

ENHANCEMENT OF INTERNATIONAL COOPERATION AND EXPERIENCE EXCHANGE -

INTERNATIONAL AND REGIONAL COOPERATION IN NUCLEAR TECHNOLOGY

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ABSTRACT

This paper will explore methods that have been effective in accomplishing broad-based technology transfer relationships between international commercial nuclear organizations, and have enhanced the benefits from such relationships through mutual participation in the development of new technology.

The factors involved in accomplishing technology transfer will be examined based on the 25 years of Westinghouse experience in establishing successful nuclear technology relationships with over 20 different associates world-wide. This will include information pertaining to organization, training, consultation, technical information transmission, and other important aspects of technology transfer.

Additionally, the methodology of enhancing and increasing the benefits of technology transfer through cooperative development programs as produced and promoted by Westinghouse with its associates will be examined. This will include reviews of several significant cooperative programs, such as the programs for the Advanced Pressurized Water Reactor and the Integrated Protection and Control Systems for future plants.

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We live on one planet but in a divided world. If a sound emanates from the Earth into space, it must surely be the clamor of argument. Some of us believe in collectivism, and some in capitalism. Some believe in community, and others in the individual. We are neighbors opposed to strangers, poor versus rich, the lazy against the productive. Man is an argumentative animal.

But on a few important subjects, most nations agree. One of those subjects is nuclear energy. A majority of mankind has concluded that nuclear energy is an indispensable source of economic hope. That mutual agreement has produced a kind of brotherhood, and a sense of larger purpose.

We work--together--for the peaceful, productive advance of a spectacular technology. What we do will inevitably make the future a better world. A nuclear power plant is a building with tomorrow inside. That is reason enough for cooperation, but it is only the beginning of our mutual motivation to work together.

Behind this global view, there are profoundly practical reasons for cooperation in working with nuclear energy: This is a technology which is advancing on so great a scale and so broad a front that to work separately is to fall behind. Cooperation is the very foundation of progress.

At Westinghouse, we see this truth most clearly in the patterns of international pressurized water reactor technology transfer. Nations and companies which have committed their futures to the mainstream of pressurized water reactor technology--now the clearly dominant choice worldwide--are bound together by great common interest.

As an example, let me use this simple illustration of the present state of our Westinghouse technology transfer operations. Each of these nations has some arrangement with us for the exchange of PWR technology. When any nation enters this pool of technology exchange, it automatically joins hands with most other PWR nations and utilities around the world. This mutual support has carried PWR technology along rapidly, and promises much for its future.

Recently, we witnessed an impressive vote of confidence on the value of such international cooperation. In the United Kingdom, Sir Frank Layfield released the results of a public inquiry on the proposed Sizewell B pressurized water reactor. The report represents years of in-depth examination of this particular PWR plant for Britain. As I'm sure you know, it recommended that the Sizewell B PWR be built--without undue delay.

There are many aspects of the Layfield report that pleased us--including the fact that this specific PWR had its genesis in the Westinghouse design. Sir Frank examined the design's safety, economics, and environmental impact. He made a positive recommendation on all three counts. Along the way, he also made a compelling statement about the value of worldwide cooperation in PWR technology.

In several places, the Layfield Report answers an objection that United Kingdom engineers lack experience in PWR technology. The objectors do not suggest that U.K. engineers lack technical competence in the nuclear field, because they clearly do not. They have more than 20 years of direct experience with gas-cooled reactors, but none with PWR's.

The report answers the objection with an unquestionable fact--quote: "There is a large amount of worldwide experience from which general lessons can be drawn and detailed operating data collected. Britain's Central Electricity Generating Board has access to this data." Unquote.

Clearly, the United Kingdom can feel comfortable with a total change from its former commitment to advanced gas-cooled reactors to the world's choice--the pressurized water reactor. Beyond any doubt, this change is greatly facilitated by the fact that worldwide PWR cooperation is a reliable basis for that new commitment.

International cooperation is the setting for the nuclear jewel. Just as this is a useful truth for technologically mature nations such as the United Kingdom, it is equally, and perhaps even more valid for rapidly developing nations. No one, whether old or new in the nuclear field, can afford to function outside the mainstream of technology.

The basic mechanisms in technology transfer which form the practical side of such worldwide cooperation are familiar to everyone here. What I would like to discuss today is the process by which the momentum of PWR development is increased. I will look specifically at the roles played by experience, by the dynamics of technology transfer, and by an all new level of cooperation which has not previously been described in papers such as this.

The powerful momentum now enjoyed by the pressurized water reactor is the product of 30 years of worldwide development. The data base and detailed understanding of PWR technology has reached enormous proportions. In many ways, PWR technology is already mature. The foundation for the future has been laid.

A few numbers tell the story: Westinghouse alone has played a direct role in the design and construction of 92 nuclear steam supply systems. Our technology has been basic to the design and construction of 72 more. In all, there are 164 pressurized water reactor systems based on the same initial technology on line or under construction around the world.

All of these designers and builders are linked by technology transfer agreements. Knowledge developed by each is available to all others.

