

THE NEXT 25 YEARS --- THE FIRST QUATER OF THE CENTURY FOR ENVIRONMENT

Atsuyuki Suzuki
Tokyo University
(JAPAN)

First of all, I would like to express our sincere appreciation, too, for the 25th anniversary of WM Conference, Tucson, Arizona, which is really a fantastic city as well as the most exotic among US cities. I particularly appreciate Profs. Roy Post and Morton Wacks for their long-lasting leaderships to have the conference every year without any disruption, which are tremendous. The WM conference has now become an annual big event not only for the US experts of nuclear waste management but also for the worldwide nuclear community. Without Roy and Morton and their colleague's great teamwork, it would not have become such a high-quality international assembly. I am very much pleased and honored to give a talk on such a monumental occasion.

What I am going to talk is somewhat specific ; being related to radioactive waste management, what we should do for the next 25 years which are the first quarter of the century to come. It seems to me most of the audience agree that the next century can be called "environmental century", or "the century for protecting environments, regionally, nationally and globally." Then, what is obvious, I think, is that the importance of management of radioactive waste in general will be increasing, whatsoever happens. In my view, this suggests a great deal of things which are by far more than ordinarily conceived. First, the environmental century does never indicate that a more healthy environment will come to pass automatically in the next century. But, rather, getting worse seems more likely than getting better. The reality is, we need to implement sober, prudent and sagacious strategies which are actually effective for environmental protection. And, the nuclear energy will have to play a central role in those strategies. This is particularly true in developing economies like in Asia, where large portion of world population are living, and let me touch upon a little more about it, first.

The second thing I'd like to emphasize upon at this talk is what about the nuclear energy in advanced economies. The growth rate of energy demand in those areas is relatively low and because of that, the craving for nuclear energy looks fading away. In long-term perspectives, however, there is the increasing demand for nuclear energy in advanced economies as well. A question is how to convince the public of such need. Let me take the opportunity of giving my personal view on that as the second subject. And then, I'll talk about another aspect which is also an important issue. That is a question of how to obtain the public support more globally ; global means twofold. It has two-dimensions ; space and time. That means, common to both advanced and developing economies, and intergenerations, not only for the current generation but rather future generations. This indicates, I think, that the use of nuclear energy should show somewhat absolute value. Oil or petroleum, for instance, why its use has been and will probably continue to be popular globally, despite the recognition that it is not necessarily the best either environmentally or economically ? In my view, the reason is that the benefit or advantage associated with the use of oil is visible and easy to understand. Whether or not we will be able to deal with the use of nuclear energy as such ? This is a key question we should address. I am glad to give a very personal view on that lastly.

Now, let me start with a view on developing economies. The population in Asia, particularly among its still-developing economies, is expected to continue increasing rapidly into the next century. Additionally, although now suffering from the effects of the year-old currency crisis, the Asian economy harbors within it, a latent potential that makes it possible to anticipate a return to growth. With growth will come significant increases in demand for energy, particularly those extracted from fossil fuels, and concerns that the area economies will come to depend on energy resources from outside the region to an even greater extent. To sustain the economic development requires a stable supply of energy. This, however, runs somewhat contrary to the need to address the environmental issues of global warming and acid rain. For instance, each year China consumes a monumental volume of coal to produce the equivalent of 1.5 times the annual gross energy consumption of Japan. This creates a tremendous burden in terms of atmospheric pollution globally and the problem has grown more serious from year to year. Thus, it is no exaggeration to say that the outcomes of the world energy issues and global environmental issues depend on what developing economies will do in the future. In particular, many things hinge on how the Asian energy

situation will change. If nuclear power provides a solution to the universal energy and environmental issues, the result would rely on whether or not Asian countries make sound and smooth progress in their nuclear power projects.

It goes without saying that nuclear power in those economies must be safe, and at the same time fulfill the safeguards of non-proliferation while being economically more attractive than any other alternatives. A most appropriate way to use nuclear power, which fulfills all three requirements, I believe, is more internationally collaborative in the field of nuclear fuel cycle program. Public acceptance is one of the keys for furthering nuclear development. Especially many people expressed serious concerns about nuclear spent fuel and radioactive waste management aspects, and future nuclear development largely depends on how we could resolve the concerns.

