Financing Disaster

How the G8 fund the Global Proliferation of Nuclear Technology

June 2001 (Excerpt - Executive Summary, Introduction and Canada)

For more information please contact the following:

Sierra Club of Canada Nuclear Campaign
C/o P.O. Box 104
Uxbridge, Ontario, Canada L9P 1M6
Tel/Fax: 1 905-852-0571
e-mail: nucaware@web.ca
http://www.sierraclub.ca/

ECODEFENSE!
PO Box 1477,
236000 Kaliningrad,
Russia.
Tel/Fax:(095) 2784642, 7766546
e-mail: ecodefense@online.ru

Amis de la Terre
2b rue Jules Ferr
93100 Montreuil
France
Tel: 33(0)1 48 51
Fax: 33 (0)1 48 51 95 12
http://www.amisdelaterre.org

NIRS-Wise
1424 16th Street NW,
#404, Washington, DC 20036
USA
Tel: 1 202-328-0002
Fax: 1 202-462-2183
nirsnet@nirs.org

"An Eye on SACE" Campaign
c/o Centro Internazi
Via F. Ferraironi, 88
00177 Roma
Italy
Tel: +39.06.24 40 42
Fax: +39.06.24 24 177
atricarico@crbm.org

Citizens' Nuclear Information Centre (CNIC)
1-58-15, Kotobuki-bldg.,
3F, Higashi-nakano,
Nakano-ku,Tokyo 164-0003,
Japan
Tel: 81-3-5330-9520
Fax: 81-3-5330-9530
http://www.cnic.or.jp/

EU-Enlargement Watch
53A Nevill Road
London, N16 8SW
Tel: 44 20 7923 0412
Fax: 44 20 7923 7383
a.froggatt@btinternet.co...

URGEWALD
Von-Galen-Strasse 4
D-48336 Sassenberg
Germany
Tel: +49 (0)2583 1031
Fax: +49 (0) 2583 4220
http://www.urgewald.de

Bridget Woodman
2A Seymour Road
London, N8
Tel: 44 20 8347 7830
bridget_woodman@hotmail.com

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Contents (Full Report)

Executive Summary

During 2001 the guidelines for Export Credit Agencies (ECAs) from industrialised countries for developing environmental assessments when granting financial cover will be finally adopted. At present only a few agencies have to apply binding guidelines to assess the environmental impacts of the operations they financially support. These negotiations are being carried out both by the Organisation for Economic Co-operation and Development (OECD) and by the G8. The 1999 G8 Cologne Summit Communiqué stated that the heads of States undertook to *"work within the OECD towards common environmental guidelines for export credit agencies... by the 2001 G8 Summit".* This was reaffirmed in the 2000 Okinawa Summit Final Communiqué.

This review is long overdue, in particular in its relationship to the proliferation of nuclear technology, as the secrecy and unaccountability of ECAs is fundamental to the survival of the global nuclear power industry. In each of the G8 countries ECAs have been used to facilitate the proliferation of nuclear technology abroad, even as nuclear power has lost favour at home. This is particularly remarkable in the case of Italy, where nuclear power has been phased out for political and environmental reasons.

This report summarises the financial assistance given by ECAs and International Financial Institutions (IFIs) to the spread of nuclear technology and highlights the concentration of investment in two global regions. Firstly and most prominently China is the key country for the construction of new reactors, with over one quarter of the world's total. All of these reactors receive financial support from at least one ECA of a G8 country. The second region of importance is Eastern Europe, where part built reactors and additions to the original designs offer work to Western contractors.

The development of the use of nuclear power to generate electricity began in G8 countries. From the 1950-70s nuclear power was seen as a new technology that offered cheap and clean electricity. However, major accidents such as Three Mile Island and Chernobyl, collapsing orders and poor economics have resulted in a global slump in nuclear power. This collapse has been most visible in the G8 which, although still operating 313 of the world's reactors, only has 6 under construction.

The nuclear manufacturers see the collapse in orders as a temporary situation and envisage a period of further growth about ten years hence, especially if they can financially benefit from concerns over climate change. However, nuclear power plants are large technically complex constructions. Although some of the parts needed to construct a nuclear power plant are also used in conventional power stations, considerable specialised manufacturing equipment is needed to build a nuclear power plant. Without new orders the nuclear infrastructure will collapse. One visible sign of this is the decreasing number of nuclear construction firms due to mergers and acquisitions.