Pressurized water reactor momentum, based on experience, is increasing rapidly --almost literally by the hour. The mechanism for that acceleration is the dynamic and cooperative nature of technology transfer itself. At any moment of any day, information may be flowing into this primary reservoir of PWR knowledge from any one of its worldwide sources. Cooperation is a continuous, many faceted process.

Italy, for example, might be adding knowledge based on the research on instrumentation and safety it is conducting in a joint venture with us. Or it may be contributing improvements in steam generator design--as part of a similar joint venture.

Japan has recently helped to make a massive contribution to the mainstream of PWR knowledge, as it has completed its mutual work with Westinghouse on the design of the Advanced Pressurized Water Reactor...a design for operation in the 1990's and beyond.

The Advanced Pressurized Water Reactor design has been created on a cooperative basis by Westinghouse and grouping of Japanese companies, including Kansai and MHI. We entered this project with the Japanese to effect significant performance improvements in every basic category--availability, economics, operations, safety, and efficiency. The design is complete through its intermediate stage. So are the verification tests. The next step is to build the APWR.

Advances in the APWR program will be made available to every PWR associate worldwide. We are already working on the design of a 1000-megawatt model which incorporates most APWR features. We believe it will be a sensible choice for many, if not most, nations.

The value of such worldwide cooperation in sharing and advancing the mainstream of PWR technology is clear to all who take part in it. It is also indispensable to those nations and utilities which are making significant plans for their nuclear futures.

We are now learning how to expand the basic value of working together internationally, going beyond the limits of the technology itself. Cooperation can also serve political, financial and especially national purposes.

Worldwide cooperation can serve national purposes extremely well, especially for smaller and emerging nations.

A smaller nation which wants to encourage exports can, as many are, take part in patterns of worldwide cooperation by developing a carefully defined capability in nuclear technology.

This process always begins with a specific plant project. The nation creates an open-ended partnership with a major supplier. As it builds, it learns. It develops manufacturing and engineering capabilities. A cadre of skilled people is created. In time, the nation's capability becomes very broad.

A nation which has reached this stage is clearly ready to export its particular capabilities to other nations. It can contribute to worldwide nuclear cooperation.

In doing so, it goes well beyond the central process of technology transfer. It pursues its own national ambitions. That's good economics. And it's good internal politics.

Cooperation can go even farther. Today, we at Westinghouse frequently find ourselves deeply involved in complex international arrangements which can extend well beyond both technology and nationalism to help bring nuclear energy to nations, especially less wealthy nations, by affordable means.

We are privileged to be part of such arrangements because we have a well established worldwide base. We have business offices, for example, in Japan; China; Hong Kong; Korea; Brussels; Spain; the United Kingdom; Sweden, and Italy. We have worked with architect-engineers all across the world. We have formed cooperative agreements of every known shape and size, from licensing through joint ventures, partnerships and minority positions. We have experience in trade and countertrade. Our financial contacts are worldwide.

From such elements we are able to assemble the kinds of agreements which can bring mainstream PWR to almost any nation on the face of the Earth, in packages which fit that nation's specific needs.

The details of such packages vary widely. We have, for example, created agreements which source many units of hardware for a plant from many nations--each of which will supply a major part of the financing for that hardware. We have sometimes gone on to secondary sources to complete 100% financing. We have even negotiated extensions on the financing to match project delays. The worldwide cooperation which may make this project possible is impressive.

At other times, we take different approaches, perhaps pulling together a package which will localize the scope of the project to the highest degree possible, because the nation wishes to keep its foreign debt to a minimum. We may take part in a joint venture which will help to get the project built as much within the country's borders as possible.

Cooperation often combines with imagination. We may begin a project by evaluating a nation's needs and recommending power plants on a build, own, operate, sell

and transfer basis. With that approach, we can build the needed plants, helping the nation attract financing for interim private ownership. We may then operate the plants, and sell their electricity to a utility for an agreed-upon price. In time, the nation will own the plant. After that, we will support it with ongoing modernization and availability improvement technology. Through such arrangements, the nation can get its electricity without a major initial capital investment. The electricity, in turn, will spur early growth of the nation's economy, and that in turn will help pay for the plant. Such arrangements benefit everyone involved.

At Westinghouse, our goal is to offer a nation a complete menu of energy options--in a mirror image of Westinghouse total energy capabilities. Some of the nation's needs may be non-nuclear...calling for combustion turbines, wind farms, solar photovoltaics or fuel cells. Whatever the nation needs, it will get.

Clearly, in constructing such packages, Westinghouse and its associates offer a new kind of worldwide cooperation in the field of energy--especially nuclear energy. We feel honored by the role we play, but we know we cannot do the whole job alone. We are well aware that this is a style and depth of cooperation which usually calls for support from many nations. It always demands multiple sources of finance, engineering, and manufacturing. Only in nuclear energy is such worldwide cooperation commonplace.

Energy is indispensable to the hopes of all nations for a better future--but most of all, to the hopes of nations which are moving eagerly toward full participation in the benefits of our technological age. We technologists have the honor of fostering that growth in energy production. We have pride in knowing that what we accomplish will touch the lives of millions, bringing hope where there is now despair, a future where there is now no tomorrow, and harmony where there is envy.

Let us hope that our worldwide style of cooperation will never be compromised.

Thank you.