

# Reconsideration of Modern Rationalism and Technological Versatile Principle after FUKUSHIMA

— Focusing on Change in Science Communication in Japan —

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The purpose of this paper is twofold: Firstly, to point out that neither before nor after the Fukushima nuclear accident in March, 2011, has there been much discussion in science cafes about the peaceful use of nuclear power in Japan; especially, the merits and demerits of nuclear power plants focusing on Science and Technology in Society. Secondly, and given the above, using data from my practice, I would like to introduce an effective strategy to foster much needed discussion on the merits and demerits of nuclear energy in the context of STS.

**KEYWORDS**: modern rationalism, technological versatility principle, science communication, the Fukushima nuclear accident

## 1. Introduction

Before the nuclear accident in Fukushima, it was not easy for ordinary citizens and specialists to discuss the pros and cons of nuclear power plants in the context of science communications. Some would contend that the advantages and disadvantages of nuclear power plants are closely tied to the problem of politics and economics. Moreover, any discussion of modern rationalism based on the economic priority of having a regular supply of “cheap, stable power” must consider the technological versatility principle which dictates that safety measures in a nuclear power plant will not be effective until both safety and utility are discussed in the context of technological ethics. In addition, since the nuclear accident, wary and dissatisfied citizens who oppose the government’s decision to reopen some plants have resisted publically by demonstrating because nuclear power plant re-operation has

solely been based on a technological versatility principle supported by economic and political logic.

To enable a breakthrough, I point out the necessity of discussing the merits and demerits of nuclear power plants, not from the viewpoint of politics and economics, but from the view of science communications, followed by elucidation of the effectiveness of this strategy.

## 2. Discussion about nuclear power energy in science cafes before and after FUKUSHIMA

According to website data of the Japan Science and Technology Agency, comparing “the information on science cafes that were held in Japan in January-February of 2008” with “the information on science cafes that were held in Japan in January-February of 2012” has revealed the following<sup>1)</sup>: Firstly, there has been no large scale discussion regarding the merits

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and demerits of the nuclear power energy at science cafes in Japan either before or after the nuclear accident in Fukushima, in March, 2011. Secondly, themes related to romantic aspects of science (like space exploration) and science as a utility (like life sciences and medical treatment) have become popular at science cafes.

Science cafes were held in 31 places in January 2008, in 43 places in February 2008, in 107 places in January 2012 and in 120 places in February 2012. The following six themes were popular in science cafes that were held both in January-February of 2008 and in January-February of 2012. The two percentages, from left to right, refer to the topics discussed in cafes held in January-February of 2008, and in January-February of 2012, respectively.

- 1) Life Sciences, plants, animals, insects and dinosaurs (24.0%, 20.5%)
- 2) Medical treatment and health (12.7%, 7.2%)
- 3) Space (9.2%, 11.6%)
- 4) Food (7.8%, 5.0%)
- 5) Physics theory (4.9%, 5.1%)
- 6) History (6.1%, 3.9%)

There was a marginal rise in interest in “Disasters (except nuclear power plant accidents)” (1.1%, 3.9%), “Nuclear power plant accidents” (0%, 3.8%), “Science-Education” (1.6%, 4.8%), “Risk communication” (0%, 0.5%), “The Environment” (2.2%, 4.6%) and “New energy” (0%, 1.8%) as themes in science cafes have seen an increase since the nuclear accident in March, 2011. In contrast, “Good life (lifestyle modification etc.)” (5.5%, 1.3%) and “Science journalism” (1.6%, 0.5%) decreased. On the other hand, “Geography and weather” (2.7%, 8.4%) witnessed a remarkable increase. Notably, there were a few science cafes that also dealt with ethics in science and technology as a theme in 2008 (0%) and 2012 (0.4%).

I analyzed the current state of science cafes in Japan from these data.