The industry is also active in overseas sales. By creating new markets and continuing to expand in already established foreign markets, the nuclear industry is trying to maintain its manufacturing base. The ECAs are fundamental to this strategy as they offer financial assistance for construction. This assistance is free of environmental and public accountability requirements and is often at favourable bank rates. The table lists the current nuclear projects that have ECA financial support.

There are currently 25 reactors under construction throughout the world.[1] Of these, fourteen are part funded by an ECA from the G8 and six are under construction in a G8 country. The influence of the G8 on the global nuclear industry is therefore indisputable.

Recent Nuclear Projects with ECA Support

(currency conversions based on 2001 exchange rates.)

Exporting Country	Recipient Country	Project	Amount Million US$
Canada	China Romania	Quinshan III Cernavoda I Cernavoda II	1,350 840 250 *
France	China Ukraine	Ling Ao 1 and 2 Khmelnitsky 2 and Rovno 4	2,000 136*
Germany	Argentina China Lithuania	Atucha II Lianyungang Ignalina	9 128 6
Italy	Romania	Cernavoda II	Unclear*
Japan	China Mexico North Korea	Quinshan II and III Laguna Verdi KEDO	36 1 923
Russia	China India Iran	Lianyungang Kudankulam Busher	1,500 ** 2,500 ** 1,000 **
UK	China Ukraine	Quinshan II Ling Ao Khmelnitsky 2 and Rovno 4	157 822 28 *
US	Bulgaria China Czech Republic Lithuania Ukraine	Kozloduy 5 and 6 Quinshan II and III Temelin 1 and 2 Ignalina Khmelnitsky 2 and Rovno 4	77 356 317 20 131 *

* Decision pending

** Total value of contract, amount of ECA guarantee unclear

China has eight reactors under construction, more than any other country in the world – and in the next year at least two new reactors are expected to be ordered. Foreign contractors dominate these projects, in part because of the ease of obtaining foreign credits as funding. The construction of overseas-designed reactors is being explicitly linked by officials to the need to obtain foreign export credits.

In Central and Eastern Europe (CEE) and the Newly Independent States (NIS-former Soviet Union), ECAs are also prevalent. Following the political changes in Eastern Europe in 1989 many reactors remained partially built. This opened up a new area of business for Western nuclear constructors. Further work is also envisaged in extending the operating life of and upgrading the Soviet designed

reactors. ECAs have already part funded the completion of four reactors, Temelin 1 (Czech Republic), Mochovce 1 and 2 (Slovakia) and Cernavoda 1 (Romania). In addition there are three projects still underway, Temelin 2, the completion of Khmelnitsky 2 and Rovno 4 (K2R4) in Ukraine and the upgrade and life extension of Kozloduy 5 and 6 in Bulgaria. Loans are also being considered for the completion of Cernavoda 2 in Romania.

The K2R4 project was a classic example of ECAs being used for a political purpose. Five ECAs from the Czech Republic, France, Switzerland, UK, and US have all provisionally agreed funding. This is despite Ukraine being off-limits for ECA funding for some of these countries and no companies actually approaching the ECAs for cover. Rather, a political agreement was reached to fund the project no matter what corporation might undertake the work. Safety concerns are also emerging with reactors being completed to lower than original design specifications using different technologies and methodologies. The most notorious example is the completion of the Temelin nuclear power plant which was five years late and around US$1 billion over budget.

ECAs are not the only source of financial assistance open to the industry for contracts in Eastern Europe. The European Commission extended the scope of the Euratom Loan facility in 1994 to enable it to fund projects in CEE and NIS. This resulted in the approval of two projects in 2000 – Kozloduy 5 and 6 and K2R4. As a result of these projects the Loan facility is now largely spent and the European Commission is preparing a proposal to extend the loan ceiling. This proposal requires the unanimous support of Member States which, given the current lack of support for nuclear power within the Union, is extremely unlikely. A freeze on the Euratom Loans programme could increase the pressure on some European ECAs to fund nuclear projects.

The funding of K2R4 in Ukraine was also significant as it involved the first ever loan by an International Financial Institution (IFI) for a nuclear power project. The loan, by the European Bank for Reconstruction and Development (EBRD), was granted despite its own independent panel of experts concluding that the project was not economic and should not be funded. However, once again, political pressure took precedence over fact or reason. However, the approval by the EBRD is only provisional and the dispersal of funds to undertake the work is still a long way off.

