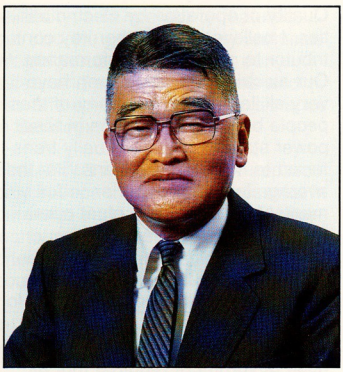

Mr. Yotaro Iida, President of Mitsubishi Heavy Industries, Ltd.

POWER PROFILE: YOTARO IIDA OF MITSUBISHI HEAVY INDUSTRIES

Japan's Mitsubishi Group represents one of the largest corporate conglomerates in the world. From banking and international trade, to consumer products and heavy industries, the 28 major companies and their affiliates that comprise the Mitsubishi Group account for over 12 percent of Japan's total GNP.

The Westinghouse Electric Corporation has been closely involved with the Mitsubishi companies since 1919, when it began negotiations with the Mitsubishi Zaibatsu for the manufacture of Westinghouse products in Japan. In 1923, Westinghouse and Mitsubishi Denki Kabushiki Kaisha (known today as Mitsubishi Electric Company) signed a ten-year licensing agreement covering the manufacture of a large scope of Westinghouse products.

Westinghouse began transferring its steam turbine technology to Mitsubishi Heavy Industries, one of the core companies within the Mitsubishi group, in 1952. Since that time, Mitsubishi Heavy Industries and Westinghouse have signed licensing agreements for a wide range of Westinghouse power generation and nuclear technologies, including the design and manufacture of such products as combustion turbines and nuclear steam supply systems.

Through the years, MHI has continued to incorporate this technology in its energy projects and has maximized its own excellent engineering and manufacturing capabilities to become a self-sufficient supplier of power plants and components. To date, MHI has been the turnkey supplier of more than 100 of Japan's currently operating utility power plants, 16 of which are nuclear units. In response to the ambitious nuclear program established by the Japanese government and utilities, MHI is also actively engaged in the construction and planning of an additional seven nuclear units which are scheduled to begin operation between 1987 and 1995.

As president of Mitsubishi Heavy Industries, Mr. Yotaro Iida has long been a driving force behind MHI's ongoing advancements in the energy industry. He has been instrumental in helping establish the development of the Advanced Pressurized Water Reactor (APWR), and has led his company in its development of many energy innovations, such as new types of fuel for power plants.

As he looks to the future, Mr. Iida sees nuclear energy as a way to secure the future well-being of the people of Japan — as well as those of other nations. He anxiously awaits the opportunity for MHI to construct the world's first APWR and looks forward to participating in the latest MHI/Westinghouse partnership — one involving the joint development of an advanced combustion turbine.

In the following interview, Mr. Iida discusses MHI's role as a supplier and shares his views of the Japanese energy industry.

Q Japan has developed quite a large nuclear program in a relatively small amount of time and has plans to carry out an even more ambitious program in the future. Obviously, your success in these endeavors has and will require a lot of cooperation and communication among government agencies, utilities, and suppliers. How do each of these bodies currently interact with each other?

A I feel that one of the most important reasons behind Japan's successful nuclear development is the fact that the government, the utilities, and the suppliers always work together as one organization. The individual parties traditionally do not oppose one another.

We are very fortunate in the fact that our government agencies wholly support the development of nuclear power in Japan. As the primary catalyst behind the advancement of this technology, they have long realized the great role that nuclear energy plays in the economy, security, and future development of Japan.

In addition, Japanese utilities — in contrast with many U.S. utilities — are totally in support of building as many additional nuclear plants as necessary to meet Japan's future requirements. We are lucky that, as

MHI Energy Generation Experience

Plant Type	Total In Operation	Total Under Construction or in Preparation for Construction
Combustion Turbine	109	7
Steam Turbine	87	5
Nuclear	16	7

Westinghouse was the prime contractor for three of the combustion turbine plants, seven of the steam turbine plants and four of the nuclear units. MHI supplied the turbine generator islands for all of the nuclear units.

suppliers, we do not have to *convince* the government or the utilities of the benefits of nuclear energy. In fact, in Japan, suppliers have very little influence in establishing energy programs or policies. The government and the utilities make the major decisions and, as manufacturers, we follow these policies.

"Good conversation can solve any complicated matter."

In the U.S., suppliers such as Westinghouse have a lot of influence within the nuclear industry and are often instrumental in setting policies. Japanese suppliers, on the other hand, do not have such strong influence, particularly with the government.

Q MHI's nuclear plant construction schedules have been significantly shorter than those of other suppliers. How do you maintain such short schedules?

A Before we started building nuclear plants, we had about 50 years of experience in constructing fossil power stations. The construction schedules for these units ranged from 24 to 28 months. By comparison, it takes us about 48 months to build a 1000 MWe nuclear plant. So, the schedule for constructing nuclear plants is really not that much longer.

