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Seeking Way to Advance Use of Nuclear Energy in 1990s; Global Env'tl Preservation and Increasing Energy Demand as Background

In 1990, following the drastic political reforms in Eastern European countries, it is considered that the preservation of the global environment from carbon dioxide, etc. and the energy issue will become a focus of debate world wide. The need for nuclear energy is expected to increase from the view-point of preservation of the environment and fossile fuel resources, although the people's uneasiness

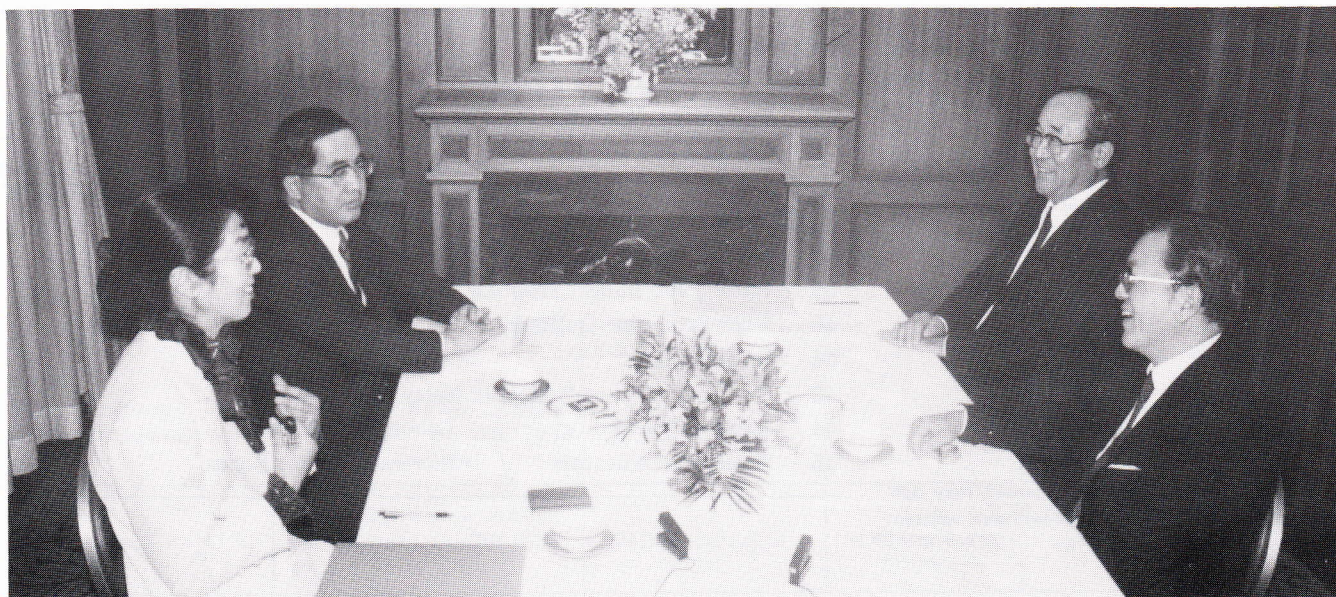
about nuclear power has increased since the Chernobyl accident. Under the mixed feelings of expectation and uneasiness, what is the direction nuclear energy problems are taking? At the beginning of the year *Atoms in Japan* carried out a new year interview, looking to the 1990s with participation of three distinguished guests and the Editor.

Guests

Mr. Tetsuya ENDO	Ambassador Extraordinary and Plenipotentiary to the Permanent Mission of Japan to the International Organizations in Vienna
Ms. Takeko YANASE	Journalist
Mr. Susumu YODA	Executive Vice President, Tokyo Electric Power Company

Moderator

Mr. Kazuhisa MORI	Editor of ATOMS IN JAPAN Executive Managing Director, Japan Atomic Industrial Forum, Inc.
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New year interview: from left to right, Yanase, Endo, Yoda, and Mori.

Mori: Thank you for taking part in this discussion. Let me introduce you to our readers.

Mr. Endo, a Foreign Ministry official well informed on the international, scientific and technological affairs of nuclear energy, was Japan's consul-general in Honolulu before being appointed as Director General for Scientific and Technological Affairs, the ministry's highest position in the field of science and technology. Now he has been appointed Ambassador Extraordinary and Plenipotentiary to the Permanent Mission of Japan to the International Organizations in Vienna. He will also serve for one year as Chairman of the Board of Governors of the International Atomic Energy Agency.

Mr. Yoda is Executive Vice-President of Tokyo Electric Power Co. The planning and international affairs relating to nuclear energy are under his supervision. He is also chairman of a new committee for the nuclear vision of the Federation of Electric Power Companies.

Ms. Yanase is active as a TV and radio M.C. and interviewer. Last year she had the most difficult tasks in the JAIF Annual Conference, presiding over the session on public acceptance of nuclear energy. She is invited to express her views on energy and nuclear problems.

At the beginning of the 1990s, we would like to discuss immediate problems in the development of nuclear energy. To begin with, we must bring a critical mind to the demand for energy, which is growing more vigorously than ever and expanding electricity consumption. We must also look at the unceasing antinuclear movement, which has continued from the year before last. Further, we must consider global environmental issues arising from carbon dioxide. These three points are having an influence on energy and nuclear power from various angles. In addition, movements for democracy in Eastern Europe have set problems spreading like wildfire. It might be advisable to begin our discussion with questions as to what implications these problems will have for

energy and nuclear power in the 1990s. You are all expected to speak unre-

servedly from your individual positions.

Indications are that a new period of worldwide economic upswing will begin in the '90s

Endo: The three points Mr. Mori has mentioned are important in any attempt to look back on 1989 and predict the future through 1990 into the ensuing decade.



Endo

First, electricity demands are growing faster than had been expected and are likely to continue their upswing. Second, environmental issues have come up since the mid-eighties in particular, as one of the most urgent world problems to be resolved. Third, antinuclear movements have arisen not only in Japan and Europe but in other countries as well.

Leaving till later the questions about the growth in electricity demand and environmental issues, let me take up the worldwide movement against nuclear energy, which I believe has been accelerated since the Chernobyl accident, which actually stimulated it.

Another remarkable thing is the recent trend toward political freedom in Eastern Europe. Such trends are emerging not only in Eastern Europe but in South Korea and other countries, too. It should be noted that some Eastern European countries, though not many, already have nuclear power. Among the major coun-

tries that do not have it is Poland. They want to build a nuclear power plant in Poland. But Polish nuclear representatives at IAEA say it is no easy task. If the successfully movement toward political freedom permits people to have their say, they will also move against nuclear energy in an attempt that otherwise would have nothing to do with it. The Polish representatives say an antinuclear movement is emerging in their country.

Korean nuclear initiators in their time, whether faced with opposition or not, have at least not let it come out into the open. The Korean antinuclear movement first arose in 1986 and gathered strength in 1988. That is because it was timed, either in 1986 or 1988, to coincide with a political democracy movement in South Korea.

