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"CANDU MARKET PROSPECTS"

B. K. Kakaria,
Vice-President, Marketing & Sales
AECL CANDU 0653500CA

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An Overview of Market Prospects for CANDU

INTRODUCTION

It is a pleasure to have this opportunity to provide an overview of the market prospects for CANDU. Before describing some of the specific marketing and sales initiatives AECL is pursuing, a few facts regarding the role of nuclear power around the world may help to set the scene and provide a better perspective of what the future may portend.

Reactors in Operation

There are, today, some 429 nuclear power plants in operation around the world. The majority are located in the G7 type countries like USA, France, UK, Germany, where nuclear power has evolved over the last 30 years and already plays a significant role in the generation mix, ranging from 20 % to 78 %. This, together with the slowing down of economic growth has led to a reduction in the rate of new commitments in these countries, which is not too surprising.

However, it is important to note that, in the interim, some of these countries are continuing to invest in the development of new reactor designs for future use, when there is an economic upturn and demand starts to increase. The situation in Canada is also somewhat similar.

Another perspective is provided by the fact that there are over 40 nuclear power plants under construction today in over 15 countries. So far from there being a global hiatus, nuclear power plants are continuing to be constructed, especially in the high growth areas of the world.

Although there are presently no new build projects in Canada, there are, as described earlier, CANDU units under construction in Romania and South Korea representing almost 15 % of the international total.

By far the highest growth area is the Asia Pacific region where recent GDP growth rates have averaged 6 to 7 % and are expected to continue at these levels well into the future. There is no doubt that the countries in this region represent significant opportunities for new nuclear power plants.

In looking at CANDU export prospects in Asia Pacific, our current activities will be briefly highlighted in some of the countries in the region. But first, an overview of Turkey, which is looking to make a commitment to its first nuclear power plant in the short term.

TURKEY

In Turkey, AECL is vigorously pursuing the revived interest in the Akkuyu nuclear power plant project. AECL's involvement in Turkey goes back to 1983 when we competed head to head with Siemens/KWU and successfully negotiated a contract for a conventionally financed CANDU 6 project. However, late in the process Turkey changed the contract basis to a BOT model, which did not achieve the support of the international financing community and the project did not proceed.

But over the last decade, electricity demand in Turkey has increased by an average of more than 8% per year. In 1992 alone, installed capacity, mostly hydro and coal, increased by 8.7% to 18.7 GW, and electricity production increased by 11.8%. Based on this growth, the Turkish utility's plan shows that 1500-2000 MWe of capacity additions will be required each year after the year 2000.

Turkey has been getting ready for nuclear for some time now and has made significant investment in the Akkuyu site. This is a fully licensed site, which is large enough to house four CANDU 6 units -- a site that could generate the 1500-2000 MWe of extra capacity Turkey needs at the turn of the century.

Turkey - Current Situation

In 1991, under the Prime Minister Dimerel's direction, Turkey once again revived interest in the nuclear option. In October 1992 TEK, the Turkish utility, requested preliminary proposals from all nuclear vendors for a 100% financed turn-key nuclear power plant at the Akkuyu site with a target of a project contract in place by October 1993 as identified in the governments investment plan for major projects.

However, in April 1993 the sudden death of President Ozal led to a chain of political events that saw PM Dimerel become President and Mrs. Ciller become the new PM. These events seriously delayed Turkey's aggressive schedule for the acquisition of its first nuclear power plant.

In October 1993, the new government, headed by Mrs. Ciller, reviewed the country's energy requirements and reaffirmed the need to proceed with nuclear.

In response to Turkey's request, AECL submitted a preliminary proposal in December 1992, offering the CANDU 6 for the Akkuyu site. We believe that this offer affords certain advantages:

- a product already known to Turkey; it was the basis of the 1984/85 contract.
- a mid-size unit with better prospects for being financed and more suited to the Turkish grid.
- economic benefits of replication based on the Wolsong CANDU 6 units under construction in Korea.

From the outset it was clear that the most difficult task was to put together the 100 % financing required by Turkey, and that it would not be possible to do this from Canada alone. Therefore, very early in the process, AECL undertook to put together an international consortium so as to be able to access world wide financing resources. Over the last year we have made very good progress on the financing package. AECL wants to acknowledge the support and participation of our Canadian private sector partners in this effort, especially NPM (Nuclear Power Managers) and Canatom, who worked closely with the consortium members in putting together a full scope priced proposal ready for submission..

So, what is the situation today ?

In January of this year, TEK took a major step forward in the procurement process by issuing an international tender for consulting services. Eighteen international companies submitted bids on April 26 which are currently under evaluation. TEK's target is to select a consultant by end of July and proceed to the preparation of bid specifications and an Invitation To Bid. Based on this process the expectation is for Turkey to complete negotiations for a project contract in 1995. However, it is important to note that Turkey is currently in the midst of dealing with some severe economic problems with the help of the IMF, but the international financial community is cautiously optimistic that this is a short-term issue.