One of the ways in which we maintain short schedules involves the way we contract. For both fossil and nuclear plants, we usually bid turnkey contracts, including installation works, and guarantee total equipment supply — since we manufacture not only main components but also all major balance-of-plant components in-house. In other words, we are assuming almost 100 percent of the risk associated with constructing the unit. Also, we work closely with the utility during construction to make sure that any problems are addressed quickly and openly. We believe that good conversation can solve any complicated matter. So, if the unexpected occurs, we always have a chance to discuss the situation with the customer and work out ways to solve the problem as a team. This reduces project risks to a great extent.

Q What do you think is the biggest contributor to high availability and reliability in your nuclear plants?

A There are many factors that affect high availability in Japanese nuclear plants. Again, the close cooperation among the government, the utilities, and the suppliers plays a major part. Also, I believe that good quality control and quality assurance in manufacturing is one of the most important contributors. Our factories introduced quality control techniques from the United States more than 30 years ago. Now, Japanese products, particularly MHI's products, benefit from this adherence to quality.

One of the reasons that quality control works so well for us is because, at MHI, white collar workers and blue collar workers work together. There is no distance between the two. Everyone works as a team to make the quality components.

Quality of operation by electric utilities, I believe, is the other key contributor to good plant performance. Our electric utilities in Japan have very skilled operators. Many of these people began as operators in fossil power stations and eventually transferred to nuclear operations. So, the average length of experience for many of these nuclear plant operators is almost 20 years.

I'd also like to emphasize that the relatively short inspection periods for plants in Japan have really helped us improve availability factors. Japanese government requires that all power plants carry out annual inspections. In the earlier days, it took about 150 days for annual inspections; today the inspection period is less than 100 days — thanks, in part, to special tooling, such as robotics. Some of these tools were developed through a joint effort between Mitsubishi Heavy Industries and Westinghouse; others were developed through our own efforts.

Q When MHI first set out to develop the Advanced PWR, what were some of your major goals?

A To date, Mitsubishi Heavy Industries has installed 16 units which incorporate Westinghouse PWR technology. Seven additional units are currently under construction or in preparation for construction. While it has always been my own personal desire that the Japanese nuclear industry continue building the Westinghouse-type PWR, it became increasingly clear that MHI also needed to begin developing another type of reactor — one that satisfies the unique energy demands and safety requirements of Japan. Part of this new development plan was in response to the requests of both government and electric utilities.

"Without nuclear energy, Japan would be a 'black-out' nation."

Japan has a very large population, with many people living close to nuclear power stations. For that reason, it is absolutely essential that we design a type of plant that incorporates not only the best availability,

reliability, and operability features, but also the greatest safety features. Westinghouse understands our safety and performance goals and has offered us the highest assistance in developing the APWR.

The APWR will originally be applied only in Japan. If we are successful in our initial endeavors, MHI and Westinghouse will eventually be able to offer the new plant design to other countries, as well.

"In Japan, virtually every industry is interested in the combined cycle plant."

Q What have been some of the major challenges you've faced in developing the APWR?

A One of our major challenges has been to try and minimize the costs associated with developing the new design. In developing the APWR with Westinghouse, we have spent quite a large amount of money. Today, the Japanese government is requesting manufacturers to reduce nuclear construction costs by 15 percent, while electric utilities are requesting manufacturers to cut costs by 20 percent. Basically, they want us to try and keep nuclear plant construction costs at the same level as fossil plant construction. Given those requirements, engineers from MHI and Westinghouse have been aggressively working on ways to reduce construction costs — as well as generation costs — for the new reactor design. We are now reaching the final stages of work necessary to satisfy the cost reduction requests of the government and utilities. If we cannot keep the price down to a reasonable level, it's clear that we will not receive any orders for the APWR.

Another major challenge associated with the APWR has been the lack of an appropriate site for the proposed plant. The Kansai Electric Power Company, which worked with MHI and Westinghouse to develop the APWR, will undoubtedly be the first utility to adopt the new design. Kansai is still negotiating with local government bodies to determine where they can build the first unit. So, although the final development of the APWR is reaching completion, we must all wait until Kansai acquires an approved site before we can actually begin constructing the plant.

Nuclear Plants Supplied By MHI

Utility	Plants In Operation	Plants Under Construction or In Planning Stages
Kansai Electric Power Co.	9*	2
Shikoku Electric Power Co.	2	1
Kyushu Electric Power Co.	4	2
Japan Atomic Power Co.	1	
Hokkaido Electric Power Co.		2
TOTAL	16	7

*Four units supplied by Westinghouse as prime contractor

Q To what extent, if any, did the Chernobyl nuclear accident affect MHI's nuclear activities?

A Chernobyl had no immediate or long-term effect on the operation of nuclear plants in Japan. There were also no delays in the construction schedules of plants under construction at the time of the accident. Delays can be very serious for us, because as a manufacturer, we have to respond quickly to the schedules established by the government and utility customer.

The accident did, however, have some influence on the APWR program, as it undoubtedly contributed to the delay in locating a suitable site.

"The time I spent working for MHI in the United States had a big impression on me."

