather than three devices is sufficient. These judgments and choices always involve value judgments, as typified by comparisons of the costs and benefits. In every respect, it became necessary to restructure and explain the relevant logic to gain social approval.

1. Nuclear Safety

(1) **Aporia that new nuclear safety regulations face**

The foremost example of the relevant challenges involved is nuclear safety.

Reviews were commenced based on new standards for regulating the safety of existing nuclear power plants, but these reviews still cannot clearly answer the long-established question of how safe is safe enough.

Some readers may point out that the Nuclear Regulation Authority (NRA) finally established safety goals as a definitive answer to this question. The author does not deny the benefits and importance of safety goals.

The issue here, though, is who answers that question. Strangely, the NRA set these safety goals rather suddenly without any trace of the expert discussions that would usually precede decisions as important as this. It is not even clear whether the safety goals were officially established. In fact, a newspaper article even explained that commissioners could not settle their

differences during the deliberation process³⁾.

If that is the case, the latest safety goals can hardly be considered a substantive answer that has been reached by the whole of society after deep deliberation.

Under these circumstances, no matter how much more rigorous the standards that we establish are and how strictly they are applied, people will continue to ask why that is enough and whether nothing more needs to be done. Regulatory authorities and utility companies must endlessly implement additional safety measures, but there is no guarantee that this will earn the public's trust and confidence. Given this, it seems that the aporia, i.e., too difficult question that cannot be resolved, is emerging.

(2) Inevitable discussions of value judgments and the role of politics

The only way to resolve this aporia is to discuss value judgments with respect to nuclear safety. To begin with, the whole of society must discuss how we determine how safe is safe enough and how we draw specific conclusions. After that, the future of nuclear safety must be discussed with due reference to these conclusions. There is no other way forward.

Starting this task and reaching a consensus will obviously not be easy.

Nonetheless, the way in which discussions should take place and under whose initiative is more or less clear. The essence of politics is to pursue conclusions about certain values through discussion.

It should be noted, however, that politics is being discussed conceptually in this context, with no meaningful reference to particular parties, politicians, ministries, agencies, or other political actors in Japan.

Unfortunately, politics in Japan today seems to have lost touch with its original purpose. Understandably, some readers will assume rather pessimistically or skeptically that the task is impossible or feel that leaving judgments to politics is ill advised.

However, this aporia cannot be overcome by simply resigning ourselves to pessimism over the current state of affairs. For instance, the controversy over the resumption of nuclear power is an extension of the issue of safety standards that require value judgments to be made concerning safety. The government leaders have left all of the substantial decision-making to the NRA supposedly out of respect for their judgments.

Although detailed discussions will have to be left for another occasion due to space limitations, we should note that a safety review by the NRA is classified as a risk assessment, which is distinct from (and not necessarily directly connected to) risk management and comprehensive risk judgments according to conventional understanding. As has already been explained, it is impossible to determine whether a risk assessment result indicates safety or not safety unless an answer is provided to the question of how safe is safe enough.

Decision-making about the procedures, methods, and criteria involved in judging whether something is safe or not safe clearly belongs to the domain of politics.

Without a political process such as this, any deeper discussions about safety will end up being mired in futile controversies, no matter how scientifically and professionally they may be conducted. The prevailing critical public view on nuclear safety will make it even more difficult for public trust to be gained by insisting in discussions that the safety regulations are adequate and that nuclear energy is not dangerous (e.g., whether an active fault runs immediately beneath a reactor core or the premises of a nuclear power plant).

Nuclear experts are not expected to venture too deeply into technical discussions on these issues. Instead, to facilitate the original function of politics, they are expected to present the results of safety assessment and technical options aimed at enhancing safety so that society can make value judgments.

2. Disposal of High-Level Waste

(1) The gap between needs and safety

The Fukushima Nuclear Accident drew the attention of the public to not only the safety of existing nuclear power plants and associated facilities, but also the disposal of high-level waste (hereinafter referred to as “HLW disposal”). This topic is being actively debated throughout society, and feedback from the Science Council of Japan has demanded a radical overhaul of the current approach⁴⁾.

