＜論　　説＞

Japanese management, leadership, and culture in the case of the Fukushima nuclear accident

(This article will be published as a chapter in a book edited by Professor Slawomir Banaszak with me in future.)

Kazunobu Oyama

Abstract

Japanese management and leadership could not prevent the Fukushima nuclear accident. We can find the weak-points of Japanese management and leadership through an investigation of the cause of the accident. First, we must understand the causes of this serious accident correctly. Gaining an accurate understanding of the damage and the causes of this accident is fundamentally important in investigating the function of Japanese management and leadership.

I conclude that Japanese management and leadership cannot control Japanese culture or its social atmosphere. Sometimes, Japanese management is admired by Occidental researchers. However, Japanese leaders are not so brave that they still do not struggle against the overall social atmosphere despite their professional knowledge and skill.

1. Differences between Fukushima and Chernobyl

The INES (International Nuclear and Radiological Event Scale) ranks the severity of damage of nuclear accidents from 1 to 7. The accident of Fukushima was categorized as level 7, as was the Chernobyl accident. The Japanese government in those days, led by Prime Minister Naoto Kan, was concerned with raising the INES level to category 7.

However, some specialists of nuclear criticized the decision of Kan's government. Mark Tran introduces a criticism from Murray Jennex, associate professor at San Diego State University[1].

> "I think raising it to the level of Chernobyl is excessive. It's nowhere near that level. Chernobyl was terrible — it blew and they had no containment and they were stuck. Their [Fukushima] containment has been holding, the only thing that hasn't is the fuel pool that caught fire."

Tran analyzed the difference between the nuclear accidents of Fukushima and Chernobyl, comparing the nuclear crises of Fukushima and Chernobyl through official data. For example, in the case of Chernobyl, the reactor itself exploded while it was still active. However, in the case of Fukushima, the cause of the accident was not the reactor itself but occurred because the plant's cooling system was crippled by a tsunami.

Tran also pointed out the level of radioactive material released in each accident. Whereas the released radioactive material by Fukushima plant's reactors was estimated at more than 10 PBq（petabecquerel）by the Japanese nuclear safety commission, the radioactive material released by the Chernobyl incident was estimated at 5,200 PBq.

Moreover, in the case of Chernobyl, he pointed that 50 emergency rescue workers died from acute radiation syndrome and related illnesses. Furthermore, 4,000 children and adolescents contracted thyroid cancer.

In the case of Fukushima, however, no radiation-linked deaths have been reported and only 21 plant workers have been affected by minor radiation sickness.

James Mahaffey has investigated various atomic accidents since the 1950s.[2] He also investigated the accident of Fukushima and Chernobyl in detail. I would like to summarize the important differences between the Fukushima accident, which happened on March 11, 2011, and the Chernobyl accident, which happened on April 26, 1986, based on the work by Mahaffey and official reports. Although both accidents were categorized as INES level 7 as previously mentioned, there were serious differences.

First, the cause of the accident at Fukushima was a large tsunami 49 feet high after a magnitude 7.2 earthquake（the Tohoku earthquake）. With the earthquake, all the working reactors in Unit 1, 2, and 3 were automatically stopped. Then, emergent isolation condensers and diesel generators started to work, and they cooled down the reactors effectively. About 50 minutes after the earthquake, the large wave inundated the entire plant.

However, the accident at Chernobyl was caused by human error and a violation of procedures during an experimental test. Mahaffey noted the dangerous construction problem of the RBMK reactor at Chernobyl, whereas Fukushima's Mark 1 boiling water reactor had no fundamental construction danger, although it had some weak-points that I will describe later.

Second, the Chernobyl accident was the explosion of a core reactor, and it was working during the accident. Fukushima's reactor buildings in Units 1, 3, and 4 exploded because of hydrogen gas. However, Mahaffey found that the reactors and fuel pools of each unit were intact despite their miserable appearance.