By the same reasoning, it might be advisable to anticipate that a similar movement, whether strong or not, will follow the recent developments in Eastern Europe. That is on one side and environmental issues on the other. I believe nuclear power is the cleanest and the most reliable of all predictable energy sources. The question for the 1990s seems to be how the two opposing questions can be brought into balance with each other.

Yoda: The ambassador is quite right in assuming that 1989, the last year of the 1980s decade, is the beginning of one of the most turbulent periods in history. A few months before the socialist system suddenly went bankrupt in the Communist bloc, few could have foreseen that it would arouse a huge wave of democracy and open up a turbulent era for Eastern European countries. This says volumes for the magnitude of new developments in the world which sometimes appear amplified when they occur at this time. As a backdrop to this turn of events, the trend toward the infor-

mation society is spreading all over the world, and that is probably what has brought about the upheavals in Eastern Europe.

I would think the important question in the assessment of these upheavals is what implications they have for the 1990s toward the 21st century. For one thing, human rights are an important factor in the democracy wave that is spreading over the Eastern European countries. I think it would be a big plus for the world if this leads them to establish a new democratic system of government. At the same time, despite the temporary confusion it could mean a new economic development of the world. New developments in Czechoslovakia, Hungary and Poland take the form of a democracy movement which encourages the hope that they will be able to get free of their economic stalemate. Any development in Europe, which so far has been limited to the EC framework, would then be extended to cover the whole continent, giving it a chance for integrated economic development. This would also hold out a fair chance of development of all other world economies.

In the Asia-Pacific region on the other hand, newly industrializing economies are growing fast, encouraging Thailand and other countries outside of NIEs to follow suit. Indications are that a new period of worldwide economic upswing will begin in the nineties.

As a logical consequence of all this, it is necessary to bring energy supply and demand into equilibrium, without which there would be no chance for a democracy movement to be carried through, or to ensure economic development. I feel that the world energy problem is going to face a new phase, as the new developments can be expected to call for more of it.

The same can be said for Japan, too, with energy demand increasing. Fifteen years after the first oil shock, Japan seemed to have somehow cleared its after-effects for a soft landing. Then a new era began with tremendous increases in energy for 1987 and 1988. With an energy elasticity value

in excess of one, progress toward electrification boosted electricity at a faster rate than any other energy sources.

Now the question is, how is Japan to cope with the new growth in energy demand. It will also be a common task for the whole world if the energy problem spreads over the world through the nineties into the 21st century. In addition, this opens up environmental issues around the world. Gorbachev describes the environmental consideration as "the world's biggest common goal." The long-standing pattern of East-West confrontation is being replaced by the environmental consideration as a worldwide common goal. The environment and energy are not now what they used to be.

How can this be resolved? How can the question be settled in such a way as to bring new hope? It is my impression that the time has come, with the opening of 1990, for all world intellectuals to begin serious studies in their respective countries.

Mori: The 1990s are expected to see such dramatic things, as you have just said. People involved in nuclear power and energy are not sure which way they are to go — forward, backward, sideways or upward. They simultaneously feel pressure brought to bear on them to do this or that and see signs of something brewing.

Yanase: In the seventies, John Lennon wrote the song "Imagine," which goes "imagine all the people sharing all the world." Now I feel the world has really entered an era that is global. The ideological barriers that have separated us from Eastern Europe and other parts of the Socialist bloc are collapsing.

The political freedom they have gained, on one hand appears to be something wonderful; on the other hand it can also be taken to mean the liberation of their desires. In any country, people would like to see beautiful show-windows and have ample supplies of daily commodities. In a unified world, one might feel both happy and uneasy. Others coming your way will not matter if you have no problem and live in a paradise.

Japan has more consumer goods than enough, but has a lot of other contradictions. It will be a matter of grave concern to see how the Eastern Europeans face up to their illusions about the Free World.

So with the start of a global era, each country must be independent of others. That is what is called for in Japan. An end to centralization in Tokyo is called for to let each local community gain its independence from the other. Calls are resounding throughout the world for Japan to take good care of its domestic demands. In regard to environmental issues, each country must consider resolving them on a self-closing system. But how this can be brought to reality at a time when vigorous productive and consumer activities are assuming global dimensions is a question that is very difficult to answer.

It seems likely that the Eastern Europeans have the same desires as the Japanese had shortly after the end of World War II. If they have, we feel somewhat embarrassed because we are now a little tired from the years spent in the pursuit of wealth.

In addition, environmental issues are cropping up. How can anything you advise about the environment come home to others when you are already glutted with dainties? It will take a long time for any country undergoing a violent change to be restored to stability. In the meantime, there could be a terrible scramble for energy resources.

This makes me feel the need to trace back through the history of energy from the technological and civilizational points of view. History shows that firewood was in use for a long time before coal and oil came into use around the time of the Industrial Revolution. Nuclear energy has been in use for only 50 years. So if nuclear energy still meets with opposition, this may be taken as a matter of course. It took 500 years for the heliocentric theory to be recognized. The nuclear age will not really dawn until everything becomes clear about how the nuclear industry will come in line with the environ-

ment and how technology will meet its requirements.

On the question, "What will become of energy in the 21st century? We have lived in the ages of firewood, coal and oil. What comes next?" President Toyooki Ikuta of the Institute of Energy Economics said, "I

see no champion to take the lead." When seen from considerations of environmental issues, any energy source has its home task. So one answer to the question depends on which energy source will be the first to clear the difficulty of the waste issue.

Yoda: You are quite right.

To make the global environment compatible with energy requirements

Mori: The way things are going with the United States and the Soviet Union, the *raison d'être* of Japan will not be what it has been. I might say, at the risk of appearing jaundiced, that Japan will be marked down only for its minuses.

Yoda: Japan is noted for its success in overcoming the difficulties that confronted it in the postwar era. In a sense, Japan is a model for national reconstruction postwar. Rising from the war ruins, Japan has brought economic recovery to the point where it is reputed to be the world's greatest creditor nation. Asian countries, such as Taiwan, South Korea and other NIEs, would like to learn some lessons from Japan. I presume Eastern European countries are also expecting Japan to offer something instructive to them.

The same can be said on the energy problem. Japan is not gifted with energy resources. It imports from abroad that have supplied most requirements for its economic growth. If on the domestic front any problem arose from nuclear power and from the use of coal and oil, they were more or less local matters for consideration, and solutions were found on problems that had to be eliminated. Now, other world countries may well hold out vague hopes that Japan will prescribe what they should do to make the global environment compatible with energy requirements.

If Japan can do this, it seems likely that this country will be in the position to prescribe solutions for some energy questions in a peaceful world free of the East-West confrontation.

This would help to allay the criticism of Japan as an economic power which makes money but does not know how to spend it. I personally see the possibility that Japan will become a world state. What would you say? Am I overestimating the ability of the Japanese?