As long as nuclear power is a source of energy producing electricity, we cannot ignore the issue associated with the management of spent fuel. Obviously, the choice of whether such fuel is recycled or simply disposed of lies with each nation. But, we must also recognize that either choice requires ourselves to build facilities that will allow the interim storage of the fuel. Since spent fuel can effectively be converted into energy resources when necessary, one of the proper functions of such facilities is to store spent fuel for future uses and thereby we can keep the option open. This is an area that is worth while exploring more extensive international collaboration in Asian countries. Appropriate international regulations govern the handling of radioactive wastes generated from nuclear power production. The wastes must be disposed of safely by the countries in which such production facilities are located, under the principle that the primary responsibility for such wastes lies with them. In the future, however, a global solution might be a good idea, because technologies for safe disposal are already available and wastes can be managed jointly by several nations by taking advantage of each nation's technological capabilities, while some countries are geologically handicapped. Solving the problem of managing nuclear wastes among different countries becomes an option providing more flexible and robust programs of nuclear power in developing economies.

Today, many of advanced economies depend on nuclear energy for significant contribution of their electric power generations. In France, nearly 80% of its total electricity is now provided by nuclear energy. In Japan, nearly 40%. Even in the US, where no new nuclear plants have been constructed for many years, 20% of its total electricity is still now generated from nuclear power stations. These numbers are not small but significant. Globally, about 400 nuclear power plants are now being operated providing 7% of total world energy, which corresponds to approximately 600 to 700 million tons of annual oil savings. This is enormous. However, the situation goes changing. In the US, 100 nuclear power plants are now operated. But they are expected to be decommissioned sooner or later. Obviously, one of the most crucial issues with the nuclear industry in advanced economies is, therefore, the life-time extension of their power plants. Japan has a plan to extend the life up to 60 years instead of 30 to 40 years. This certainly makes sense when we look at nuclear energy's significant role in the daily life of the public people taking place in many countries. Notwithstanding the high level of contribution, however, in recent years, the governments in developed countries often have found it necessary to make special arrangements or actions concerning the nuclear program. Sometimes, referendum is necessary like in Sweden, political agreement is especially required with the coalition cabinet like in France and Germany, and special tactical compromise is arranged between the central and local governments like in Japan. These facts in themselves betoken the highly complicated and difficult situations which are associated with nuclear power program in advanced nations. But, why?

My observation is rather simple. Because the energy demands in those countries have not increased as much as they used to be. When the growth rate of demand falls down, there are less economic incentives for industries to invest new capital-intensive facilities like nuclear power plants. This seems true not only for industries but for the public as well. Public people usually have their own judgments, either consciously or unconsciously, concerning social trends surrounding their circumstances. It might be quite natural that they feel why more energy supply is necessary? Why more nuclear energy, when the energy demand growth is not as much as in the past? It seems that the current energy situation has made more difficult people's understanding about the need of having more nuclear energy. This view is also valid in case of recycle use of plutonium in light-water reactors. Insofar as the Pu-recycling plan aims to achieve

significant savings in uranium, there are no evident reasons for opposing or halting the plan. However, some countries have opted against the recycling in favor of the once-through approach. The policy of the United States is particularly interesting in this regard. While the United States did pursue a Pu-recycling approach during the 1960s, all plans were abandoned in the 1970s when the construction of new nuclear power plants came to a stop and the operation and construction of reprocessing plants were terminated. To be short, there seem two reasons for the American choice. First, the United States is rich in energy resources and domestic supplies of coal and natural gas can be utilized to operate thermal power plants, and thus the nation's energy security is not compromised by the decision whether or not it should raise its dependence on nuclear power. Second, nuclear power generation has proven to be more expensive than conventional thermal generation.