Citizens of Japan experienced a large-scale nuclear accident, which is tantamount to being confronted with a difficult ‘trans-science’ (a

problem that cannot be solved by science alone), although certain questions have arisen that involve the problem. Therefore, “Knowledge related to people’s lives and common sense”, which is different from the “Expertise of scientific-technical professionals and scholars” is needed as well as a forum where professionals and citizens could exchange views. However, in Japan, to citizens, scientists, engineers and administrators science cafes have not been used to critically discuss ethics pertaining to science and technology; rather, these cafes are conceived as venues where people can vent intellectual curiosity through stimulating discourse about such topics as the amenities science and technology can furnish in future. (Regarding science cafes where discussions about “Geography” have increased, these basically have dealt with scientific analysis concerning the mechanisms related to earthquakes.)

### 3. Discussion on nuclear power plants before FUKUSHIMA

#### 3.1. How nuclear power was introduced to Japan

When we consider details about how nuclear power was introduced to Japan, the following two points require clarification. Both of these involve the logic of the economic priority<sup>2)</sup>.

The first point relates to the policy of the National Security Council in the United States.

Back in March of 1954, the crew of a Japanese tuna long liner “The fifth Fukuryu-maru” was exposed to radiation released by the American “Bravo” hydrogen bomb experiment off Bikini in the Marshall Islands. This impacted the introduction of nuclear power to Japan. To offset anticipated criticism from the Soviet Union, due to its glaring nuclear superiority, the Eisenhower administration tried to take the high road by offering peaceful, non-military use of nuclear energy to Japan in indemnification for the

atomic bomb and subsequent radiation damage. Many Japanese politicians greeted America's gesture positively. Yasuhiro Nakasone expressing his view at the time said that, "If Japan doesn't embrace the Atoms-for-peace policy (the Policy of increasing the number of friendly countries using nuclear power technology for peaceful use) soon enough, it risks falling behind the rest of the world".

The Assistant to the Secretary of Defense Erskine's proposal was well received, and consequentially, a committee reviewing the strategy of America's National Security Council recognized that the importance of introducing "Peaceful use of nuclear power" to Japan had increased, and they took full advantage of the bikini accident as the committee began to move toward ratifying the Japan-U.S. Atomic Power Agreement.

The second point is that the leaders of the U.S. industrial world anticipated the Japanese Government could surmise that "The United States would provide Japan with a nuclear reactor in the near future".

The president and the chairman of the company General Dynamics, John Hopkins, proposed a "Nuclear power Marshall Plan" that aimed to construct and maintain nuclear reactors in countries that reported electricity shortages, like a "Marshall Plan" that supported a plan to rebuild the infrastructure in war torn Europe after World War II. Hopkins also remarked at a lecture of the National Association of Manufacturers that this was good for business because, "It proved potentially profitable for American enterprise". In addition, Thomas Murray who was on the Atomic Energy Commission committee, spoke at the annual conference of steel makers labor union, "To wipe out the memory of the slaughter of Hiroshima and Nagasaki, backed by our full cooperation, let us construct a nuclear reactor in Japan". House of Representatives Assembly member Sidney Yates submitted the bill which outlined how, "a nuclear reactor to generate electric power could

be donated to Hiroshima City", although it did not pass.

There were a number of interpretations offered to explain America's decision. One reason for the introduction of nuclear power plants to Japan was based on a rationalistic idea for political economic gain, "To secure a stable and sufficient electric power supply cheaply" and "as a counter measure to criticism from Japan for the Bikini event". In addition, the professionals believed that technological versatility was paramount. Consequently, no effort was made by the policy makers to earnestly discuss issues such as the danger nuclear power posed, because of the technological versatility principle of providing fairly low cost energy in abundance; an endeavor that was primarily funded by America in its effort to help rebuild Japan.