Endo: I hope you are not. Our Japanese people certainly have the potential for it. To do what they did in the postwar era, the Japanese circumstances were favorable, and in using their efforts they had some models to follow. Some specific means were available to them to achieve goals set for their own purposes. They could find something somewhere that could be adjusted and prepared in ways that met their specific aims. But the way things go now, there are no models to follow. You have to build for yourself. The point is that even if one may lose on one's efforts short term, it will serve one's interests long term. In other words, it will turn out to be enlightened self-interest. That has been Japan's weak point.

Yanase: I really think so. From now on, Japan should change ...

Yoda: I would think the Japanese will be happier if they refuse to acknowledge their weak points and move ahead with a national objective that may seem a little too big for them.

Endo: I think so, too. Some people, if not all, say Japan is a faceless country because it has no universal message to deliver. Whether good or bad, the Soviet Union once had Marxism-Leninism as its aim, the United States sought to see democracy

prevailing throughout the world, and France tried to disseminate its glorious culture. What is Japan trying to get out of all the values it is getting for its money? Japan once entertained the spirit of universal brotherhood in the wrong sense of the word. Now no objectives are clear to others about what Japan is going to do. It is like being a stranger, where others say, "What is he going to do?"

Yanase: I understand what you mean. One of the scientists I interviewed about the fundamental research they were pursuing said, "That's where the Japanese feel humiliated. Technology becomes an asset for the country that has it. Science becomes an asset for mankind. No countries will be respected if they do not produce such assets for mankind. It's too bad of Japan to provide sufficient manpower and funds if they are only to serve technical purposes. Anything technical, by its very nature tends to involve corporate secrets and boundaries."



Yanase

I don't see why the way cannot be cleared for the transfer of techniques for nuclear generation and environmental protection. The techniques should be made available along with the Japanese perceptions of nature and civilization. This may be our home task to resolve from now on.

Is it possible for the electric utilities to let others share any technology that have been developed in Japan?

Yoda: Yes, it is.

Yanase: Are you already making

such moves?

Yoda: Yes. For example, we are supplying information without compensation, though not sufficiently yet, to South Korea, China and Taiwan.

That is because they are related to us. Anything happening in South Korea or China will come through the information society to Japan — and that in amplified form. You'll have to take it upon yourself. You can't let it run its course where it happens. If you do, you will eventually have to pay a high price. People are now beginning to realize this.

One of our affiliated firms recently held a research study meeting in Taiwan to give local nuclear interests all the knowhow we have.

Any trouble with a nuclear power plant in another country, or any inadequate treatment and disposal of waste from the plant, could have serious social repercussions, even if it is only trivial, leading people to say "That's why nuclear power is dangerous." Then you can't say "That's the way they do things in that country. We are different" — logic that is not any more tenable than it was after the Chernobyl accident. We are aware that we will bring trouble on ourselves unless we realize that the task for mankind is to keep nuclear power under proper management. We are ready to supply all the knowhow we have.

If the Poles go ahead with a nuclear development program, as the ambassador pointed out, under the conditions that exist in their country now, I would like them not to be led to something cheap and inferior.

Mori: There will be increasing cases where the trouble will come back to Japan if it refuses to be responsible before the whole world.

The government has so far appropriated some ¥300 billion annually for spending on nuclear energy, but the light water reactors in operation now are, in a way, a lucky, transient technology. So one percent of the budget, or ¥3 billion to ¥5 billion at least, should be devoted to fundamental technology to provide a wide range of grounding. That is what we emphasized in our Long-Term Program for

the Development and Utilization of Nuclear Energy. But no response has been offered other than for what they call underlying techniques. This is not for science; it is for technique. They want us to do nothing but just build up formulas, such as for higher efficiency ratings.

Yanase: There are some 50 research institutions at Tsukuba and there I have interviewed researchers in different fields of study. An astronomer there said to me, "High technology and biotechnology are popular with science students these days, and few young researchers go in for astronomy, which they probably think is outmoded." "It's true that astronomy has nothing to do with our GNP for tomorrow," he went on to say, "But we are indebted to the 500-year-old science of astronomy for our present-day civilization. Are we to understand that Japan will spend no money on anything that will not bear fruit for 500 years?" Is ¥3 billion enough for 500 years ahead?

Mori: Astronomy is not an outmoded of science, but it may be a matter of education that makes the difference. There must be more people brought up to find a life worth living dedicated to scientific pursuits. There are many people going in for the technologies that serve the purposes of the GNP.

Yanase: That's right. That makes life lonely, although one can't live without regard for economics.

Mori: Among recent developments are higher temperature superconductivity and cold nuclear fusion. I would say that physics is a world in which no one doubts that anything like that could happen. It is often said by way of suggestion, "An apple lying in the middle of the Korakuen Stadium, the franchise for the Tokyo Giants, is the equal of a nucleus, and it may be assumed to have electrons revolving around the baseball park." But we do not know much about it, even what the state of configurational spaces among atoms of solid matter is. If some atoms like dust build up in it and this causes the temperature to rise, everybody will take it for granted.

This means that we are now only at the gateway to the study of nuclear energy. We have energy coming from nuclear fission, some 70% of it serving to heat up seawater and 30% to produce electricity. I would think further methods could be developed which go the other way.

After all, it is to be hoped that Japan will become such a country as to bring up philosophical or righteous people who are enthusiastic about building human assets.

Endo: In this connection, I would say postwar education in Japan seems to have gone from bad to worse. If the Nobel Prize can be taken as a standard for postwar education — although I do not intend to say it is the most important — it may be noted that most of the several Japanese who have won the Nobel Prize for natural science since World War II had either received their education before the war or had made their studies in countries outside Japan. None of the Japanese educated since the war has won the Nobel Prize.

Yanase: It's a said story you are telling.

Endo: Dr. Susumu Tonegawa and Dr. Reona Ezaki had done their studies at foreign research institutes, not in Japan. Dr. Ken-ichi Fukui and Dr. Hideki Yukawa are both old-timers. The postwar Japanese generation has had a very weak education.

Yanase: I wonder if it's the bad thing about it that has paid off in some other sectors of life.

Endo: That would be right. Japan's budgetary appropriations for research and development are shared between the private and government sectors at the ratio of 8 to 2. The pursuit of fundamental technology is certainly going on in the private sector as well, but I would say nongovernmental research cannot be faulted as being intended for some particular target.

Yoda: The greatest loss to the nation in the postwar era is precisely the education you have just mentioned. Education has turned out to be a high price to pay for the prosperity of present-day Japan. The delight you could take in dreaming forward or devoting your life to a long

future is now lost to the present generation, as everybody is resigned to taking a short view of things. It's a pity that university graduates educated in technological knowhow tend to seek a career in financial management, instead of technology. Japan will not be saved unless this situation is reversed.

Yanase: I am afraid the time will come when some history book will say that the Japanese lost their country because they did not know how to use the abundant wealth they had accumulated.

Yoda: That could be.

Yanase: I once happened to be with an American computer company official seated next to me in the Shinkansen super-express. I asked him, "What do you think of Japanese com-

puter technology?" He said, "You have good political science, but I would think you are weak in pure science. So your technology is effective but there is little to be feared from it."

The absence of philosophy is probably mostly responsible for this, I think.