The building in Unit 2 did not explode, even though a reactor in Unit 2 was active, because

of a large hale caused by an explosion in neighboring Unit 1. On the other hand, the building of Unit 4 exploded, even though the reactor in Unit 4 was not active, because an exhaust pipe was shared with Unit 3. Hydrogen gas was discharging to Unit 4 from Unit 3 through the shared exhaust pipe.

Mahaffey commented on a photograph of the accident at Chernobyl : "It is completely destroyed and unrecognizable as a power plant."But about a tragic photograph of the Fukushima accident, he said. "The damage, which appears devastating, is not quite as bad as it looks. The top floors of the reactor buildings, which were built only to keep rain off the refueling equipment, have been blown away, but the solid concrete structures that hold the reactors and the fuel pools are all intact."

Third, the damage from the Chernobyl accident was far more serious than from Fukushima. As previously mentioned, the number of direct fatalities from the accident, and the amount of radioactivity released, were greatly different. Moreover, the areas affected by radiation were also very different. In the Fukushima accident, radiation levels exceeding the annual limits were seen over 60 kilometers to the northwest and 40 kilometers to the south-west, while in the case of Chernobyl, an area up to 500 kilometers away was contaminated according to the United Nations.

2. Neglected advice for TEPCO

Leaders of TEPCO (the Tokyo Electric Power Company) ignored important advice from Bruno Pellaud, who was a vice-general in the secretariat of the International Atomic Energy Agency (IAEA). The advice about Mark-1 (M-1) produced by GE in the United States of America, contained four suggestions made in 1993, 18 years before the accident.[3] The suggestions were as follows :

a) Strengthening of vessels and buildings.

Pellaud pointed a weak-point of the M-1 type of reactor equipment. In this equipment, the reactor is too closely situated in the building. As the space between the reactor and the building is narrow, when hydrogen gas is issued, the buildings explode easily. To protect from such an explosion, the vessels and buildings of each Unit must be strengthened.

b) Diversification of a power source.

Pellaud recommended that an alternative source of power must be established on the top of a hill, to protect against submergence by a large wave from the sea. The Fukushima 1 nuclear power plant is built on the coast, as are all other plants in Japan, to utilize sea

water in the cooling system. In other words, Pellaud was afraid that a large wave might inundate the entire plant.

c）Building a device to combine hydrogen and oxygen to form water, thereby, reducing the pressure of hydrogen gas.

He also recommended that an emission device of oxygen gas be installed in the building of each Unit. As the device can form water by combining with hydrogen gas in the building that is emitted by the cooling system, it will protect the building from a hydrogen explosion.

d）A device for the ventilation of hydrogen gas, removing radioactivity from the gas.

When hydrogen gas is generated rapidly, ventilation is the most useful solution to avoid a hydrogen explosion. As the hydrogen gas is radioactive, a ventilation system that can remove radioactivity is necessary.

If leaders of TEPCO had accepted these suggestions, the serious nuclear accident would never have happened. They would not have needed to accept all the suggestions ; if only b）had be accepted, the accident could have been avoided. I think suggestion b）is the most important and critical.

After close investigation, we can see that the Fukushima nuclear accident was not caused by an accident at the nuclear plant itself, but by a failure in the energy source for the cooling system, which was caused by the tsunami.

Why did the leaders of TEPCO did not accept Pellaud's suggestions ?

Pellaud had an explanation for why TEPCO did not accept his advice : ‘‘The leaders of TEPCO was arrogant as God. They might accept advice from General Electric Company, which produced Mark 1. However, they treated me as outsider completely.”[4]

Certainly, arrogance was the reason they did not respect his opinion. However, we must pay attention to why they were so arrogant. I will therefore take a brief look at the history of Japanese nuclear development.

During World War Ⅱ, Japanese scientists were at the forefront of nuclear technology, but after being defeated in the war in 1945, the General Headquarters of the Supreme Commander for the Allied Powers prohibited Japan from developing nuclear technology. After a recovery of sovereignty in 1952, nuclear development was restarted.