A study conducted by the Nuclear Waste Management Organization of Japan (NUMO) clearly indicates growing interest in HLW disposal and greater perceived needs even though no major changes have been observed with respect to awareness of HLW disposal before and after the nuclear accident⁵⁾. However, this is not necessarily a positive trend. In fact, it would be more reasonable to interpret this change in a negative sense (e.g., concerns over safety) considering the media coverage and the flood of information on radioactive waste (which is, of course, mainly waste from decontamination work and other waste produced in the response to the Fukushima Nuclear Accident).

In fact, the same NUMO study noted a significant year-on-year drop in the perceived level of safety in relation to HLW disposal in the first survey conducted in February 2012 after the accident. Even in the latest survey, which was conducted in February 2013, confidence has not recovered to the same level as that of February 2011. A similar trend can be observed with respect to the share of opinions in favor of HLW disposal. The heightened perceived needs have not been matched by any increased endorsement of safety and disposal.

As you may know, the HLW disposal project has not achieved any notable progress since the enactment of the Designated Radioactive Waste Final Disposal Act (Final Disposal Act) in 2000, the establishment of NUMO, and the call for proposals for candidate repositories.

Countless efforts have been made to address this problem based on the assumption that the fault lies with an inadequate understanding of safety among the public.

(2) HLW disposal as a social undertaking and value judgments

Public interest in the safety of HLW disposal is unmistakably very high.

It seems, however, that those people who voice concerns over the safety of HLW disposal seem to be worried about more than just the objective results of safety assessments.

HLW disposal must envisage a significantly longer time frame compared to many earlier human undertakings. A major issue, then, is how we should deal with the uncertainties of the future. The idea of deep geological disposal was devised and developed to offer a solution to this issue, but most people will be unfamiliar with its basic concept.

In general, one possible approach for addressing a high level of uncertainty is to anticipate various scenarios, prepare necessary measures in advance, and then manage the risks while monitoring and responding to the situation as appropriate. In contrast, deep geological disposal seeks to manage these risks to the extent necessary without active human involvement by making the most of the natural containment capacity of the environment deep underground. The validity of such an approach is hardly intuitive for non-experts.

There are obviously good reasons for experts in deep geological disposal to regard this approach as the best option. For instance, history teaches us that society undergoes too many changes over the time frame envisaged for repositories. There is no guarantee that society in the future will be able, or willing, to maintain the level of management that is expected by today's society.

On reflection, such reasoning also seems to involve value judgments. It must be stressed that this fact in no way invalidates the reasoning. Instead, attention should be paid to the fact

that the choice and conception of deep geological disposal were not driven solely by technological advancements in a narrow sense. This idea has been validated as a social project through various discussions and decisions from political, economic, legal, ethical, and other perspectives. During these processes, value judgments have been made repeatedly to determine which option is desirable.

In other words, deep geological disposal is a social undertaking with a specifically proposed plan that extends far beyond the narrow confines of technologies. This principle will remain the same even if other technologies are discussed, adopted, or combined for the HLW disposal.

Experts in deep geological disposal most likely share this sense of a social undertaking as they continue to engage in sincere discussions to make value judgments. If we examine past reports prepared based on the input of experts from various countries, such as those published by the US National Academy of Science and the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development, we can clearly see how these discussions have been conducted and knowledge has been accumulated^{6, 7)}.

(3) Discussions of value judgments as a social experience

So, why has deep geological disposal not gained social confidence and support as an answer based on years of wisdom? The main reason is that society has never experienced value judgments by getting involved in these discussions.

The foremost shortcoming that can be identified in relation to the abovementioned sincere discussions is the fact that discussions and decisions concerning values have been made only among experts.

To be fair, these experts did not actively try to exclude other actors. However, there must surely be room for improvement in terms of making adequate efforts to engage other actors in a series of dialogues.

In the mid-1990s, for example, prior to the enactment of the Final Disposal Act, the Japan Atomic Energy Commission established a commission for the disposal of high-level waste with the aim of compiling a report based on discussions among experts from different fields and with a diverse range of views. Later, the law was enacted within roughly two and a half months of the bill being submitted. In fact, the interpellation session conducted in each house of the Diet took practically a single day to discuss the bill. It is also known that the bill was passed and enacted by an overwhelming majority in both houses after just nine days of their respective committee's deliberations⁸⁾.