Yoda: Yes. We have no philosophy to fall back on. Any country collapsing after a period of prosperity, as was the case with the Roman Empire, had reached full maturity with people losing themselves in prosperity, going out of their minds as humans, and giving themselves up to self-interest and pleasure. If Japan is not to go that way, it must have a lofty ideal to follow.

best choice ever desired, trust it and rest assured that no inconveniences will occur." In response to the people's vague anxiety about nuclear issues and fear for nuclear safety in particular, the authors of the past visions have just told them to "trust" the authorities.

In some particular circumstances, that could be allowed to a certain extent. Under the socialist system that prevailed in Eastern Europe and the Soviet Union, an ideology-based political regime could force the people to follow the absolute power of their government. There everybody would move ahead with a government-initiated vision, as it could be forced on the people. Now Eastern European countries offer a good lesson as to how dangerous it is to go that way.

A European antinuclear movement started with the debut of the Green Party. No adequate responses have been offered to its anxieties and fears. That is why the antinuclear movement has been left to spread like wildfire. I was thinking that someday Japan would also undergo its baptism of opposition. I thought the Chernobyl accident would be such an occasion, but in fact, it did not come here until two years later.

In a sense, it would be wrong to have the government set forth a self-righteous vision. Information society now could give anybody the opportunity to participate from one's individual position. Each could have a say. Since present-day societies have characteristics for dialogue, no vision will have appeal unless it is designed to fit in with dialogue-based society.

Dialogue-based society would allow everybody to speak out on questions confronting them. While saying what one thinks and what one doubts, others can be asked what they think, and such a two-way approach to questions would sum up the questions and draw a conclusion which everyone could share. I feel any vision should be made to reflect such conclusions as may be shared by the people.

That is why outsiders are now invited to join nuclear interests in working out a new vision, a departure from

Why Japan has to have nuclear energy?

Mori: The same rule holds good for nuclear energy. You set out with its introduction from abroad, and one day you wake up to find nobody walking in front of you, and nobody even to walk side by side with you. The trouble is that the vision is going out of sight that could reveal to Japan the reason "why it has to have nuclear energy."

These days, with regard to our nuclear fuel cycle project, foreign countries ask: "When uranium resources are more than enough and prices for them are going down, do you think the fuel cycle business will pay? Why does Japan stick to it? It doesn't seem to be intended for anything else, though." Under the pressure of circumstances, I tell them to "wait and see because it may or may not prove to be something that will go down in history as Japan's share in the development of nuclear energy." What does the Nuclear Vision Committee have to say about this?

Yoda: In fact, we made a similar vision-making effort three years ago. It is reflected in the current long-term nuclear energy program. Only

three years later, we are now under the necessity of drawing up a new vision.

However, there is one point we want to make in a departure from any of the previous vision-making efforts, and we are trying to make it known to the public. Most of the nuclear visions that the government and the industry have worked out to date



Yoda

have been more or less imposed on the people. The people have been given to understand that they can "have the

the past practice of restricting it to nuclear industry circles. Nuclear opponents could also be invited to tell the industry why they are opposed, for us to hear them in a humble way and put up questions we want to ask them.

We cannot go so far as to give them a hearing because a considerable segment of the industry still resists the idea of inviting nuclear opponents to speak out. But I would like to have both advocates and opponents offer their opinions in a comprehensive effort to draft a new vision. Soichiro Tahara, the political critic, has been asked to offer all the criticisms he has against the industry. He is among five outsiders invited by turns for a monthly meeting with us, as we ask them to "speak for nuclear opponents whom we cannot invite."

They can point out problems of which we have not been aware. How far can we go in offering responses to them? That is the point, I believe, where our drafting work should start. I would also like to invite women to join our guest speakers.

After a whole round of such discussions, we will make out a draft and again refer it to outsiders for comment. That is what we are doing now to draw up a vision that will fit in with dialogue-based society. That's why we are taking time.

Mori: That is a very interesting move.

Yanase: I hope you will gather opinions from people in all age groups. It is largely by the benefit of electrical energy that more women than ever have been able to go into public life. And women are the most worried about nuclear power. Livelihood cooperative officials tell me that women began their studies with inquiries about food safety. In their efforts to resolve questions about it, they encountered many contradictions in present-day society. Since the Chernobyl accident, they have been motivated to start a denunciatory movement. Nuclear power has become the symbol of contradictions for them in present-day society. If you object to their way of thinking, they want you to resolve their apprehensions about nu-

clear power. At a time when a nuclear power plant accident, even if not happening in Japan, would have consequences for the whole world no matter where it happened, you need to be so considerate as to remove the underlying fears that come to all women who have children.

It would seem that they have not been given enough of the responses they should receive in this age of information.

Yoda: Certainly not enough on that point. That is what is responsible for the underlying credibility gap.

Yanase: Yes.

Endo: I doubt the wisdom of the term "public acceptance" — a term difficult to put into Japanese or to get used to. Why use a term like that? There is no getting around the impression that you are taught or told to accept something. I never use the term "public acceptance."

Yoda: That term is an expression of the long-standing structure. The tendency is to think one can get anything if a campaign is made for it. The recourse to campaigns will not work out unless based on the idea that one should know how and what to do for those who are willing to listen. But now people are too busy to listen and one has to force them one way or another to listen. Then you get more rebuttals than acceptances.

Yanase: People want responses when they are willing to listen.

Endo: Another question about public acceptance is that this term could be intended as a cover-up for

what people want to know about the fundamentals of nuclear energy, such as safety operations and food, as Ms. Yanase has said, as well as radiation protection. So it might be advisable to take the position that you are more prepared to tell anybody who asks about what one wants to know than to carry on a campaign for it.

Yanase: It would be much better if you are prepared to answer questions at any time.

Yoda: The way things go now, people tend to seek ready responses so hastily that it may be pushed back rather than brought out. So I see the need for serious reflection on the way public acceptance should be, especially on the idea of campaigning for public acceptance.

Housewives are in the forefront of the antinuclear movement that has spread around Japan. I meet many women working for my company. They are women in positions closest to electricity than most other sections of the workplace. I once suggested that some young housewives or women not yet married should be invited to speak out on what they want to know about nuclear power, what they wish to appeal about to other women, and what they would like to do as a company staff member. But male-dominated society would not agree. "There is no need to let young women make so much trouble," they would say. "We can make up a good pamphlet. Please don't worry."

Yanase: Women are better aware of women's concerns.

Why is it that movements for democratization and freedom tend to be associated with anti-nuclear movement?

Yoda: You would be astonished at the strength of male resistance. I kept on insisting for a year and a half, until they began to come around to my way of thinking.

Besides, I am backing up a group of housewives I happened to know outside our company. I help them organize tests for commodities and classes for the study of nuclear problems. We

stay away, leaving them with the nuclear problems for discussion, until they come up with questions they want to ask. We answered such questions from a total of 3,000 housewives last year. We are planning to continue the study group this year. It's a small segment of the mass public, but no grass-roots power will grow unless built up on such segments. Now it's

only beginning to grow.