Political pressure from some EU and G8 countries is also clear in the Russia Mox project scheduled for discussion at the G8 Summit in Genoa in July 2001. The proposal for funding the construction of facilities in Russia to make and use Mixed Oxide Fuels (Mox) or plutonium fuels has been building since the 1996 Nuclear Safety Summit. However, the project is plagued by political and economic problems and underscored with technical and proliferation concerns. In recent months, lack of funding for the first phase of the US$2 billion project has also become apparent. Additional obstacles remain in liability concerns and a body to host the multilateral fund. Despite continual denials by EBRD staff that they want to host it, they appear to be the only body with the experience or infrastructure to deal with such a project.

The chances of the Genoa Summit achieving its objective to *"develop an international financing plan for plutonium management and disposition based on a detailed project plan, and a multilateral framework to co-ordinate this co-operation"* are now slim. The US review of its financial assistance to Russian proliferation is likely to be sufficient to justify further delays. The current single-track approach of Mox utilisation as opposed to plutonium immobilisation is much to blame. Fewer countries are likely to give financial assistance to a project that is technically risky and will increase the overall production of plutonium.

In the rest of the world the era of blind faith in the promises of the nuclear industry has passed. Nuclear power now has to compete in the global marketplace like other technologies. The result of this competition is clear, as there are fewer reactors under construction. To counter this, the nuclear industry has used its political influence to develop large, unnecessary and dangerous projects, like that for Russian Mox, to enable multilateral funds to be put together to subsidise the use of plutonium fuels. The industry also relies on Government credits and financial assistance to export reactors around the world.

The Genoa Summit is a key opportunity for the G8 to renounce nuclear technology and regain some environmental and social credibility. A rethink of the current Mox project must be undertaken and a real reform programme for ECAs put forward. Such a programme should exclude lending for nuclear power, which for over forty years has been shown to be dirty, dangerous and expensive.

Introduction

Export Credit Agencies (ECAs) are designed to support the domestic industry of a country, by assisting the awarding of foreign contracts. As Government bodies, they also reflect national foreign policies to a degree. ECAs have played a particularly important role in the development of the Western nuclear power industry. With the decline of nuclear power in the West, they are now aiding its survival by financing foreign projects.

When companies from different countries bid for contracts they are measured on the economics of the bid, their technical competence and their suitability to undertake the contract. One deciding factor is the financial package that each company can offer. The availability of financial assistance with Government backing is a clear advantage and often mandatory for international tenders. Further advantage can be gained by having fewer conditions attached to funds, less public scrutiny and looser environmental requirements. In this way, the lack of transparency within ECAs can be a significant advantage for a company when competing for foreign contracts.

ECAs are in the process of being reformed within the framework of the Organisation for Economic Co-operation and Development (OECD) and the G8. For the majority of ECAs, this process will be the first time that they have considered binding guidelines relating to environmental protection. While improvements in environmental standards have been seen in most Multilateral Development Banks (MDBs), the same developments have not been seen in ECAs. In the past, projects with lower environmental standards, or even those rejected by MDBs, have been taken up by ECAs.
There is therefore a strong lobby against this reform process.

Against this background, this report presents details of ECA lending for nuclear power projects around the world. The report was prepared by NGOs and consultants from the G8 countries and reflects both the current state of financing for nuclear power exports and the unwillingness of the appropriate institutions to be open to non-government organisations and the public.

In researching this report the true extent of the lack of public accountability and reluctance of the ECAs to release information became apparent. In over half the countries included here, no official list of nuclear projects funded by ECAs has been published. In these cases, either the information will not be released or researchers have been told that it will be available at some point in the future. Such information cannot be deemed commercially confidential, as it is routinely released by other international agencies such as the World Bank. Authors have therefore combined publicly available information with that gleaned through personal contacts. Consequently, this report should be seen as the start of an ongoing process to increase the public accountability of ECAs, especially in relation to their nuclear lending.