### 3.2. Movement to promote the peaceful use of nuclear power in Hiroshima

Hiroshima, which was the first place to suffer radiation exposure, did not even oppose the proposal for the peaceful use of nuclear power by the United States. The new energy source was met with these words, "We renewed the decision to never engage in nuclear war, but instead embraced the use of nuclear power for the happiness / betterment of mankind and prosperity", being inserted into the "Hiroshima appeal" that was adopted by the 1st World Rally against A & H Bombs, an event that also marked the opening of Hiroshima City Public Hall on August 6, 1955.

Consequentially, the "World Rally against A & H Bombs" established to acknowledge and support the suffering of the radiation victims did not contest the "Nuclear power for peaceful use" fantasy, but instead encouraged it.

It not only strengthened the radiation victims' resolve, but also forced a lot of citizens who took part in the convention countrywide to consider nonproliferation as keenly as any aspiration. The message that it was the only

solution to solve various economic social problems was repeated at the World Rally against A & H Bombs every year until the rally was divided in 1963.

Thus, not only the leaders of the Nonproliferation, but also most of the general population opted not to discuss findings from studies about the “Peaceful use of Nuclear power” either. On the other hand, they maintained their steadfast opposition to nuclear weapon possession and use<sup>3)</sup>.

#### 4. Discussion on the nuclear power plant after FUKUSHIMA

##### 4.1. Logic for re-operation

Prime Minister Noda described the process to review the re-operation of the Ooi nuclear power plant as follows: “Myself and four cabinet ministers are responsible for the decision making in the end. Finally, in consultation with the four cabinet ministers I want to initiate and decide how to engage the re-operation. The time for us to make a decision will arrive soon. After which, I will take all the necessary steps to ensure the plant is completely safe.” He also explained that, “People who are using artificial respirators must be vigilant in the event of a sudden power failure.” Other adverse effects espoused by the Noda government, to legitimize re-operation of the plants include, the risk of bankruptcy to small and medium-sized enterprises who relied on cheaper power sources, the shock to the Japanese economy and ordinary people who can’t help but be affected given that nuclear power plants once provided 30 percent of the power supply<sup>4)</sup>.

Actually, Prime Minister Noda’s stance is the same as those who look forward to the nuclear power plants returning to operation.

People who insist on the nuclear power plants being re-engaged cite four reasons to support the policy: (1) There could be electricity shortages and power failures without the plants as an energy source. (2) The electricity rates

may go up because a lot of oil is needed to operate non-thermal power plants. Also, factories will close and reopen in foreign countries, due to the newly exorbitant cost of domestic production. (3) When the tsunami defense measures end, and given that the cause of the Fukushima nuclear accident was a giant freak tsunami, reopening the nuclear power plants there is justified. (4) There should be a variety of power supply sources. Therefore, it is necessary to return the nuclear power plants to the list of power sources, right away<sup>5)</sup>.

On the other hand, people who oppose the nuclear power plant re-operation doubt the credibility of the insistence that “if they don’t operate again power failures will occur because of an electricity shortage”. As evidence, they cite frequent changes to the figures recorded that estimate a lack of electric power<sup>6)</sup>. For instance, the numerical values on which the Ministry of Economy, Trade and Industry based its assumption of an average intense summer heat in fiscal year 2010 has changed greatly as follows: “There was a 18.4% shortfall” (compared to the estimate on April 13, 2012), “a 16.3% shortfall” (in comparison with information distributed at the ministerial conference on night, April 13), “a 16% shortfall, and even if the electric power flexibility from the other companies were considered, it was still a 15.9% shortfall.”(May 10) and “the reduction decreases up to 5% if flexibility reflected in what other electric power companies are required to save is carried out.”(Numerical values made public at a conference on energy strategy of Osaka City on May 15). In addition, Kansai Electric Power Company tried to use the numerical value of 2010, which was an intensely hot summer, rather than the numerical value of the average for the past five years, when it did not include the effect of power saving, and did not include the charge system according to the peak shift contract and time zone, while estimating the numerical value.