In 1955, the Atomic Energy Fundamental Act was formed ; the Atomic Energy Commission of Japan and the Japan Atomic Energy Research Institute were organized in 1956 ; and the Japan nuclear power generating corporation was founded in 1957. In 1963, the first electric power generated by nuclear energy was established in Tokai-mura village.

In those days, Japanese public opinion sustained nuclear development, notwithstanding the horrible experience of atomic bombing in Hiroshima and Nagasaki in 1945. They thought nuclear power was an important alternative to thermal power or hydro power. Moreover, the severe shortage of gasoline during World War Ⅱ might have boosted social opinion. Furthermore in 1949, Dr. Hideki Yukawa won the first Nobel Prize in Japan, in Physics, in the field of atomic theory, which might also have pushed the public opinion toward nuclear development.

In Europe and US, extreme optimism for nuclear energy was dominant in those days. For example, face powder, face cream, and soap that contained both thorium and radium were introduced in France in 1933, and these products were sold in Europe until the early 1960s.[5] Also in New York, radium powder was sold as fluorescent paint.

Japanese nuclear development accelerated through cooperation with American companies. Cooperation among General Electric, Westinghouse Electric, Hitachi, Mitsubishi heavy industries, and Toshiba greatly contributed to the development of the nuclear industry.

Moreover, two oil crises, in 1973 and 1978, accelerated the nuclear development despite the various troubles of nuclear plants. After the two oil crises, oil prices rose from less than $20 to $110 per barrel. As 99% of Japan's oil is imported, nuclear energy needed to be developed.

In Japan in 1970s, the technology of nuclear plants was improved. Through these improvements, the average rate of operation of nuclear plant rose from 40% - 60% in the 1970s to 70%-80% from the 1980s to the early 2000s. Tetsushi Nakase mentioned that these successful experiences were the cause of the arrogance of Japanese electric companies including TEPCO, and its successful performance created an atmosphere in which no one could criticize the improved nuclear technology[6].

Furthermore, mounting discussions about protection from global warming also promoted the development of nuclear technology in 1990s. In particular, the Kyoto Protocol to the United Nations Framework Convention on Climate Change, pushed the development of nuclear technology, which can reduce CO_2.

On the other hand, after the Three Mile Island accident in 1979, the anti-nuclear movement also accelerated — particularly in the US, where the movement was highly emotional.

The accident at Chernobyl in 1986 gave an impetus to the anti-nuclear movement worldwide. Even in Japan, there is a large anti-nuclear undercurrent connected with the antiwar and anti-nu-

clear weapon movements.

Japanese leaders of nuclear electric companies had to confront the anti-nuclear movement and the necessity for the development of nuclear energy to reduce CO_2. While, it is true that the leaders became arrogant after the successful improvement of nuclear plants, I think these circumstances laid the groundwork for ignoring the advice from Pellaud.

The leaders of nuclear electric companies had to declare the 100% safety of nuclear plants to persuade anti-nuclear leaders to agree with the construction of nuclear plants in each prefecture. Of course, a 100% safe technology will never exist. However, they had to declare the 100% safety in every public hearing. Without the declaration, they could not build nuclear plants in any prefecture because of the anti-nuclear atmosphere in Japan.

The nuclear energy leaders escaped from scientific and logical explanations, so to speak, to deflect emotional agitation. They avoided a challenging negotiation through the scientific approach. Once they declared the 100% safety of the nuclear plants, they must have felt serious difficulty in accepting some devices for improving the plants, because, accepting the improving devices would have proved the imperfect safety of the nuclear plants.

Their arrogance pushed them to ignore Pellaud's advice. A third or even half of the leaders might actually have believed in the 100% safety of their nuclear plants.

3. A concept of a minus-bubble

Through the investigation in the previous section, we can see that the serious Fukushima accident occurred because of the intransigence of the anti-nuclear movement, because, the leaders of Japanese electric companies had to declare the 100% safety to Japanese society to build nuclear plants against the wishes of the anti-nuclear movement, and this declaration prevented them from introducing improving devices, or taking Pellaud's advice.