Nuclear Technology and the G8

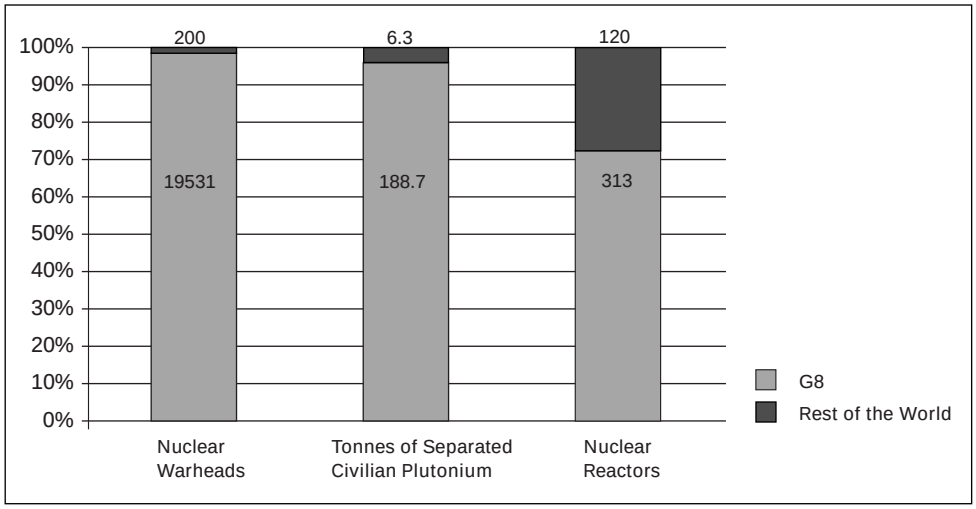
Nuclear power was born out of the development of nuclear weapons, in particular in the 'original' nuclear weapons states – France, Russia, the UK and the United States. The link between military supremacy and civilian nuclear development is still apparent today – these 4 countries remain distinctive from their G8 counterparts.

Nuclearisation of G8

	Number of Warheads[2]	Tonnes of Separated Plutonium (civilian)[3]	Number of Reactors currently operating[4]
USA	8,876	4.5	103
France	470	40.3	59
Japan	0	29.3	53
UK	185	59.8	35
Russia	10,000	30.3	29
Germany	0	24	19
Canada	0	0	14
Italy	0	0.5	0

Today, the G8 countries continue to dominate the military and civilian nuclear programmes, with the figure below showing their stranglehold on the world inventory for nuclear technology. The G8 countries own and operate the majority of this technology, particularly in the military sector.

G8's Interest in Nuclear Technology



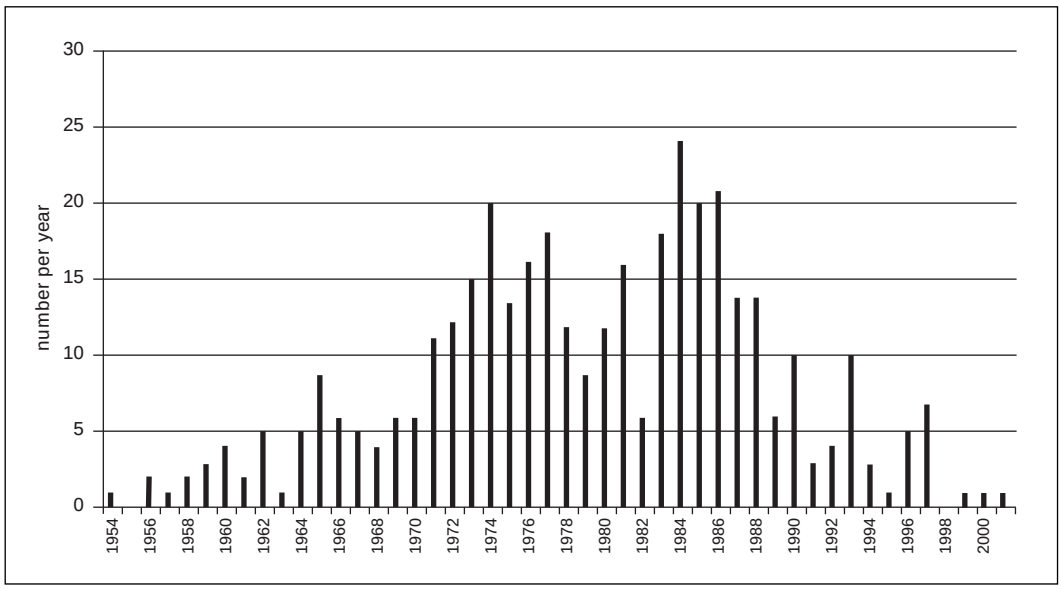
Source: Bulletin of Atomic Scientists; IAEA; ISIS-online

This hegemony is based on historic desires to dominate the global nuclear market. The failure of nuclear power and its related plutonium economy have led to a collapse in orders for nuclear power and the abandonment of the plutonium fast breeder reactors. Consequently, the G8 is now faced with two key problems – what to do with the tonnes of unwanted plutonium and how to support their near redundant nuclear power industry.