People who oppose the re-opening of a

nuclear power plants can expound on their case easily. For example, there is the potential magnitude of subsequent catastrophes, and the burden that future-generations should bear given the high probability of there being substantial long-term radioactive residue / fallout. They have justifiable misgivings about any assumptions that the extent of the state of emergency incurred at the nuclear power plants in Fukushima will never take us by surprise and overwhelm us again. For instance, when we think about measures for safety in traffic and construction, we consider that accidents actually happen, and whenever an accident happens, we can study it to enhance preventative measures. Conversely, with nuclear plants, we do not have such a luxury as nuclear accidents may cause irreparable damage. The people who promote nuclear power use unrealistically pledge that such a monumental catastrophe as befell Fukushima is likely never to happen again. Such assurances do little to assuage legitimate concerns about the helpless desperation we may again feel when the next natural disaster wreaks havoc on our best, (albeit still woefully feeble defenses) up against the earth's vicissitudes. Essentially, we cannot estimate the level of risk from past accidents, because a still worse case may be yet to come especially given the unpredictable volatility of nuclear accidents<sup>7)</sup>. Therefore, it becomes a foregone conclusion that abolishing nuclear plants is the best strategy to prevent another Fukushima from occurring<sup>7)</sup>.

#### 4.2. Trends in nuclear power plant abolition

Even if the government announces that it will take all measures possible to guarantee safety, the possibility that a "Situation outside of the assumption" could surpass the government's worst-case scenario, especially due to the unhealthy nature of the relationships between public officials and certain industries. In addition, a report that there might be an active fault under the Kansai Electric Power Company's Ooi nuclear power plant that just

began operating again has also exacerbated civic distrust<sup>8)</sup>.

Citizens began campaigning for complete abolition of nuclear power plants in protest to the government's repeated sophistry and placing economic recovery above all else, because a forum had not been provided to discuss the safety objectives. Thus, people not only objected to re-operation of nuclear power plants, despite their safety having been reconfirmed, but also pressured the government to abolish plans to build other nuclear power plants in future and discontinue use of all of the old nuclear power plants.

Beginning in March 2012, citizen volunteers began picketing the Prime Minister's Office every Friday. By July of this year, 150,000 people had joined the protest (The Tokyo Metropolitan Police Department announcements indicated 21,000 people).

Prime Minister Noda's authority allowed the Nuclear and Industrial Safety Agency to make a tincture of provisional safety standards because shortly after closing it, Noda re-opened the Ooi nuclear power plant, of his own volition; failing to heed the sage counsel of professionals and laymen alike. Because no concrete political measures have been implemented to promote the abolition of nuclear power plants, it is natural that civilians might think "the government could try to re-operate many of the idled nuclear power plants, little by little"; thereby, confirming for some, their distrust in government.

#### 5. Reasons why, right or wrong, nuclear power plants have not been adopted as a theme in science cafes in Japan

One of the reasons why, right or wrong, nuclear power plants have not been adopted as a theme in science cafes is simply that the government has endeavored to foster science cafes supporting its own scientific and technological policies.

The notion of a science cafe was introduced

to Japan officially in a government document, “Cafe Scientifique<sup>9)</sup>: a cafe where scientists can discuss with citizens on equal footing”, (2004 version White Paper on Science and Technology), in June, 2004. Moreover, the Ministry of Education, Culture, Sports, Science and Technology held science cafes on three occasions at the National Museum of Emerging Science and Innovation during “Science and Technology Week” from the 18th to the 24th of April in 2005. The Science Council of Japan, Japan Science and Technology Agency and Ministry of Education, Culture, Sports, Science and Technology held science cafes at 21 venues nationwide from Sapporo to Okinawa during “Science and Technology Week”, from the 17th-23rd of April, in 2006.