Illogical, emotional, and hysteric arguments without scientific data or logic introduced a bubble phenomenon that is not linked with the real society. Generally, the concept of a bubble means a jump in prices of stocks, land, or products without a substantial reason. In general, ''bubble" means a plus-bubble, so to speak. First, I will discuss the plus-bubble concept, after which I will explain the concept of the minus-bubble.

The classic case of a plus-bubble with historical data is the "Tulip Bubble" of Holland in the 1630s. Until the beginning of 1630s, tulip bulbs were traded among tulip fanciers and horticulturists. However, after 1630, speculators joined the tulip market because of a rise in the price of tulip bulbs. This new demand by speculators caused the price to rise even further.

Moreover, a new transaction system — futures transactions — inflated the price of the bulbs.

This rising price introduced even more speculators into the tulip market, and the increasing speculation increased the demand for the tulip bulbs, with the price increasing still further.

As a result of the cumulative circulation, in January 1637, Semper Augustus, which was the most popular tulip variety, cost 11,000 guilders — which would be valued at about one million USD today. However, only after four months, the price of tulip bulbs rapidly dropped to 1/20 or 1/100 of that price through the collapse of the bubble.

The next two historical bubbles happened in the 1720s through utilizing a new system, the stock market and national bonds: the "South Sea Bubble" in England, and the "Mississippi Bubble" in France. In these bubbles, the price of stock in the South Sea Company and the Mississippi Company jumped without substantial justification or information. And after a collapse, the stock price fell rapidly.

In the South Sea Bubble, the stock price jumped to £ 1,000 in June 1720 from £ 100 in January 1720, and after the collapse, in 1721, the price dropped to £ 100. In the Mississippi Bubble, the price of stock in the Mississippi Company jumped to 10,000 livres in 1720 from 500 livres in 1719 with no specific information about actual business activities, and after the collapse, it fell to 500 livres in 1721.

We can summarize common causes of bubbles through investigating the reasons for historical bubbles. First, comes the existence of uncertainty. Uncertainty causes unfounded expectations and meaningless hope in an optimistic atmosphere. Actually, the futures transaction and stock market system were too complicated for most speculators in those days. There was also uncertainty surrounding tulip hybridization, in business activities dealing with South Seas trading, or in Mississippi mining — both of which were located too far from Europe for information to be accurate.

Second, comes the participation of a large number of amateurs. Each time there is a bubble, a large number of amateur speculators contributed to both skyrocketing prices and their sharp decline.

Third is the public psychology of keeping abreast of the times. This mental state of the mass of the people causes uniformity and large-scale synchronism.

A "minus-bubble" means shrinkage, withdrawal, decrease, and reduction without well-founded information or reasoning. We can see the minus-bubble in the collapse stage of a plus-bubble. Although the direction of minus-bubble is opposite to the plus-bubble, the causes and mechanisms are absolutely the same.

The minus-bubble after the Fukushima nuclear accident

In 2011, just after the accident of Fukushima nuclear plants, the government of Naoto Kan was apparently in a panic. They explained that the large tsunami was of an exceptional scale and happened only once every hundreds years or so. Despite this explanation, they decided to stop nearly all the nuclear plants in Japan as if another exceptionally large wave were coming the next day. Their explanation of the accident, and certainly their political decision, lacked any scientific grounds.

After the Fukushima accident, most Japanese people become afraid of nuclear power, and supported or agreed with the anti-nuclear movement. They created an anti-nuclear atmosphere, which Japanese leaders cannot control well.

I think this inclination of public opinion is a minus-bubble. I will demonstrate how the anti-nuclear atmosphere after the Fukushima accident in Japan is a minus-bubble through the three elements of minus-bubbles as mentioned above.

First is the existence of uncertainty. There are large uncertainties concerning nuclear energy and radioactivity for the general population, and that lack of knowledge or information stimulates uneasiness, anxiety, fear, and even panic. This emotional state in a large population causes a minus-bubble.

