

Why I can't give up nuclear power

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Two tragedies and a big mistake

“Over half the buildings along the coast have disappeared, and those that remain are also damaged in some places. Along the coastline many inland locations are still flooded. I couldn't believe that these were Japanese towns. Instead of sandy beaches, the coastline is dotted with pile after pile of rubble. Remains of houses destroyed by the earthquake were carried out to sea by the tsunami and later washed back on shore again. It is likely that among them many—” (from the author's book, “TSUNAMI,” Shueisha Bunko)

In addition to the disaster due to the earthquake and tsunami, the Great East Japan Earthquake two years ago also brought another big disaster: the nuclear accident at the Fukushima Daiichi Nuclear Power Plant. This accident caused radioactive contamination in neighboring towns and cities as well as the tragedy that even now, two years later, many residents cannot return to their own homes. Moreover, reactor decommissioning will reportedly take 40 years.

It also had a significant effect on Japanese energy policy as well as the future of energy worldwide.

The “myth of nuclear safety” crumbled, and the number of operating nuclear reactors in Japan was temporarily reduced to zero, out of over 50.

What led to this state of affairs is that most Japanese people equate nuclear power plants with the Fukushima Daiichi Nuclear Power Plant. This is a big mistake.

Each plant differs according to date of construction, model, manufacturer, and location. One must also take into account the differences between boiling water and pressurized water reactors. If we were talking about cars we would not expect the same degree of safety from the latest domestically-made car and a defective foreign-made car from 40 years ago.

Hamaoka Nuclear Power Plant, which was promptly shut down without any firm basis, was built in 2006, and Oi Nuclear Power Plant was completed in the 1990s. They are reviewing preparations for loss of all power, taking the Fukushima accident into account. Only Fukushima Daiichi actually experienced this kind of severe accident in the Great East Japan Earthquake, and other nuclear power plants are in cold shutdown. Some nuclear plants even became temporary shelters.

Now, majority opinion in Japan wants to reduce dependence on nuclear power.

We made it through last summer as well as this winter with either no nuclear power or with several reactors in operation, and we can probably make it in the future too. The reasoning is that if we expand our use of renewable energy then we will be fine without nuclear power.

A global look: Japan out of seven billion people

What about the rest of the world? There have been calls to reconsider nuclear power in Europe and the U.S., but China plans to build 32 reactors by 2020. India is planning 16 reactors, and Turkey 5. Even the apparently oil-rich Arab countries have plans to construct 10 nuclear reactors.

Moreover, there are plans to expand to over 200 reactors in Asia including China, Vietnam, and Indonesia, and other countries, and worldwide from approximately 430 now to 800 reactors by 2030.

Regardless of trends in Japan, the world is moving toward building nuclear power plants. Why is that?

The world's population has 1.3 billion people in China, 1.1 billion in India, 300 million in the United States, and 240 million in Indonesia. Japan is in 10th place with 130 million people. There are a total of 7 billion people.

Of these, the United States consumes 22% of the world's electricity, China 19%, and Japan 5%. India uses only 4%.

In other words, the United States, with only 5% of the world's population, accounts for 22% of the world's electricity use, and India, with 17% of the population, uses just 4% of the world's electricity.

Most of the people in the world use only an amount of electricity below the global average.

All of the people who live on Earth have as much a right to use electricity as Japan and the U.S., and they actually want to. When it is hot, they want to be cool. When it is cold, they want to be warm. They want to watch television. They want to listen to good music. As humans it is only natural that they should desire such things.

If people in developing countries like China and India want energy just like Japan, the U.S., and Europe, then the energy situation will change significantly every 5 or 10 years. A massive amount of energy will be needed.

Global warming, too, will accelerate more and more in the future. In light of such circumstances, it is not enough simply for Japan to go into panic mode all alone. If we do not think on a global scale then both Japan and the rest of the world will suffer from the resulting failure.

Taking these circumstances into account, nuclear power, with its high energy density and lack of CO2 emissions, turns out to be a technology that is difficult to abandon. However, we are still left with that risk, as well as the problem of accumulating radioactive waste.

The potential of science and technology and the importance of the temporal dimension

Six months after the Great East Japan Earthquake, I went to Kesenuma.

I found street after street reduced to wasteland, and there were heaping piles of rubble everywhere. There were practically no people in sight.

Two years later the vast ruins of the still empty town remained, and restoration was a long way off.

When we had the Great Hanshin Earthquake, Kobe was full of people six months later, and after two years we were restoring the original Kobe as a mere formality.

One of the reasons that recovery and even restoration is not going forward is that they have not decided on a grand design for the disaster site. Either that, or perhaps it is too grand. They are aiming to build a town that will withstand even the next major earthquake and tsunami. There are apparently various measures available such as relocation to higher ground and improving the port, but all of them take time and enormous funds.