While we do not manufacture the type of reactor installed at Chernobyl [the RBMK design], we should consider this event as a warning. Our priority is to protect the public at any rate; therefore, we must put greater emphasis on developing the necessary actions to take in the event of an accident. This is an area that I would like for our company to more seriously study, under the supervision of Japanese government and utility people.

If an accident such as Chernobyl were to happen in Japan, the Japanese energy policy would certainly be reconsidered and possibly abandoned. Without nuclear energy, Japan would be a "black-out" nation; there is simply no other practical energy alternative. Therefore, it is essential that we design and operate our plants to the highest safety standards.

Q Aside from the development of nuclear plants, including the APWR, what other ways will MHI be meeting Japan's future energy needs?

A There is a major need in Japan to reduce fuel costs for both nuclear and fossil units. Because Japan has no natural coal, oil, gas, or uranium, we are forced to import most of the fuel we need — often at very high prices. In response to this issue, MHI is exerting a major effort to develop different kinds of fuels for power plants. For instance, we are doing a lot of work with fuel mixtures, such as coal and oil mixtures. In 1985, we completed a fossil plant which uses a fifty-fifty mixture of coal and oil. We have also been developing a fuel which consists of a mixture of coal and water. In 1987, we are carrying out a burning test of this mixture at a pilot plant that we are currently constructing. In addition, we are also investigating the burning qualities of certain types of low-price oil.

Q In 1986, MHI and Westinghouse formed an agreement to develop new combustion turbines for use as peaking units and in combined cycle plants. What is the market for such plants in Japan and how will Westinghouse and MHI work together to produce the turbines?

A Fortunately in Japan, we have a long history of utilizing power generation plants in industrial factories. So, we have a lot of experience in this area. Right now in Japan, virtually every industry is interested in the combined cycle plant — especially those plants which contain combustion turbines. Our joint collaboration with Westinghouse will allow us to merge our experience to offer these turbines in Japan and the U.S.

"I'm hoping that nuclear development in the U.S. will resume soon."

Essentially in this agreement, Westinghouse is the professor and MHI is the student. The professor will determine the responsibilities for each supplier. We will follow Westinghouse's lead. Scopes of work will be decided by friendly conversation between Westinghouse people and MHI people. It is most important to keep friendly conversation between the two.

Q Early in your career, you spent time at Westinghouse's plant in Lester, PA, where you were involved with steam turbine technology. What were your responsibilities, and how did this early exposure to Westinghouse and U.S. technology influence your later work at MHI?

A MHI formed an agreement with Westinghouse to license its steam turbine technology in 1952. Shortly thereafter, MHI received an order to supply a 66 MW steam turbine plant [Himeji Unit 1] for The Kansai Electric Power Company. In order for MHI to prepare the complete design for the plant, I was sent to the Lester facility to study the design of the Westinghouse-type turbine. In addition to learning the design details of the turbine, I learned how to work on design engineering on a broad scale. This was quite an education for me. Years later, between 1959 to 1961, I was again stationed at the Lester plant — this time as a district representative of MHI.

The time I spent working for MHI in the United States had a big impression on me. At that time, in the early 1960s, I saw America as a very idealistic country. John Kennedy was a young president. People had big dreams. I had very strong impressions of people working very hard and very prosperously. In fact, one of the most important things I learned during my stay in the U.S. was how to enjoy life. I was very busy, but also very happy in America.

Yotaro Iida and Ted Stern, Westinghouse Energy Systems Executive Vice President, signing Memorandum of Understanding for the APWR program in 1981.

My early exposure to the U.S. business world showed me that hard work and high technology contribute greatly to the prosperity and well-being of a country's people. Today, at Mitsubishi Heavy Industries, we are always concentrating on ways to benefit the people of Japan, so that they can enjoy a more comfortable life. As a company policy, MHI considers national profit over company profit. By national profit, I'm referring to the contribution we can make to the welfare and economy of Japan as a whole.

"My number one priority is to secure an order for the APWR."

Q Aside from the collaboration on the APWR and combustion turbine technologies, how do you view Westinghouse's future role with MHI?

A Westinghouse has a very highly developed and large technology base, and, in terms of experience, is far ahead of MHI. We are hoping that we can continue to receive new nuclear technology and operating data from Westinghouse in the future. However, we are concerned that the dwindling nuclear market in the U.S. will affect Westinghouse's ability to provide us with the very valuable technical information that we appreciate so much. As an engineer, I'm hoping that nuclear development in the U.S. will resume soon, so that Westinghouse can continue to maintain its leadership role and provide us with valuable data.

Q What are your personal visions for MHI's future nuclear program?

A My number one priority is to secure an order for the APWR from a domestic utility and begin construction as soon as possible. My second priority is to export the Westinghouse-type PWR to overseas markets, under the cooperation of Westinghouse. Based on MHI's success in building nuclear plants in Japan, I feel that we can make a very good contribution to energy programs in other countries. If, in the future, a country requests our help in developing a nuclear power program, we would willingly extend our valuable experience to them. Of course, we will do this only through a prior agreement with Westinghouse.

In every country I visit, I promote nuclear generation. I believe it will lead to much prosperity for the people of the world.