Second is the participation of a large number of amateurs. Including politicians, a large number of amateur commentators in the media — TV, radio, and newspapers — tried to explain the dangers of nuclear energy or the seriousness of the accident at the Fukushima nuclear plant with neither specialized knowledge nor honest investigation. Almost of them denounced nuclear technology in an emotional way.

In fact, after the Fukushima accident, many people bought Geiger counters, and they measured the degree of the radioactivity around their homes. This ludicrous craze proved that the anti -nuclear atmosphere was a minus-bubble.

Furthermore, Japanese government tried to search active-fault lines that are one million years old by digging in the ground at each nuclear plants, at a cost of several billion yen, notwithstanding the fact that the cause of the Fukushima accident had nothing to do with cracks in the ground but with being inundated by a tsunami, as previously mentioned. Such ridiculously formal activities by the government also proved the existence of a minus-bubble and the lack of rational thinking.

The minus-bubble creates as harmful an effect as a plus-bubble, but in the opposite direction. While plus-bubbles leave serious damage through over-investment or over-commitment after the

bubble's collapse, a minus-bubble also leaves serious damage through over-avoidance or an unreasonable withdrawal after the collapse.

4. The characteristics of Japanese leadership and the decision-making process

We see an atmosphere of unreasonable and emotional avoidance of nuclear technology in Japan after the Fukushima accident. In Japanese cultural characteristics, such an atmosphere is inclined to dominate people. Therefore, the mass media usually tries to control the atmosphere.

Japanese leaders seldom debate any theme that is against prevailing opinion. For example, before the Fukushima accident, the leaders of Japanese electric companies rarely discussed the security of nuclear technology with anti-nuclear advocates. The leaders easily declared the 100% safety to the public society to avoid severe scientific debate. They managed to let the counterforce go past without controversy. This is characteristic of Japanese leadership.

However, their easy 100% safety declaration caused them to refrain from further improvement. After the Fukushima accident, the same phenomenon is appearing again. Even today, Japanese leaders, including states-men, the government, and corporate executives, avoid tough debate on the future policy of nuclear energy in Japan with anti-nuclear forces, just as before Fukushima accident. Then, we must realize this Japanese traditional leadership style as a coordinator of conflict has serious limits.

Furthermore, the other serious problem is that some Japanese leaders are inclined to truckle to some dominant public opinions or atmosphere. However, many of these dominant opinions or atmosphere are easily created by mass media. In the days of the Democratic Party government of Noda, after Kan, Minister of Health, Labor and Welfare, Yoko Komiyama decided in October 2011 that the safe level of cesium radioactivity in food was less than 1mSv, even though the international standard safety level is 5mSv.

Also, Minister of the Environment Goshi Hosono, who was a member of Noda's cabinet, had responsibility for the governmental decision to set radioactivity levels for the evacuation zone. He influenced the decision to set the acceptable radioactivity level for returning to an evacuation zone at 1mSv, even though the international standard was 20mSv. In this decision-making process, local governments in Fukushima also had responsibility for the excessively severe standard, because they bowed to the 1mSv standard for the exhaustive cleaning of radio-activity to the national government. The leaders of the local governments in Fukushima also kowtowed to the dominant social opinion or atmosphere.

In sum, these decisions were obviously a panic reaction. This excessively severe 1 mSv standard for removing evacuation zone designation is now hurting the refugees, towns, and villages in

Fukushima. In 2012, more than 160,000 persons took refuge from Fukushima. In 2018, some towns and villages in Fukushima were removed the evacuation zone. However, a total of 2,250 persons who had taken refuge from Fukushima were dead by 2018 through various stressors or the lack of medical services in the refuges, — a phenomenon called "deaths related to the Great East Japan Earthquake". Furthermore, many towns and villages where inhabitants had to abandon for a long time have practically became ruins.[7]

Although the Liberal Democratic Party came to power after the Democratic Party at the end of 2012, no Minister of the Environment has ever tried to restore the level of refuge to 20mSv from 1mSv. As they also bow to the dominant social opinion or anti-nuclear atmosphere or maximum safety precedence, they hesitate to explain, discuss, or debate with the public using science-based knowledge and facts.