But surely we do not need to start worrying right away about a once every 1000 or 600 years disaster. We should first put all our efforts into restoration. Leave the future to the future.

Science and technology are developing exponentially. Progress in the last few decades has been particularly significant.

After 100 years, we will have science, technology, and wisdom that is 100 years more advanced. We should prepare for disaster using the science and technology of that era.

The same can be said of high level radioactive waste.

We should let go of foolish ideas like digging holes hundreds of meters underground and burying the waste and instead build spent nuclear fuel management and storage facilities where we can manage it. Then we can take a fresh look every 100 or 200 years.

After 100 years we may be building storage containers several hundred times safer and more robust those of today. After 200 years we may have developed devices or chemicals that significantly decrease the half-life of radioactive materials. Nuclear reactors the size of a single building which hardly produce any waste may become common. We may also discover a new use for the high level waste that we now struggle to dispose of as garbage. In fact, making discoveries is what progress in science and technology is all about.

We can also expect new technological innovation in nuclear power plants themselves.

Even now I hear that some companies have plans to build 10,000-kilowatt small nuclear reactors that can be operated for 30 years without refueling. These sodium-cooled fast reactors automatically shutdown and undergo heat removal without human intervention, and they have safe designs that make use of natural phenomena. Even in the unlikely event of an accident, I hear the effects of these small reactors are limited to a radius of 20 meters.

Development of the new traveling-wave reactor (TWR) is also making progress. This next generation reactor, which uses depleted uranium as fuel, can operate for up to 100 years without refueling.

With further enhancement of fool-proofing and fail-safes it will be possible to build safer nuclear power plants.

If such technology becomes a reality then the revival of nuclear power in Japan can also come to fruition.

What is important is that the science and technology for that future is not prevented from developing, and moreover, that we occasionally stop and reexamine the past and present and communicate this great tragedy in the time to come. That way people in the future can use the science, technology, and wisdom of the future to handle the rest.

It is said the Earth's population will reach 10 billion at the end of this century. We must explore a variety of energy sources so that those people will also live affluent, convenient lives.

Japan's responsibility and duty: Become a center for nuclear power

I mentioned that apart from Japan, the world is moving toward constructing nuclear power plants.

In fact, I was writing a book before the March 11th disaster. It is called "Genpatsu (nuclear power) NEXT." It says that the things Japan can be most proud of in this world are large-scale infrastructure like the Shinkansen (bullet trains) and water treatment facilities, along with nuclear power plants. In short, this means making these into the three pillars of our exports. At the time, global trends had been shifting based on the assumption that developing countries would build nuclear power plants.

Until just two years ago, I believed that Japan's nuclear power plant technology rivaled that of France and was the top of the line globally. I believed that we should export those safe, efficient nuclear power plants to the world. The leading exporters of nuclear power plants in the world today are Russia and South Korea. The fact that Russian-made and South Korean-made nuclear power plants are being built around the world is in some ways very frightening. That being the case, I felt that exporting nuclear power plants utilizing Japan's superior technology would be to the benefit not only of Japan but of the world as a whole.

But after the disaster of March 11th, Japan was engulfed in the movement to abandon nuclear power plants.

Yet, Japan's role with respect to nuclear power may have become even larger than ever before.

First, we urgently need to set up a national accident control center, starting in Fukushima. Right now, in order to gather data related to nuclear accidents, we must access databases from a variety of research institutions and universities, as well as corporations. The data and figures to be obtained are varied as well. Even in national announcements the various figures have undergone frequent changes. Under these circumstances the people do not know what to believe, which only leads to more distrust.

If we unify information distribution and seek out necessary information at that center, we will have something we can rely on for accuracy. We should create an organization in the Fukushima area that can provide the best possible advice, including with respect to decontamination and decommissioning. We must tackle this problem with the collected wisdom not only of Japan but of the whole world.

Japan has a duty, and a mission, to communicate this great tragedy fully and accurately to the world and to the future.

Next we should establish global standards for the safety of the nuclear power plants being built around the world. The horror of nuclear accidents reaches across national borders. I hope that Japan, having caused such an irreparable accident, will advocate and implement such standards.

At the same time it is important to train engineers specializing in nuclear power. I hear that there has been a sharp decrease in students specializing in nuclear power since the accident. We will need more and more talented people in the future, including for decommissioning.

In a sense, energy is one solution to a system of equations. Various elements such as economics, industry, people's lives, the global environment, resources, and politics are intricately intertwined. The system of equations has these elements as its solutions. If one coefficient in those equations is changed, it will have an effect on all the solutions. We need to properly modify those effects and come up with a solution.

I want Japan to be the country that the whole world looks to. Thus, we need to find better solutions while keeping in mind that we are 130 million out of 7 billion people.

(Published March 11,2013)