Mori: Last year we had a Soviet journalist mission to Japan in exchange for a visit there by Japanese newsmen. The Soviet mission was headed by V. S. Guvalev, Pravda's science editor, who was very appreciative of the visiting Japanese newsmen who reassured the Soviet public, saying that nuclear energy is very important and that it could be kept as safe as in Japan if the necessary provisions



Mori

are made. He was thinking to do something out of gratitude to Japan when he had an opportunity to speak to the public in Nagasaki. He said, "You probably know one or two popular singers by sight. Do any of you here know by sight someone who is operating a nuclear power plant?" No one answered in the affirmative. "It won't matter at all to your everyday life if there are not one or two popular singers," he went on to say. "But these persons have built and are operating the most excellent nuclear power plants in the world." His audience showed tangible reactions when he said, "How is it that you don't recognize the face of any such important person?"

The technological community is isolated from mass society. And such advanced technologies as nuclear power are maintained by faceless persons. The Soviet journalist went home after suggesting this as a "hint for a breakthrough."

Yanase: Six years ago, I was preparing "The Third Fire Now," a series

of TV programs designed to promote knowledge of nuclear power. It began with a technical commentary by a number of specialists invited to speak in the studio, only to receive a very poor audience rating. So we changed it to let viewers see operative workers as we interviewed them in their nuclear power plants and in their homes. TV viewers reacted, some being surprised and some reassured just to find people with their children in an ordinary home. If you come to think of it, it sounds strange, though.

One difficulty about the recent antinuclear movement is that it bears the brunt of all contradictions, including environmental issues, incurred by modern civilization.

As was noted recently by Dr. Ken-ichi Omae, chairman of the program committee for the forthcoming JAIF Annual Conference, a hundred-percent safety was claimed too much for nuclear power in the early stages. It should be taken for granted that a 50-year-old technology can not be perfect. It started on a high level of safety, to be sure, but impeccability was claimed too much for it to advance with no difficulties in store. Once it is claimed to be perfect, the general public will not remain undisturbed when something unforeseen happens to it. They would become nervous both about radiation and about technological progress. They should be told that it is one of the technologies that civilization has brought to mankind, and is on course for further development.

Mori: That's right.

Yoda: When I was asked by a weekly magazine to comment on the TMI accident just after it happened, I said that the materials inside a reactor core are extremely dangerous. The reporter said I was the first to speak thus about the danger. I told him "It is very dangerous, and it is important to know how dangerous it is. There are many unseen and unpredictable hazards around us. If you try to avoid them, you don't know how to prevent them, because you cannot predict them or do not have any idea of the dangers. At a nuclear power plant, the core materials are very

dangerous, and we know why they are dangerous. We know how a serious accident can happen at a nuclear plant, so a nuclear plant is designed to control such dangers." The reporter said that explanation is understandable. However, people at a nuclear plant say that the plant is not dangerous because of defense in depth. If a reporter says, "Still accidents occur." Then they reply, "There is nothing absolute in the world." "Then, what is the probability?" the reporter asks, and they say, "Once in tens of thousands of years." "Could it occur tomorrow?" "That is possible." In this way, things become all the more confused.

We should take a philosophical attitude toward the problem of "danger." If we predict a danger or crisis, it ceases to be a danger or crisis. Man tries to understand, but when man does not understand well, an unexpected accident can occur. People at large and other people who are promoting nuclear power generation should be humble enough to recognize the limit to our knowledge, or when asked, they should provide accurate information. This is an important point. However, we tend too much to emphasize safety to be able to take a humble attitude, and this situation, I think, is unfortunate for nuclear energy.

Yanase: We have been moving in the opposite direction.

Yoda: And that opposite direction has come to be denied by facts that have occurred one after another.

Yanase: The situation is the same with aircraft. You find after it was designed that the wings of an airplane are not strong enough, and then improvements are made. You are then satisfied with the improvement. This is all right for ordinary technologies. However, if you say that improvements have been made on a nuclear power plant on the basis of new findings, people say, "You are a liar." This is very unfortunate. If you stress the infallibility of your technology from the first, people are put in the dark as to the process of improvement.

Yoda: I agree with you.

Yanase: Why is it that movements for democratization and freedom tend to be associated with anti-nuclear power movements?

Endo: Anti-nuclear movements are classified into movements for nuclear power plants and those related to waste management. In particular, the question of high level waste management is posed as a serious problem. For instance, people involved in anti-nuclear power movements question how it is possible to control plutonium with a half life of about 22,000 years. However, those promoting high level waste management insist that the amount of high level waste is limited and that it does not pose any hazards as it is to be disposed of by vitrification and geological disposal. Further, new studies are being made on nuclide transmutation, which will provide an ultimate and most fundamental solution to the problem of high level waste management. If you mention this, they immediately say that you admit the hazards of the present disposal method. So we tend not to mention this study. Speaking from the standpoint of the progress of science, it is quite natural that we should accept what is considered safe today and switch to the method of nuclide transmutation when it is established in due time.

Yanase: As Mr. Ikuta has said, there is no champion energy source. We are at a dead end so far as energy sources are concerned. People think that everything should be recycled. Women in particular think that that is the safest way and the best way for the earth's environment. If you say, "We have already started necessary studies, although it may be 500 years before our studies will be completed. Anyhow, we are doing the necessary studies," and we will feel a bit relieved. But we don't say this very much.

Mori: Discussions are being held privately on the question of basically reviewing the problem of high level waste. Nevertheless, we have to face the question you have just raised. To tell the truth, the present discussions on high level problems originated in

foreign countries, if you see what I mean. In foreign countries, high level waste is buried more than 500 meters deep. We say that this is done after cooling it for 30 years. But people in general say, "Wait a moment. In foreign countries there are rock salt formations and formations that have not moved even a little for hundreds of millions of years. There are also areas where nothing but granite is seen for miles and miles around. But in Japan earthquakes may occur anywhere. There is no such place in Japan. Therefore, such a proposition is impossible for Japan."

However, even in Europe and America, the ground subsides about 500 meters if a glacier covers it. This does not occur in Japan. It is necessary therefore, to devise a Japanese way of controlling high level waste. We have attained the present level of technology in 10-20 years, so I think it is important for us to propose a new method with increased self-confidence. It appears to me that the problem of high level waste has been made more and more complex by digging our own holes.

Yanase: We can draw encouragement from the expression of our determination that Japan is staking its future on high level waste control for the sake of mankind, and we can also make this appeal to the world.

Mori: If we split uranium, a heavy molecule, into two, we get energy. The question is as simple as that. Since mankind has entered this field, just as Pandora's box is opened, we have been lost in a new world of alchemists. It is impossible to think that when we can split a molecule, we cannot restore it. Actually, it is theoretically possible to do it. So we should have a vision for the future.

Yanase: It is important to express a desire to achieve the seemingly impossible. . .

Yoda: Just to express a determination makes a difference.

Yanase: Yes, it does.

Yoda: It will have an impact on the world.