“Children losing interest in science” had become a societal problem by then and the Ministry of Economy, Trade and Industry began to take counter measures to dispel such an attitude and revive students’ curiosity. For instance, classes were arranged to be taught by company-employed professional scientists, in lieu of teachers, in order to “reinvigorate children’s interest in science and revitalize the attitude that Japan is a technological country”. At the same time, to enhance familiarity with contemporary science and technology, famous enterprises like the “Sony Explorer Science” facility in Daiba and the “NTT Inter-communication Center” in Shinjuku were launched by their respective companies. If ordinary citizens could become familiar with science and technology, then the popularity of science and technology could increase; thereby, justifying expenditure for the facilities<sup>10)</sup>.

Science cafes then spread quickly nationwide, because they were a vehicle of the government’s science and technology policy. However, the government continued to promote science cafes, in cooperation with private enterprise, as they championed the third stage of their Science and Technology Basic Plan (fiscal year 2006 - fiscal year 2010). This mandate aimed to value the progress of science and

technology, and play down or even discourage constructive criticism from citizens and societies. The citizens who oppose science and technology policies that the government is advancing, for instance nuclear plant promotion, these citizens who demand that government-touted behemoths like the Tokyo Electric Power Company, who have placed profit above all else, be held accountable, anticipate difficulty discussing the following themes in science cafes: “What does the research and technology mean to each citizen?” “Who has been influenced by this research and the technology?” “What changes have been experienced by citizens as a result of this research and the technology?” “Why should we trust this research and the technology being proffered?” These pointed questions might not be debatable because they relate too directly to the ethics of foisting science and technology on or delivering it to the nation; a potentially fractious theme indeed.

## 6. To discuss pros and cons of nuclear power plants in the context of the society theory of science and technology

### 6.1. Ethical issues concerning the usefulness of nuclear power plants

The purpose of this paper is to seek a method to discuss the right or wrong / merits and demerits of nuclear power plants and the ethics inherent in the science and technology of nuclear energy, but in as apolitical and bipartisan a climate as is conducive to constructive dialogue. Notably, if other choices or energy alternatives do not exist, the discussion concerning the ethical standpoint of nuclear power becomes meaningless. As indicated by an “Ethics committee for the stable supply of energy” in Germany<sup>11)</sup>, any trust to a parliamentary democracy that discusses only moot questions is endangered by the insistence that “There are no choices”. On the other hand,

choices regarding the energy supply and diversification increase in a society that has the wherewithal to conduct itself responsibly including investigating alternative energy sources; something that begins with simply being able to discuss such notions freely in public forums.

To achieve this, I am attempting to create what is in effect a science and philosophy café or a philosophy of science café.

The roots of philosophy cafes reach back to the custom of people freely discussing topics in cafes and salons in big cities in Europe in the 17<sup>th</sup> and 18<sup>th</sup> centuries. In my opinion, participants in scientific cafes can keep the ideal of “Clarifying ones ideas by reflecting on the opinions of others.” Moreover, “Opinions can change through discussion” and this holds true for those of participants and observers alike. If we refer to the management style of the philosophy café, since December 2010, I have held scientific technological ethics cafes where citizens discussed the topics involving ethics in science and technology with professionals on eight occasions in Tochigi Prefecture, which is adjacent to Fukushima.

Japanese culture doesn't necessarily lend itself to sharing opinions openly in public. Because silence is a virtue in Japanese culture, critical thinking and critical insistence are very difficult for Japanese citizens who haven't received special training on how to state their views in elementary and junior high school. The public tends to think that what professionals espouse about science and technology is unconditionally true. Therefore, a scientific and technological ethics café seeks to make two key points: firstly, we offer “a place” where citizens can readily talk about topics concerning the ethics of scientific and technological advancement, secondly, we encourage citizens not to regard everything that professionals say concerning the ethics of scientific and technological progress as the gospel, but instead to reflect critically and try to constructively interpret, analyze, synthesize and evaluate

information objectively; ever cognizant of the fact that there are seldom direct pat answers to ethical questions involving the business of nuclear power generation.