Nuclear Power in G8 Countries

As in virtually all parts of the world, nuclear power in G8 countries is on the decline, especially in North America and Western Europe. The graph below shows the historical development of nuclear power in G8 countries in terms of the number of reactors commencing operation. This was high from the 1970s and peaked in the mid-1980s, but since then has largely declined. There are currently only 6 reactors actively under construction in any of the G8 countries, a historical low.

Start-up of Reactors in G8 Countries



Source: Nuclear Engineering International Handbook, 2000

In **Canada**, the Candu reactors continue to be plagued by their "mid life crisis". Age related problems have forced the closure of some reactors and extended maintenance programmes for others. Out of 22 reactors, 8 are no longer operating due to technical and management problems and it is unclear when they will return to operation.

In **France**, often regarded as a fundamental supporter of nuclear power, the country's last reactor will be completed in 2000 and there are no new reactors on order. The Superphenix reactor, the pride of the nuclear industry, is scheduled for closure over the next few years, signalling the abandonment of Europe's only Fast Breeder programme. Plans to develop the next generation of reactors, the European Pressurised Water Reactor, have also been postponed.

The **German** Government reached an agreement with the industry in 2000 to limit the operating life of their existing reactors. Furthermore, the liberalisation of the electricity market has forced the early closure of two reactors in 2000.

Although the **Japanese** Government remains formally committed to nuclear power it is clear that support for the technology is fading. In recent years the industry has been rocked by major accidents at its Fast Breeder Reactors, reprocessing plant and fuel fabrication facilities. Revelations about the quality of fuel manufactured at the UK's Sellafield reprocessing plant have further damaged the credibility of the industry.

In **Russia**, the industry continues to suffer from lack of finance, due to low levels of cash collection for the electricity sold. This has resulted in delayed or no payment for workers, and no funds for maintenance and waste management. However, in 2001 the Rostov nuclear power plant was completed, the first new reactor since 1993.

In the **UK**, a time-schedule has been developed for the closure of the first generation of reactors, the Magnox power stations. With no new reactors planned this is seen as the beginning of the phase out of nuclear power in the UK.

In the **United States** it is over 20 years since a reactor has been ordered and subsequently completed. Although the US has the largest number of operating nuclear reactors (103), it also has also a large number of reactors cancelled or abandoned (around 115), shutdown (20) or awaiting decommissioning (10). The closure of US reactors has begun in earnest with six closing in the last five years. The George W Bush administration has recently signaled its support for nuclear power, however, how this will be manifested is still unclear.

G8 Summits and Nuclear Power

Due to the transboundary impact of the technology and the influence of the industry on the Governments concerned, nuclear technology has found a way into most G8 and G7 summits. In April 1996 there was a specially convened Summit on Nuclear Matters. The main topics that have been consistently discussed are:

- nuclear safety in Eastern Europe and the former Soviet Union, with emphasis on supporting the Nuclear Safety Account (NSA);
- the closure of the Chernobyl nuclear power plant in Ukraine; and
- most recently, the initiative to reduce the stockpile of excess military plutonium in Russia and the United States.

Extracts of the most recent statements on these issues are included in Annex I.