Importance of science-based standard

Traditionally, Japanese leadership has the characteristic of coordinating diversity of opinions. But this style of leadership is mainly concerned with the emotional condition of its members, so to speak. Certainly, this leadership style has the merit of keeping emotional harmony in an organization. However, this type of leadership also has the problem of avoiding disputation with others to find the truth or to realize some important objectives. In particular, Japanese leaders are inclined to be submissive to or flatter some dominant opinions to avoid difficult discussions, as I have mentioned. This is a serious fault of Japanese leadership.

In the future, Japanese leaders in any organization must be brave enough to argue with anyone about anything in an attempt to find the truth in the best interest of public welfare. In any discussion or disputation, scientific bases or facts are important. Japanese leaders must utilize science-based data or knowledge to persuade opponents without emotion.

Recently, many incidents of falsification of data by Japanese production companies were reported. For example the Kobe steel company is a famous large company that falsified data on its steel material for more than 40 years. They adopted a special standard that they themselves set for a test of the material products. This standard is called "*tokusai*," an abbreviation of "*tokubetsu saiyo*," which means "special adoption".

Of course, this tokusai standard is lower than the regular standard. However, many client enterprises acknowledge the tokusai standard, and they accepted the products that passed the tokusai standard. What should we learn from this incident? A spirit of compliance to appear to be legitimate is important, evidently. However, I would like to pay attention to two points. First, no accidents have ever been caused by this lower tokusai standard. Second, the client enterprises

agreed with the tokusai standard.

To sum up, the most important problem is whether the regular standard was excessively severe? If the regular standard was too high to produce quality products at suitable costs and within an appropriate period of time, the regular standard cannot be a legitimate standard. We must remember that an excessively severe level for removing the evacuation zone ban is harming both the refugees and the area around Fukushima.

These excessive or ideal standards are often created by excessively dominant opinions or atmospheres with no scientific discussion. They say that Japanese people usually use this stated principle and true intention appropriately. I think the core problem of these type of incidents is the lack of scientific discussion by Japanese leaders. In other words, the lack of bravery of Japanese leaders for tough disputations against powerful opponents is the core problem.

I would like to introduce a case from my university that was concerned with creating a standard, as an example of the Japanese decision-making process.

One day, my university decided that every student must prepare for two hours, and spend two hours in review, for every subject they take. The university's office formally demanded that every professor write this obligation for students in their syllabus.

I argued with a clerk who made this demand of me. I insisted that four hours of preparation and review for each subject that a student took was impossible. No professor should publish such an unrealistic obligation for students in the syllabus. However the clerk insisted that this policy was decided by official committees in our university, guided by the Ministry of Science and Culture.

Then, I explained her what it meant. Most students take about 12 classes a semester. If they must study for four hours for each class, they must study for 48 hours a week in total. It means that every student must study for about seven hours a day, seven days a week. Yet, after classes at the university, students may come back home, eat dinner, and have a bath, before they start their studies at 8pm. — and they must not stop studying until 3am. They must keep this schedule every days. This means that no students'circle activities, no part-time work, and no social activity is possible for any student.

I told the dean of our faculty that this unreasonable policy had to be reconsidered. He accepted my proposition immediately. However, it will take a long time to remove such a nonsensical policy. Furthermore, most of the professors accepted the silly demand by the university as the authorities wished. Therefore, the unrealizable obligation for students will continue to be published on official syllabuses for a long time without anyone actually carrying it out. I think that this type of decision is closely related to the falsification problems of Japanese enterprises.

Through the analysis mentioned above, we can summarize the Japanese leadership style and decision-making approach as follows. First, Japanese leaders usually do not like debating with people over issues. They would like to coordinate conflicting opinions rather than prevail against opposing opinion or persuade an adversary.