The competition for this project is intense with the strongest challenge being from Nuclear Power International, the joint venture company of Siemens and Framatome. This group has proposed the German Konvoi 1300 MW unit design with most of the heavy equipment manufactured in France. Their sales effort is being led by Siemens which brings very strong trade and political ties between Turkey and Germany.

Other competitors like Westinghouse, and ABB-CE are also present.

With good progress on the international financing package and the excellent record of the CANDU 6 in the export market, CANDU is seen as a strong contender for Turkey's first nuclear power plant.

ASIA PACIFIC REGION

In the Asia Pacific region, the high growth countries of China, Indonesia, Thailand, and Philippines represent potential new prospects for CANDU nuclear power plants.

THAILAND

In Thailand and the Philippines AECL is mainly supporting their early planning and policy formation activities for the nuclear option.

Electricity demand in Thailand is forecast to grow from about 11,000 MW at present to about 20,000 MW by 2002. EGAT's (Electricity Generating Authority of Thailand) planning document calls for 6000 MW of nuclear capacity installed during the period 2005 to 2010. The initial units are likely to be committed in 1996/97.

The decision to proceed with nuclear program is yet to be taken by the Thai government although just last month, the Prime Minister of Thailand announced the formation of the Nuclear Facilities Regulatory Centre which will oversee all future nuclear power plant activities. This move signals the seriousness with which Thailand is pursuing the nuclear option.

AECL has been active since 1992 in Thailand, building awareness of the nuclear option, especially CANDU. AECL's current program is focused on market development and developing support for the nuclear infrastructure.

THE PHILIPPINES

Power shortages continue in the Philippines. At least 4000 MW electricity is required by 2000, a growth of 6 % over their current grid size of 7000 MW. Westinghouse's BATAN nuclear power plant, built in the 1980s, remains mothballed. The Philippines is formulating plans for new nuclear plants, separate from the issue as to what to do with the Westinghouse plant at BATAN. A preliminary Philippines study last year, recommended proceeding with nuclear and identified CANDU as one option that should be considered.

AECL is offering input to the Philippines' government's nuclear public information coordination team, and we will continue to be active in this market.

KOREA

The success of the recent sales of Wolsong 2, 3 & 4 in Korea has once again focussed world attention on the CANDU option. Korea's dramatic economic growth and successful experience with nuclear power is seen as a model by many countries in the region for the development of their own nuclear programs.

Korea's long-range energy plans include about 12,000 MW of new nuclear capacity required in the next decade. One of the new challenges emerging in Korea is securing additional nuclear sites. KEPCO has therefore identified the need to maximize the electrical output from the existing nuclear sites, including Wolsong.

As a result, one of the options being looked at in a joint program is the potential for a large CANDU unit, suitable for the Wolsong site. The studies are targeted to ensure that AECL is ready to respond to KEPCO's needs with the right product at the right time.

For the longer term, technical work continues with Korea on the fuel cycle flexibility of CANDU, with particular emphasis on the synergy with the PWR. The ability of CANDU to burn spent PWR fuel can provide strategic benefits. The Canada/Korea/US "DUPIC" (Direct Use of PWR Fuel in CANDU) program, which is looking at the direct use of spent PWR fuel in CANDU is progressing well.

INDONESIA

AECL worked in the Indonesian market in the mid-1980s, when AECL was awarded a contract to supply an electro-mechanical laboratory to the BATAN Research Centre at Serpong just outside of Jakarta.

Indonesia, with a population of about 200 million and sustained high economic growth (approximately 6%), has an energy plan that includes 7000 MW of nuclear capacity to be committed between the years 2000 and 2015, with the initial unit commitment planned for 1995/96.

A detailed feasibility study has been underway for some time of the Mauria site in North Central Java carried out by a Japanese consultant NEWJEC in conjunction with BATAN, the Indonesian Atomic Energy Authority.

In March 1992, Indonesia launched an additional feasibility study to assess the available reactor types and their suitability for Indonesia's nuclear needs. BATAN invited all nuclear vendors, including AECL, to submit comprehensive information packages for their evaluation in conjunction with NEWJEC of Japan. This study was completed in late 1993 and concluded that nuclear is economically and technically feasible for implementation on the island of Java. In addition, it recommended a mid range unit size of 600 MWe in service by 2004, as the preferred option for Indonesia to start its nuclear program.

BATAN is now embarked on the next step of preparing the bid specifications and an Invitation To Bid, that is expected to be issued within the next 2 years.

The competition is tough, with a strong Japanese presence and interest in this market. The Mitsubishi/Westinghouse combination is expected to be the strongest competition supported by an attractive Japanese financing package. Others in the field are the Hitachi/Toshiba/GE combination, ABB-CE, and Siemens/Framatome.

Given Indonesia's preferred unit size of 600 MWe, the CANDU 6 certainly provides the basis for a strong challenge from Canada. To strengthen CANDU's position in this market and pursue this potentially large opportunity, AECL has formed a joint marketing team with major Canadian private sector companies, who have been successfully doing business in Indonesia for many years. These include Babcock & Wilcox Canada, General Electric Canada, and Canatom which also represents Agra/Monenco and SNC/Lavalin.