Genoa Summit July 2001

On July 20-22 2001, the G8 summit in Genoa, Italy, will discuss several nuclear-related issues including:

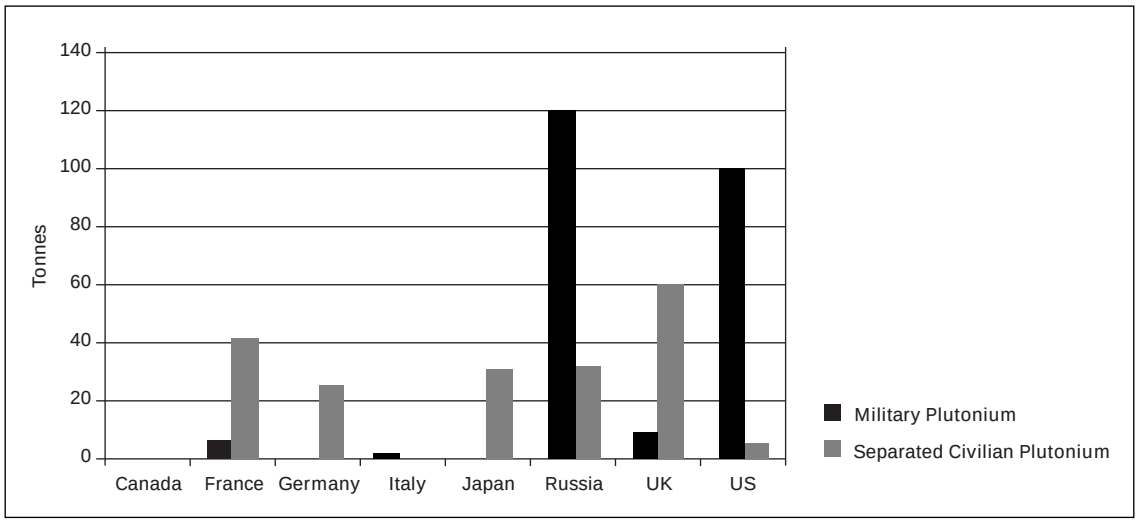
- Plutonium Immobilisation.
- Export Credit Agency (ECA) Reforms.

The G8's Plutonium Disposition Programme

Once again commercial interests and military power have come together to create a very expensive and dangerous situation. Officials from G8 countries are working hard to put together a US$2,000 million proposal to allow old and unlicensed equipment from Germany to be dismantled and shipped to Russia for the production of plutonium fuels. If the fuel fabrication plant is reassembled in Russia, the plutonium fuels —or Mixed Oxide Fuels (Mox)— will be loaded into substandard Russian reactors and possibly shipped around Europe. The process is already expected to take decades to complete and even then will only affect around a quarter of Russia's military plutonium.

The G8 currently have an estimated 430 tonnes of plutonium which has been separated and is ready for use – 242 tonnes of military plutonium and 188 tonnes of civilian plutonium. In addition they have produced an estimated 800 tonnes of plutonium which remains in used or spent fuel.[5] The G8's stockpiles of separated plutonium —excluding that still in spent fuel— in G8 are shown in the figure below. Russia and America hold the largest stocks from military sources, while the UK and France hold the most separated civilian plutonium.

Plutonium Stockpiles of G8



Source: ISIS-online.org

However, what this graph does not show is the current trends. The production of military plutonium has virtually stopped. However the production of separated civilian plutonium continues and is increasing to such a degree that it outstrips demand. It has been estimated that by 2015 an additional 65 tonnes of surplus civilian plutonium will have been separated, almost cancelling out the benefits of the whole of the US/Russian disposition proposal. Furthermore, with only a limited number of reactors in Europe operating with Mox fuel, the additional Russian Mox may only displace that produced by EU Member States and increase their plutonium surplus.

The Proposal

At a specially organised Summit on Nuclear Safety in April 1996 the G8 developed a political framework for the development of a plan to dispose of 'excess' plutonium from Russia and the USA. This plan has taken five years to develop and it is now hoped that a concrete proposal, with attached financing plan, will be approved at the G8 Summit in 2001. In September 2000 the US Vice-President Al Gore signed the US part of an agreement which would see the disposal of 34 tonnes of plutonium from both the US and Russian military stockpiles. The agreement allows the plutonium to be disposed of in Mox fuel or to be immobilised through vitrification (embedding in glass). The Russian side of the proposal does not envisage any vitrification while the US assumes that around 7 tonnes would be subject to this method.

The schedule assumes that by the end of 2007 Mox production or immobilisation facilities will be constructed that will enable at least 2 tonnes per year to be disposed of by each country. It is then envisaged that a second stage will be developed to allow up to 5 tonnes per year to be disposed of.