Second, leaders are inclined to be submissive to a dominant atmosphere or an authority. Then they wait patiently for the storm of objection to pass. This tolerance is useful to avoid a severe conflict, at least for a while ; in fact, many radical objections in Japan decline or disappear during this tolerant, submissive period.

Third, Japanese leaders are inclined to be concerned with emotional conditions rather than rational or scientific affairs. Of course, this tendency of Japanese leadership is related to the characteristics of Japanese society. Japanese society, thinks that the critical element of leadership is humanity rather than ability

5. How must the Japanese leadership style be changed to overcome the minus-bubble in nuclear energy?

According to the characteristics of Japanese leadership style, although they have merit for avoiding severe conflicts between opponents and realizing appropriate agreements in adequate timing after long negotiation, they also have negatives with their tendency to be swayed by populism or emotionalism with comparative ease.

Then we must remember the causes of bubble phenomena as described in the previous section. Fundamentally, the bubble phenomena are mainly caused by irrational and emotional enthusiasm in the public under the conditions of uncertainty. The illogical, excessive hope and expectation of the majority causes the euphoria of a plus-bubble, while a minus-bubble is caused by the majority's irrational excessive anxiety and fear.

While the plus-bubble always does grave damage and causes serious regret for excessive investment after the collapse, the minus-bubble also does grave damage and causes deep regret for the excessive withdrawing and restriction after the collapse, as I mentioned at the end of Section 3.

I see Japanese public opinion as a factor in the phenomenon of the minus-bubble after the Fukushima accident. In actuality, this minus-bubble phenomenon has expanded to some foreign countries. For example, the German government decided to stop nuclear energy development after the Fukushima accident.

I do not know if the Japanese leadership is effective enough to solve this type of problem as a kind of bubble phenomenon, as Japanese leadership is weak against emotional public opinion,

and the bubble phenomenon is formed by public emotion.

Let us review the problems of creating excessively severe standards for radio-activity by the Democratic Party, the many incidents of falsification of data by Japanese production companies caused by creating excessively high standards of quality, and the creation of excessively stringent study obligations for students at my university.

Why do they create such unrealistic standards? The excessive standard is usually the result of pandering by Japanese leaders to some dominant influence such as public opinion or authority. Particularly, in the case of a dominant influence based on idealism, Japanese leaders are apt to accept any demand by the dominant influence easily.

"As the human security is the most important factor, a severe standard for radio-activity is the best approach", "As higher quality products are the most important factor for customers, a higher quality standard is the best approach", "As training students is the mission of each university and each professor, a higher study standard is the best approach". Because these types of advocacies are based on idealism, any responsible person of any organization feels a difficulty in disputing or opposing them.

Other type of advocacy, such as peace, democracy, equality, and so on, also have an irresistible power for the majority. In general, Japanese leadership is weak in disputing with such kinds of advocacy. Of course, Japanese leaders in any organization sometimes must resist or fight against unreasonable claims. However, even in that case, they usually adopt the Japanese style of leadership without much dispute.

In the case of nuclear policy, the Japanese style of leadership has several fatal weak points. First, this approach takes a long time to persuade an opposing influence. However, as I mentioned in the Section 4, a large number of refugees have been sacrificed during the attempt to reach a consensus on restoring the safe radioactivity level in evacuation zones to 20mSv instead of 1mSv.

Second, the opposing influence will never be persuaded by a long and patient negotiation because of their political conviction against nuclear development in Japan.

The third, an emotional approach to solve the problem of the nuclear accident, will produce a contrary effect. For example, if the government emotionally talked about the large number of sacrificed refugees or the devastated villages in Fukushima where refugees cannot return as a means of promoting the restoration of the radioactivity level in evacuation zones to 20mSv from 1mSv, that appeal will be utilized by the opposing influences to promote anti-nuclear development.