The team is now actively preparing plans to pursue this opportunity in Indonesia.

CHINA

With its economic reforms and modernization program, China by far represents one of the largest markets in the world given its high growth rate in electricity demand. Just in terms of electricity demand alone, most provinces in China are "equivalent" to countries. The high growth areas include southern and eastern coastal regions, which are remote from China's hydro and coal resources located mostly in the north and west.

China's current installed capacity is 165,000 MW. It requires another 40,000 MW just to ease today's severe shortages plus, on average, another 15,000 MW per year this decade!

As China decided to base its nuclear power program on PWR technology, the nuclear power plants to date comprise only PWR designs, both indigenous and imported. Currently there is one Chinese 300 MW PWR in operation at Qinshan and two 900 MW Framatome units at Daya Bay. In addition there are two 600 MW Chinese PWR units under construction at the Qinshan site.

China's plans include some 15,000 to 18,000 MW of nuclear capacity to be committed before the year 2000. At the moment, the provinces of Jiangsu, Shandong, Guangdong, Jilin and Hainan Island offer the most potential for new nuclear plants, because of their high growth and coastal locations. Each of these provinces requires is looking at a possible commitment within the next 2 to 3 years.

AECL's marketing efforts in China go back to the 1980s, when an agreement was signed with Jiangsu province to carry out a feasibility study for a CANDU unit. However in the intervening period, political developments and China's PWR only policy precluded completion of this work.

In 1993 China showed a renewed interest in examining the potential use of CANDU, and a number of senior level delegations visited Canada for exploratory talks. This led to the signing of agreements between AECL, the China National Nuclear Corporation and the Provinces of Jiangsu, Shandong and Jilin to assess the feasibility of introducing CANDU into these areas.

This work has yielded positive results regarding the suitability of the CANDU option, and the attractiveness of its fuel cycle flexibility. In addition CANDU's synergy with China's existing PWR program provides the longer term prospect for the use of spent PWR fuel in CANDU units, a strategic benefit.

The process is now underway for putting in place a nuclear cooperation agreement between the Governments of Canada and China. This is an important prerequisite to open the door to the large opportunity that exists for CANDU in China.

However, this will be quickly followed by the enormously challenging task of structuring comprehensive CANDU projects, and the supporting financing packages that will be required to realize this opportunity.

OTHER PROSPECTS

Egypt

Peak electricity demand in Egypt is projected to grow at 700 - 900 MW per year to 2015. The Egyptian government included a nuclear unit in its 1992-1997 five year plan.

AECL and Bechtel have been working together since the early 1980s in Egypt, focusing on localization studies relative to the introduction of a CANDU 6 at the El Dabaa site.

A 2-year AECL study on Technology Transfer of CANDU 6 nuclear power plant components was launched in July 1993. AECL's Localization and Implementation Planning Phase portion of the Technology Transfer study is currently underway with NPPA (Nuclear Power Plants Authority) of Egypt and AECL.

Fuel Cycles

CANDU has recently captured increasing international attention with recognition of its unique ability to handle advanced fuel cycles. There is growing interest in our fuel cycles from around the world, including the Netherlands, Korea, Germany, the U.S. and others.

In particular, technical discussions are underway with Dutch and German research institutes to demonstrate CANDU as a candidate for actinide burning and the use of thorium fuel; this will partially alleviate the nuclear waste problem.

Russia/Former Soviet Union

When the Former Soviet Union's structural changes occurred in the early 1990s, Canada and AECL were one of the first to offer assistance that focussed on improving the safety of the RBMK reactors. As part of this program, a Canada-Russia Government-to-Government Memorandum of Agreement on Safety Programs will be finalized shortly with Russia.

The Ukraine is interested in the CANDU 6 and Spent Fuel Dry Storage but talks are of a preliminary nature. Since the political and economic transition is taking longer than expected, AECL will continue to focus on safety initiatives with Russia.

Argentina

Argentina's Embalse plant, a CANDU 6, went into service in 1984. Since then AECL has maintained an active marketing and service support effort to CNEA, the Argentine National Nuclear Commission.

AECL and CNEA recently signed study agreements to look at the potential for a small CANDU 3 type reactor in Argentina and the potential for collaboration in R&D. The Canadian-Argentine Nuclear Co-operation Agreement is expected to be signed shortly, thus facilitating increased AECL-CNEA co-operation and work opportunities.

SUMMARY

In summary, not only is nuclear "alive and well" but the prospects for CANDU are significant, especially in the high-growth markets of the Asia Pacific region.

The competition will be fierce. With slow growth in their domestic markets, all major nuclear vendors are targeting the international arena.

To win, we need the backing and support from all parts of the Canadian nuclear industry and the Canadian government, "Team Canada".

This 'domestic' support is vital, but we will also need to complement this with 'international partners', so as to access the much-needed financing required for CANDU projects around the world.