Yanase: However, man's living itself causes a lot of trouble. The en-

vironmental problems are not caused only by factories as they were in the past. All people are responsible for water pollution and suffer from it. People want to return to nature, but no one can now live like Robinson Crusoe. After all, evils generated by technology should be countered by technology. So if a breakthrough is made in solving the problem of nuclear waste, even if it is a small beginning, the present public opposition to nuclear energy will be considerably eased.

Yoda: Such a technical development is needed.

Mori: JAIF is now analyzing the results of a public opinion poll on nuclear energy with the cooperation of Ms. Yanase. We are now at a loss as to how to analyze various opposing trends. When asked what the future energy source should be, about 50% of the respondents replied that it is nuclear energy. But to the question "Do you agree to increasing nuclear power plants," only less than 20% reply in the affirmative.

Yoda: I think it is necessary for us to change our attitude to nuclear power on two points.

One point is that we should endeavor to make nuclear power the common knowledge of ordinary people. So far, we have been discussing this issue in terms detached from our actual life, speaking carelessly about 10,000 years ahead and numerical figures unthinkable in the context of our actual life. This has closed all ways to a public understanding and intimacy with nuclear power. How can we bring nuclear energy to the world of common knowledge?

The other point is this. Since nuclear energy is a product of science and technology, it is necessary for us to present to the public in clear-cut and unmistakable terms what nuclear energy should and can do in the future in the field of science and technology and what it can bring to us.

However, these two points are not clearly conceived or presented, and this is why nuclear power has been contained in a world of technology. We have made technological explana-

tions, saying that we need energy, that nuclear energy is the best energy and that nuclear power plants are safe. So we have come to a dead-end in technical discussions, discussions that are not easily accepted by the public.

Mori: This severe public attitude to nuclear power also reflects public expectations for it.

Yanase: That may be so.

Mori: That may be a reflection of the public wish that if one is to select an energy source in a long range view, say, 100 years, it should be nuclear energy, and that at least nuclear energy will become nearly per-

fect by then.

Yanase: If we were to compress the long history of the universe from its genesis into one year of 365 days, it is only in the last moments that mankind made a debut. And mankind has damaged the earth's environment so much in such a short time. No civilization has ever settled its accounts with the earth's environment. Mankind has been only throwing away wastes. Can't we create a civilization that throws away wastes cleverly and does not accelerate environmental disruption?

tion to the question of controlling such a weapon and may come to think that they should do something against this danger as an international obligation.

Endo: Japan's attitude is this: "Japan will never allow itself to proliferate nuclear weapons; Japan will take every possible measure to prevent the transferred nuclear technology of Japan from being abused." There are areas in nuclear energy with which Japan has nothing to do directly. Therefore, Japan's attitude is that other countries should do what is necessary about such areas, while Japan will do what is necessary about those areas with which Japan has something to do." But this is not the attitude Japan should take as an international state.

Yoda: In this sense, our thinking is closed.

Yanase: Under the impact of the upheavals in the world, which we discussed first, a considerable number of people will flow into Japan from foreign countries as a labor force. We cannot but feel that the influx of people and goods will become more and more active.

Endo: Peaceful utilization of nuclear energy and the problem of non-proliferation are problems cut from the same cloth. If a problem of nuclear proliferation occurs somewhere in the world, the cause of the peaceful utilization of nuclear energy will be greatly damaged. If Japan says that it is committed to peaceful utilization of nuclear

Peaceful use and non-proliferation of nuclear energy are problems cut from the same cloth

Endo: I am working for IAEA. There are bright and dark sides to nuclear power. Japan is working hard on the bright side of it, but it is a matter for regret that Japan is not interested very much in the dark side, which, unfortunately, has been inseparable from it since its birth.

This is because we have refrained from touching on the dark side since the dark side was too disastrous at the beginning, namely, Japanese experience in the atomic bombing catastrophe of Hiroshima and Nagasaki. We say to the world, "Japan will never do such a thing. Japan is committed to its peaceful utilization. Please trust us." However, we should show proof of this internationally. Just to say, "Please trust us" is not sufficient. Foreign people receive the impression that Japan is not interested enough in the problem of nuclear non-proliferation.

Yanase: I am not enlightened on this question. Then, what can Japan do about it?

Mori: Needless to say, Japan is cooperating with other countries in its own way under the regime of the Nuclear Non-Proliferation Treaty which aims to prevent an increase in nuclear weapons-holding states, by accepting the safeguards and promoting technical developments for inspec-

tion. After all, there are limits to what Japan can do merely with its economic and technical capacity.

Endo: For instance, there is hardly any possibility of discussions on nuclear non-proliferation being held in Japan. It is practically impossible.

Yoda: The Japanese are not aware that their country is a world state. Their logic is formed and their world view confined to domestic considerations, so that it is difficult for them to conceive that the problem of nuclear non-proliferation is their own. If they are aware of Japan's position as a world state, and if they are aware that there is a danger that the "dreadful weapon" they have may be abused by someone else, they will pay atten-



Yoda (left) and Mori

energy, this argument will not be accepted in the world if the dark side of it is posed as a serious problem.

Yoda: No, it won't be accepted. It is necessary to clearly recognize the duality of nuclear energy. The bright side of it will be able to shine more brightly not by stressing only the bright side but by concentrating on control of the dark side. I think the bright side will lose its brightness if we ignore the necessity of balancing these two sides. The dark side is precisely the dangers of nuclear energy. I am sure that it is necessary for countries benefiting from the bright side of nuclear energy to be equally aware and assume the common responsibility for the dark side, that is, the danger of it being misused as a dreadful weapon.

We should have a world view or philosophy on nuclear energy. We are not permitted to utilize it without this, just because it is convenient or cheap.

Endo: The NPT regime is a system intended to reduce the dark side as much as possible. However, the NPT regime is criticized variously. One criticism is that the regime is intended by the United States and the Soviet Union to ensure their monopoly on nuclear weapons and that it is an unequal system. The other criticism is made by many developing countries which wonder what merit they can derive from advocating that regime. They argue that if there is no merit, there is no reason why they should stay in it.

It is already 20 years since the NPT was concluded. A conference to review the treaty is to be held in August and September this year. The treaty is to be terminated in its 25th year. So it is going to be examined in its 20th year to decide on its future in 1995. The above criticisms are not unrelated to this situation.

Yoda: So if it is important to control the dark side, it would be very difficult to maintain the regime, unless obligations and responsibilities for the dark side are balanced with the bright side. There will be a strong demand for the bright side of nuclear energy, but

if the demand is accepted unconditionally, the problem of the dark side will be multiplied and become uncontrollable. And those for its peaceful utilization may be compelled to oppose it. Something like the south-north antagonisms may be caused in the area of energy.

Yanase: Was the NPT regime promoted mainly by the United States and the Soviet Union, and not by some organization like the United Nations?