It is certainly possible to explain this by assuming that this robust bill left no room for any objections or questions. However, such scanty deliberation is not desirable given the fact that HLW disposal entails a crucial value judgment for society. Such rough-and-ready decision-making leaves little room for society to share related experiences in jointly discussing HLW disposal until a convincing value judgment can be made. As a result, even this legally accepted disposal project cannot easily gain political and social legitimacy.

Today, in 2013, actors with conflicting views seem to be arguing over what the specific envisaged risks for deep geological disposal are and how countermeasures should be taken (e.g., the seismic impact on the safety of repositories). Their arguments do not necessarily bear in mind the importance of the abovementioned value judgments.

Any discussion of safety is likely to end up in aporia no matter how much the results of risk assessments are expounded unless values are discussed beforehand to provide indicators for risk management. This is in line with the safety regulations for nuclear power plants, as discussed in the previous section.

This folly must be avoided by enabling all of society to re-experience the value judgments

and derive their own answers. To this end, experts in deep geological disposal and other stakeholders should present multiple options after clarifying their reasoning and the answers that they reached with respect to various questions involving value judgments, such as reasons to go ahead with deep geological repositories at this point and how the chosen approach can ensure their safety. An initiative must be adopted to facilitate society-wide discussions and cooperation in order to go beyond the simple communication of judgments made only among experts.

The issues to be addressed through societal discussions and cooperation have also been compiled by a special committee under the AESJ for an interdisciplinary evaluation of the deep geological disposal of radioactive waste. The findings of this committee—to which the author also belongs—are expected to be presented in the final report this autumn.

3. Expected Roles of the AESJ

In closing, it should be noted that the AESJ is also expected to engage in the discussion of value judgments.

The Fukushima Nuclear Accident prompted various discussions within the AESJ on this topic, which also led to the amendment of their articles of association. The Investigation Committee on the Nuclear Accident at the Fukushima Daiichi Nuclear Power Plant has also submitted a report on the desired roles of the AESJ and necessary remedial measures. As of the time of writing, a call for public comments on this report is underway.

Nonetheless, attention must be paid to the possibility of vast differences in the views held by AESJ members regarding the nature of learned societies as well as where their fundamental values lie.

Japan embraced engineering after the Meiji Restoration in a bid to build up its wealth and military power by boosting new industries. This was when engineers in other countries began to organize themselves. For this historical reason, groups of engineers have been regarded as learned societies in Japan⁹⁾.

In countries other than Japan, groups of engineers tend to carry strong echoes of their origins as professional associations during the movement to advance engineers. They seek to enhance the status of engineers and preserve their dignity through social contributions and professional behavior. They often clearly indicate that they are made up of engineers (e.g., the American Society of Mechanical Engineers). In this context, the AESJ could also reflect on how future activities should be conducted and how its members should be involved.

In contrast, engineering societies in Japan have developed as learned societies with a distinctly academic nature since their establishment. In line with this tradition, those who value the academic freedom and autonomy of researchers may voice a sense of discomfort with the idea that the AESJ governs its members, makes collective statements, and takes public actions.

In this context, value judgments must also be discussed with due consideration given to the multiple stances and views that exist with respect to the fundamental question of what a learned society is. Otherwise, members who regard themselves as part of a group of professionals and their more academically oriented peers may end up involved in futile counter-accusations. Unable to understand the intention and significance of proposals from the other camp, they may also end up being preoccupied with differences instead of working to deepen discussions concerning the future roles of the AESJ. In fact, active participation in discussions concerning value judgments is essential not only between experts and society as a whole, but also among experts.

IV. Conclusions

The Fukushima Nuclear Accident has shaken many of the assumptions that nuclear experts and society as a whole used to take for granted. Fundamental questions are being raised with respect to the manner in which all matters are arranged (or not arranged as the case may be).

Nuclear experts need to leave aside their assumptions and participate in social debates and the decision-making process while fulfilling their accountability based on their own value judgments and the reasoning behind them. Engaging in the discussion of value judgments actively and sincerely in this way is an essential process for nuclear experts to regain society's trust.

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