Drastic changes in Japanese leadership will dramatically overcome the minus-bubble

To overcome the minus-bubble, Japanese leadership must become more aggressive in basing its policies on scientific logic against an illogical, emotional atmosphere. We already learned the concept of minus-bubble. It is constructed by unreasonable fears, and uncertainties and anxieties in the majority. Therefore, leaders of any organization must communicate the precise information and explain the logical theory, assisted by specialists.

Of course, the Fukushima accident gave the world a serious shock. In some ways, the Fukushima accident was a more serious shock than Chernobyl even though the Chernobyl accident was far more serious than Fukushima, because of the high credibility of safety from Japanese technology and management.

The panic of the minus-bubble occurred not only in Japan, but also in Germany, which has decided to stop nuclear energy development. However, Germany continues to buy its energy from France ― which is created by French nuclear plants.

Today, France creates about 75% of its energy in nuclear plants. Japan, as with England, cannot buy energy from foreign countries. For any country, nuclear energy is still an important alternative, ranking with thermal power generation and hydroelectric power generation. Renewable energy source such as solar, biomass, wind, geothermal, and kinetic wave energy occupy only a few percent in total.

Moreover, thermal power generation brings about a serious problem of CO_2. Also, in the hydroelectric power generation, dams bring about the problem of encroachment by the sea upon the land. Japanese leaders must create a strategy of nuclear development with a concrete roadmap founded on scientific theory.

Because of the existence of important companies in Japan such as Hitachi, Toshiba, and Mitsubishi, Japanese leaders in politics, government, and energy industries have a responsibility to create the scientific strategy of nuclear development against the emotional and eccentric anti-nuclear movement, for the future generation.

In France, Framatome, which was formerly Areva, has high-level nuclear technology. Therefore, international cooperation between Japan and France will be very important. However, Framatome partially cooperated with China, so I cannot help warning of the danger of cooperation with China.

China is extremely aggressive in its attempt to gain any kinds of hegemony, including energy from nuclear development. Moreover, responsible leaders of every country must be cau-

tioned that the Chinese government has never valued the concept of human rights nor security. We must investigate the surprising incident of the super-express train in China. China stole its super-express technology from Shin-kansen, TGV in France, and express technology in America.

After collecting the various technologies, China declared the start of their *original* super-express train. Soon after it started operation, at 8 : 34 p.m. on July 23, 2011, a serious crush happened — but more importantly is the reaction from the Chinese government. Only five hours after the accident, they stopped searching for survivors, cut the train, and tried to bury it under a railroad bridge.

However, 5 p.m. the next day, a two-year-old girl was found and was saved from the cut train. On the 26th they tried to dig up the train, then they completely buried it on the 27th. The Chinese government announced that 35 passengers were killed and 211 passengers were injured in this accident. This announcement was not at all credible, because of the testimony that nearly 600 passengers rode on that train.

Even though Primier minister Wen Jiabao repeated the importance of finding the cause of the accident and the importance of safety many times at a press conference, we have seen no evidence of a diligent search for the cause of the accident, nor any honesty about improving safety to protect human life, since the hurried cut and burial of the train surely held the key of the cause of the accident.

From this case study, we can foretell what would happen if Chinese nuclear plants are exported to the world. Therefore, Japan and France must continue to cooperate to improve the safety of nuclear energy. Then, Japanese leaders must become braver to argue against emotional dominant opinion with scientific theory.

Bibliography

1. Tran, M. Nuclear crises : How do Fukushima and Chernobyl compare? *The Guardian* April 12. 2011
2. Mahaffey, J. *Atomic Accidents* Pegasus Books New York 2014
3. Pellaud, B Journal of Sankei p.3 June 12. 2011
4. Pellaud, B Interview on a Journal of Sankei p.4 June 12. 2011
5. Mahaffey, J. *Atomic Accidents* Pegasus Books photographs next p.202 New York 2014
6. Nakase, T.『日本電気事業経営史―9 電力体制の時代―』日本経済評論社 2005
7. Aoki, M.『地図から消される街―「3.11 後の言ってはいけない真実」―』講談社新書 2018