## 6.2. Outline of scientific and technological ethics cafe

In our science and technology ethics cafe, only the theme concerning science and technology ethics will be regularly discussed in the framework of “Science Cafe”, and such a science cafe is at present only found in Tochigi, according to the science portal of the JST<sup>12)</sup>.

The themes discussed in science E cafe over the course of eight sessions up to June, 2012 were as follows: The 1<sup>st</sup> “Is a distinction between cure and enhancement possible?”, the 2<sup>nd</sup>, “Should a poor quality house, based only on cost performance, be built?”, the 3<sup>rd</sup> “Does the advance in technology contribute to making society more inclusive?”, the 4<sup>th</sup> “How can we reduce the gap between the speculation of each country/companies and the expectations of consumers/ citizens about a smart grid?”, the 5<sup>th</sup> “Is there a scientific basis for any prejudice against drinking (alcohol consumption) by women?”, the 6<sup>th</sup> “Are the safety standards officially announced for radiation really safe? (data and comparison of low line amount radiation exposures)”, the 7<sup>th</sup> “Are the animal experiments are trying to give safety-confirmations for cosmetics' research?”, the 8<sup>th</sup> “Why did major media in Japan neglect the verification of the radioactivity data immediately following government announcements after the nuclear accident?” Participants were 95 people (23 men and 72 females) in total, from as young as junior high school age up to retired seniors. One-third of the time was allotted to the guest lecturer's presentation (a professional in the field related to the theme), and the remaining time devoted to discussion involving all participants, including the lecturer.

### 6.3. Results of a survey and consideration

We can judge the extent to which “we were successfully able to offer a place where citizens could readily talk about topics concerning scientific and technological ethics”. Such was the first aim of this café; namely, to be able to conduct the café, both in response to the comments from the regular participants and results from a questionnaire seeking themes for future cafes. Regarding participants and their rate of attendance, on average there are 15 new participants per café, 15 attended twice or more; notably, those who attended three times (thrice) or more were all women. We deemed the venture successful if the café became a place where people could meet to readily discuss the negative aspects and adverse effects of science and technology, rather than the less controversial more positive notions of science and technology. Ultimately, the café became “the place” where everyone can share their views easily. Over the sessions, participants got to know each other, which deepened people’s trust and made the discussion more fruitful, as well.

Notably, we cannot assert that we achieved the second aim of this café, that is “supporting citizens not to take what professionals say at face value when it concerns scientific technological ethics. Rather, constructively and critically they were able to reflect on the big ideas”. We have analyzed the questions from participants and lecturers (not to other participants) in eight café sessions, to date. As a result, “Question about knowledge” comprised 39 (the entire 71%) of all 55 questions. On the other hand, 16 questions (the entire 29%) were allotted to ponder “Questions to ask regarding the appropriateness of my understanding” were fleshed out over 55 questions. There were overwhelmingly a lot of questions regarding content knowledge. From this, we understand that there are still persons who understand professionals like this: professionals are persons who have a wealth of expertise (beyond

reproach) that civilians may not be privy to, and through the course of imparting it to ordinary citizens, mistakes in logical interpretation and evaluation are seldom made.

### 7. Conclusion

I pointed out that the successful and unsuccessful use of nuclear power energy had never been discussed in the context of STS either before or after the Fukushima nuclear plant disaster. This topic on STS was concretely discussed using the example of the scientific and technological ethics café, which I promote. However, it was and is not easy to change the current state of discussion, because to do so risks denying a political-economic community that values modern rationalism and the technological versatility principle, not to mention Japanese people’s traditional character.

I do not think the current situation involving the controversy, in part, a political battle, regarding a continuum from “re-operate or abolish the plants?” is preferable. I think that I should advance practice with scientific and technological ethics café on a large scale to change Japanese society into one based on responsibilities and the results of one’s educated choice.

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