Endo: The United States and the Soviet Union decided to monopolize nuclear weapons, on the ground that their monopoly is for the good of world peace and that other countries had better do without them. However, at that time France, Britain and China already had nuclear weapons, and they refused to accept the NPT regime. The two superpowers could do nothing about these three countries, but decided that no other countries should have nuclear weapons. In this situation, Japan and other countries were drawn into the NPT regime. However, there are some countries which refuse to ratify the treaty because of its inequality.

Yoda: These five nuclear states are controlling other countries which are capable of developing nuclear weapons. . . .

Endo: Therefore Japanese nuclear plants are all open to inspection, permitting cameras to be brought in and allowing inspectors to examine them.

Yanase: Can these five countries refuse a camera?

Endo: They can, if they want to.

Yanase: What will become of this if U.S.-Soviet relations change, as they are changing now?

Endo: I think both the United States and the Soviet Union want to continue monopolizing nuclear weapons. Even when U.S.-Soviet relations were in their worst state, the two countries cooperated in refusing at least to transfer nuclear weapons to other countries.

Mori: Yes. They were agreed on that.

Yoda: In the past, there was a certain stability in the cold war condi-

tions. However, the danger is greater as the cold war is fading.

Endo: There are not a few countries capable of developing nuclear weapons.

Yoda: There is no denying that there is now sufficient technical proliferation.

Endo: There is not sufficient recognition of the dark side of nuclear energy. The question is how to control the dark side and how Japan can cooperate in this.

Mori: What will come out of the present worldwide trend for liberalization? I myself think that as transparency is increasing in the world, no country will be able to hatch an evil design easily.

Endo: That will be a favorable prospect.

Mori: No country can engage in wrongdoings secretly. In this sense, liberalization is to be welcomed. But there may be an argument that now that the cold war is over, there is no need for nuclear weapons. This may lead to an unexpected danger.

Yoda: A danger incomparable to the danger of peaceful utilization of nuclear energy?

Mori: Yes. That is what I mean. This danger should not be overlooked.

Yanase: I hope a new international organ will be formed in this new situation.

Endo: In order to strengthen the present regime, there is no alternative but to develop it into a system from which participating countries will profit.

Yoda: I think so.

Endo: Conversely speaking, a system that will make a country suffer a loss outside.

Yoda: Japan will have to play a suitable role in evolving such a system.

Mori: Yes. Japan should play its role there.

Yanase: There are products with an "Ecology-Mark," showing that products with the mark are friendly to the earth's environment. In a similar way, it may be possible to declare that the participating countries are Ecology-States as a mark of international credibility.

Endo: Japan is doing that sort of thing, saying that Japan will not cooperate in nuclear development with a country outside the NPT regime. Japan does not extend technology nor does it extend repair services. Japan will do nothing for such a country.

Yoda: The trouble is that if we don't give anything at all, some countries will go it alone.

Mori: Some other countries may follow suit, taking advantage of a precedent.

Endo: There are always people in the world who would steal a march on others.

Yanase: Something has to be done to prevent such a development.

Endo: Under the present system of international law, no sovereign country can be punished, even if it has violated a treaty. You cannot "arrest" a country to punish it.

Yoda: It is true that no country is punishable, but the problem arises that something has to be done against a country for a criminal act or an act against humanity. The case in point is the Panamanian problem. It may become natural for some country to act as a policing country. But if such a country uses violence against another country, a problem, different in character, arises.

Yanase: What attitude does an anti-nuclear power movement take toward this question?

Endo: I think no anti-nuclear power movement in Japan has anything to say about it.

Yanase: In other countries?

It would be necessary for women to be more interested in energy problems

Yanase: Women tend to take a stern attitude toward nuclear power. This is understandable from the fact that women have the role of preservation of the human species and tend to be conservative on this. It is thanks to this nature of theirs that mankind has been preserved to this day. Their conservative tendency,

Yoda: Early anti-nuclear movements in Europe took a certain attitude toward this problem.

Yanase: Anti-nuclear movement, meaning "opposition to nuclear arms" should be taken for granted, and I do oppose nuclear arms.

Endo: Japanese anti-nuclear power activities are not interested in this question.

Mori: Very few of them are interested, I think. They need not appeal against nuclear arms, because the public is generally against nuclear weapons. There has been a tendency in recent years to take advantage of the public opposition to nuclear arms in order to warn the public against nuclear power plants.

Endo: Even if Japanese anti-nuclear power activities appeal against peaceful utilization of nuclear energy, saying that it will lead to the manufacture of nuclear arms, the public will dismiss such a warning. But the situation would be different if they urged the public to prevent global nuclear proliferation to other countries.

Mori: However, nuclear energy always carries with it its dark side, and this dark side appears from time to time. If the public is told that "after all, nuclear energy was born of military technology," they nod their heads.

Yanase: For that matter, there are many things that were developed from military technology. It is up to man's wisdom whether man can control them or not.

Mori: That's true.

which has a positive effect on mankind, is desirable. Their conservative nature is a sort of safety valve in a sense when it puts a brake on single-minded commitment to economic efficiency. For this purpose, it would be necessary for women to be more interested in the problems of energy in general and obtain correct infor-

mation.

Yoda: It is better for us to have anti-nuclear power movements for the sake of balance in the world. People promoting nuclear power generation are always in strained relations with the opposing forces. A dangerous situation would arise if there were no opposing force. A political situation dominated by a permanent ruling party without an opposition party is a dreadful one. I think it is extremely important in the areas of technology or business that there should be a critical force.

It is important here to provide new information for the anti-nuclear power movement leaders and have them criticize instead of alienating them and leaving them in the cold. No strained relations will be born if constant efforts are not made for this. If tensions are eased, there is a danger. It is important to promote nuclear power generation, but it is equally important to foster a sound anti-nuclear power movement. It is necessary for us to take the attitude of respecting the position of those who are against nuclear power.

Yanase: No technology has been developed without the question being asked whether there is a better technology than what we now have. This is also true with nuclear power technology.

Japanese automobile and electronic components technologies have been developed as fine technologies. I think that it is true that nuclear power technology was at a high level from the beginning. But I am afraid that recently its technical growth has slowed down. For instance, large quantities of steel materials are used for building the base mat rebar. When I interviewed people engaged in their manufacture, they said that they would take refuge here if an earthquake occurred. It is a matter of regret that it was reported recently that some substandard steel bars were delivered to a certain nuclear power plant under construction. It would be extremely unfortunate if we were to hear such reports often.

Yoda: No technology can be per-



Yanase (left) and Endo

fect. Constant improvements are being made and information on them should be provided. . .

Yanase: Public distrust is caused most by the failure to provide accurate information immediately in case of trouble. Failures and malfunctions are apt to occur. Other technologies have developed through various steps of improvement. Our failure to give such allowance to nuclear technology is due to some non-understandable circumstances accompanying an announcement of a failure.

Yoda. When I ask people against nuclear power generation if they have visited a nuclear power plant, they say that they haven't. Furthermore, as they are not been given information by power companies, what information they have is a mixture of information, unreliable and unsubstantiated, obtained from foreign sources.