The economic factor is certainly of particular importance. The Japanese and European power industries have in recent years become increasingly sensitive to cost considerations and the situation in United States is no longer particularly unique in this respect. As seen in the ongoing programs for deregulation and its efforts to raise its level of international competitiveness, the Japanese power industry shows keen interest in improving its economic efficiency. In considering the next generation of nuclear power, the highest priority should be placed upon the economy relative to other alternatives. However, the American style of emphasizing cost above other considerations is not without its drawbacks. One of the problems is that it is difficult for the industry to become actively engaged in environmental protection. An easy-to-understand example concerns the sulfur dioxide emissions of thermal power plants. Measured in terms of the volume of emissions per kilowatt hour of power generation, emission levels in the United States are still tens of times higher than in Japan. This is because desulfurization is costly and the power companies simply cannot afford to install the high performance equipment. What is a challenge in the next century is how to comprise between to be more cost-conscious and to be more environmentally friendly. This is largely related to the question: to what extent the recycling options are actually employed. In any case, there is no choice but to dispose of highly radioactive wastes in deep underground repositories. Secure underground facilities will be needed whether a country opts for the once-through approach or whether it decides to invest in reprocessing. This suggests we need more intensive international cooperation in this field as well between advanced nations, regardless of the difference in their own backend nuclear fuel cycle policies. Recently, Japanese government made a cost estimate, albeit very rough, on geological repository of high-level radioactive waste, equivalent to 40 thousand tons of spent fuel. In view of the geologically handicapped nature of our country, the cost was estimated to be nearly 25 billion dollars, assuming the current exchange rate between dollar and yen. Even though it corresponds to approximately only 1 mill/kWh, as it does in the US, more attention will have to be paid to such immense amount of cost, because as I mentioned above, the central issue with nuclear industries in advanced economies is to take every efforts to make the nuclear energy economically more attractive to a greatest extent. There seems an indication that we need more collaborative works between different nations to jointly develop a more economical way of final disposal of highly radioactive waste.

Finally, let me add a few words on another global issue ; environmentalism is a sexy word and has been well-received worldwide. In most cases, however, it seems anti-nuclear. This is just the opposite of the fact that nuclear energy is actually playing a significant role for protecting environment. We must dissolve this frozen misperception, because, otherwise, it seems difficult to expand the world nuclear program smoothly in the next century. This is a real problem we must challenge during the first quarter of the century to come. In other words, what we need now is to have more public support globally about the usefulness of nuclear energy or nuclear fuel cycle technology. Now we are living at the post-cold war age ; we are enjoying the post-cold war era. However, we still have more to do. That is the nuclear disarmament, which most people in the world are willing to support. And if we can actually demonstrate the usefulness of nuclear technology so that it may certainly be useful for stimulating the nuclear disarmament to take a step forward as well as producing safe, secure and peaceful energy, then we will probably have more positive, stronger and broader supports from the global public. So, let me propose here, we will start an action plan concerning a very specific project in that way, which is to be called the Global Peace Project. The project should be aimed to give a very clearcut and decisive message to the public in the world that the nuclear industry may help building the global peace more firmly and long-lastingly.

There exist a couple of interesting areas which are worth while to tackle. They are the disposition of surplus W-Pu and the environmental restorations in ex-nuclear complexes. Surplus W-Pu and a pile of wastes contaminated at ex-nuclear military bases are a sort of precipitation of the past nuclear technology, having thrown a long shadow still upon the current nuclear industries. It seems very likely that we will be able to change the public's emotional impression, if we actually prove the fact that the nuclear peaceful use technologies can be certainly of great help for the disposition of surplus W-Pu and the environmental restorations of ex-nuclear sites which have been heavily contaminated. Again, we must have more active and more collaborative international cooperation, in particular in Russia. In the US, the programs are ongoing or ready to start on its own. In Russia, however, unless international financial supports are provided, no progress would be expected. Fortunately, almost all the technologies required there have been already developed for peaceful purposes and are now available. A question is how to make utilization of them. The time has come to take an immediate action jointly by countries who can afford to participate. There have been a number of interesting proposals concerning international collaborations on getting rid of Russian excess W-Pu. An important point is that we give the global public the clearcut message that those collaborations are definitely dedicated to our common goal, nuclear disarmament and global peace as well as environmental protections.

Now, concluding remarks. What I emphasized upon was the eagerness for more intensive and extensive international cooperation which should be considered in the context of globalization. That means, toward the next century, we have a sort of global cry: environmental protection and nuclear disarmament. The best way given for the next generation of nuclear energy is to demonstrate the fact that the use of nuclear energy is certainly fruitful in improving the situation. To have more flexible and robust nature of backend fuel cycle program is also of great importance for the next generation of nuclear energy, because the current way to use nuclear energy looks too simple, either direct disposal or reprocessing, for instance. It goes without saying that whichever it may be, we have to resolve a problem with final disposal of highly radioactive wastes and hence, more active international joint collaboration might be extremely helpful to come up with a solution in each nation. What we should pay more attention to is global solutions as well as each nation's own indigenous endeavor. The nuclear issue is now totally internationalized and, as is observed in many other industries, the nuclear industries would become more promising with closer partnerships between nations worldwide.