So I tell them, "Come to our nuclear power plant. We will give you the necessary information. It is all right for you to oppose nuclear power plants if you are still against them after that." We would like to maintain this attitude in the future, too. Without this, it would be impossible to have a sound opposing force. If the public is misled by wrong information, that would be more damaging.

Some time ago, we showed the Kashiwazaki Kariwa Nuclear Power Plant to people working against nuclear plants. They wanted to meet and talk with the wives of people who worked at the plant. When they met the five wives, they asked them,

"Don't you feel worried when you send your husbands to the plant in the morning?" "Don't you think of a possible accident in the plant, living so close to it?" One of the five wives present said, "We don't have any worries at all. People against nuclear power say that nuclear power plants are dangerous. Would you please explain specifically how they are dangerous." Her last words were so effective that at that moment the visitors found nothing to say, and the question and answer session ended there. Mr. Ikuta was present there, and he said "her words were more effective than Mr. Yoda's explanations."

Yanase: Seeing is believing. This is important to all people.

Yoda: Yes, it is. If people see things with their own eyes, they gradually change their thinking. In this sense, seeing is believing. If we ask visitors what they think of the plant after showing them over and making explanations, they say, "The plant is a lot different from what I imagined."

One thing I think important is this. We say there is a need for nuclear power plants or coal or oil-fired power plants, because it is necessary to secure sufficient energy to enable us to maintain the present economic growth and development and prosperity. However, isn't it necessary for us to re-examine seriously if our present lifestyle or living is what it should be. It is clear to all eyes that if we continue to use and consume natural resources and energy as we do now, we will ultimately bump into a thick wall. In order to

solve this problem, it is necessary for us to make an efficiency revolution in the utilization of natural resources in all areas from production to consumption. We have sufficient technology to do this, but we have not paid sufficient attention to this problem. We have been blindly following the practice of meeting demand wherever it is. . . .

Endo: That is true with industrially developed countries, but developing countries are experiencing a population explosion and a rising economic growth. If we tell them to change their lifestyle and pursue a new course, they will immediately counter our suggestion, saying, "You have already developed to the present level, and so you can say that so easily. We are still at a lower level of development; do you want us to stay where we are?"

Developing countries are repelled by our concern about the environmental problem. They say to us, "What do you say now, when you have already polluted the world with carbon monoxide? If we cut trees in the Amazon valley, what effect does that have on the earth's environment? We don't say that that would not have any impact on it, but when you tell us not to cut down trees there, you tell us not to utilize our own resources."

Yoda: If developing countries wanted to build society like that of industrially advanced countries, the result would be disastrous. To prevent this, advanced countries should show an example of new society. But this does not mean that we should lower our living standards or endure austerity. Take, for example, electric power: A fluorescent lamp consumes far less power than an incandescent lamp. With special technology, a fluorescent lamp can be made to consume 30% less power. Without its brightness being changed, its service life can be lengthened, as its power consumption is lower. If such a technology is available, we should promote it.

Endo: And it costs less. . .

Yoda: Right. As yet, it is not necessarily lower in cost. It is now

necessary to reduce the cost.

Endo: To a level affordable in

developing countries?

Energy saving technologies have reduced our power consumption considerably

Yoda: Yes. It needs an accessory device, and the lamp will be higher in price. However, if its service life is longer and if it consumes 30% less power, this means a lower power charge. Therefore, the additional cost will be recouped after some passage of time. We have technologies such as this that can be used effectively for consumer goods and which can also be utilized for production.

However, in the past we have not necessarily made efforts to fully utilize such technologies and exhaust their possibilities in an integrated way, systematically or purposefully. When the oil crisis hit us, prices rose and products became energy-saving-oriented. As a result, the power consumption of refrigerators and other consumer products was reduced. However, as refrigerators have now become bigger, their power consumption is not so low now. However, if we were to use large size refrigerators of the type before the oil crisis, their power consumption would be very great. Energy-saving technologies have reduced our power consumption considerably. This means that we should further promote the effective utilization of energy.

Yanase: We would like you to enlighten the public more on this point. And there is still much scope for the utilization of waste heat in urban areas, isn't there?

Yoda: Urban waste heat is a tremendous resource.

Yanase: At present, we live in a vicious circle of buying new products one after another. For instance, if you install a heater, you have to buy a humidizer, and use a dehumidizer in the rainy season. The number of new home appliances is growing constantly. Can't an energy-saving system be developed that can perform the functions of all these products? I would

like to see a co-generation system introduced when a new town is planned.

However, as Japan is a country extended from the north to the south, wouldn't it be uneconomical to utilize a nationally unified system?

Mori: Yes, it would be.

Yanase: It appears we were not aware that we should utilize natural energy differing in different regions.

Yoda: In the past, there was no need for such a fine-tuned approach. There was plenty of energy, and we were able to manage without going out of the way to take such a fine-tuned attitude toward the energy problem. However, now that the energy supply is getting tight, it is necessary for us to chart a new course.

Endo: For instance, what do you think China will do about the energy problem?

Mori: China with one-fourth of the world's population is potentially rich in coal and water resources. But there are hardly any energy resources in its industrial areas. It would be impossible to carry sufficient coal and water to its industrial areas in the immediate future. Then, what else is there? Its population is growing fast. What will that country do?

Yoda: Power supply is constantly about 20% short in China. Power supply failures occur frequently, and the situation is getting worse. If the living standards of the people are raised even a little, the demand for electric power increases 20%–50% immediately.

Endo: The situation in the ASEAN countries is already about the same as in China. Everywhere . . .

Yoda: The question is how these countries solve the problem of a more than 20% power shortage. If they should seek to find a solution in coal, acid rain would cause tremendous

damage to Japan.

Yanase: When it comes to this question, you cannot easily tell them to stop using coal, can you? A very difficult question, isn't it?

Endo: For instance, if they are to depend mainly on nuclear power plants, it is necessary to develop reactors suitable to the conditions of individual developing countries, such as a reactor like a fool-proof camera that can be operated safely in countries with a relatively low technical level.

Yoda: Such a direction is being sought in the utilization of nuclear power. Apart from this, the question is also how countries near the equator can use solar energy effectively. At present, we utilize the heat of the water of the Sumida River in Tokyo as an energy source with the use of heat pumps. We are drawing an energy resource from there. Further, it is possible to utilize heat in subway tunnels. There are lots of such heat sources in these countries. If you use one unit of electric power, you can obtain a resource three times greater than that. The heat source in the environment can be used for heating and cooling, and our future approach should be along this line. Of course, the basic electric power is needed, but it breeds three times greater energy.

Mori: That makes a difference.

Yanase: It is encouraging.

Yoda: The question is how this technology can be established systematically in developing countries.

Endo: If money and technology are to be used for this purpose, Japan can give a message to these countries.

Yanase: Yes.

Mori: Money is not enough.

Yoda: We should not be giving money as charity.

Yanase: The money spent will be for us too.

Mori: It will be for us and for them as well.

Yoda: We all share the same fate.

Mori: Now it seems that we have reached a conclusion. We will end our discussion here. Thank you very much.