The Problems

The vast majority of politicians and the public believe that there is an unacceptably large stockpile of plutonium which needs to be reduced. Furthermore, the current over-production of 'civilian' plutonium is adding to the global plutonium stockpile.

a) Rate of Disposal

The bilateral agreement between Russia and the USA calls for the disposal of a minimum of 4 tonnes of Plutonium per year by 2007. Given this time-table it will take approximately twenty years to carry out the agreement. Although it is assumed that a second phase will be introduced to at least double the annual rate of production of Mox, this is dependent not only on the availability of production facilities but also on the availability of reactors to utilise the Mox fuel. Due to the decay of plutonium, Mox fuel cannot be stored indefinitely before use. Therefore, the production rate of Mox fuel must be linked to its use. There are only a limited number of Russian reactors, the VVER 1000s, which will be modified to use Mox fuel and therefore either additional reactors need to be constructed or the Mox fuel exported. The US-Russian bilateral agreement requires US agreement for any export of Mox fuel from Russia. However, the Western European Mox manufacturers are extremely worried that this would significantly impact on their market and prices.

Within the bilateral agreement it is currently proposed that only around 10% of the plutonium is directly immobilised. The Russian side have refused to include any immobilisation plans, saying that plutonium is a fuel and thus cannot be wasted. However, increasing the percentage of immobilisation would remove the obstacle of insufficient reactors to burn the Mox fuel and thus could accelerate the rate of plutonium disposition.

b) Project Costs

French (Cogema) and German (Siemens) nuclear fuel companies have been negotiating with their Russian counterparts for joint ventures in the Mox field for about a decade. Their further

involvement has been limited by lack of financing. However, the current proposal would see taxpayers from the G7 and EU countries footing the bill. The current expected cost is thought to be around US$1.8 billion for the Russian side and around US$4 billion for the US. In order to start construction in Russia a minimum of US$830 million will be required.[6] This is for the construction of the facilities to dismantle the warheads and then produce the Mox fuel. So far the following funds have been pledged directly for the construction:

- US: US$200 million
- UK: US$105 million
- France: US$120 million

In addition Japan have pledged US$33 million for bilateral assistance of the Russian FBR programme and the German Government have pledged US$100 million for plutonium immobilisation. It is also reported that the EU might offer up to US$100 million. However, problems are emerging in the United States, the main driving force of the initiative. The US press has reported that President Bush has cut the budget for Russian disarmament initiatives by around US$ 400 million, including a reduction in the Plutonium Disposition Programme of nearly US$200 million.[7] Current estimates suggest that $17 million in additional funds may be available rather than the US$200 million envisaged under the Clinton administration.

c) Mox Use

The bilateral agreement envisages that the majority of the Russian plutonium will be used in Mox fuels. During the fabrication process the military plutonium will be mixed with reactor grade plutonium, increasing the total volume of plutonium to be made into Mox from 34 tonnes to 37.

The US Mox will be burned in four PWRs in the U.S. – two at the McGuire nuclear station in the state of North Carolina and two at the Catawba nuclear station in the state of South Carolina. Russia plans to use its seven VVER-1000 reactors and the BN-600 fast neutron reactor at Beloyarsk. Some of the Russian Mox may also be used in reactors outside Russia. However, this has raised concerns over its transport and impact on the Western European Mox market.

According to the Washington-based Nuclear Control Institute (NCI), the use of Mox fuels will increase the actual and potential impact of the nuclear power plants in which they are used[8] as:

1. The probabilities of certain severe accidents may increase as the introduction of Mox fuel into LWRs reduces the effectiveness of the materials used to absorb neutrons in the core. This makes it more difficult to control the nuclear reactions in the core and reduces the margin available to shut down the reactor safely if problems arise.

2. The consequences (as measured in latent cancer fatalities and early fatalities from acute radiation exposure) of a severe accident involving containment failure or containment bypass (i.e. a steam generator tube rupture) will be greater if Mox fuel is in the core. This is because Mox cores have higher concentrations of actinides, including isotopes of plutonium, americium and curium. Most of these are alpha-particle emitters with large radiotoxicities if inhaled or ingested.

NCI also investigated the potential impact of burning Mox fuel in the Russian VVER 1000 reactors and concluded that, *"the most severe consequences of an accident at a Mox-fuelled VVER-1000 would result from a failure or bypass of the containment, unresolved issues associated with VVER-1000 containment and steam generator integrity will become even more urgent if Mox fuel is used"*.

Given that Mox has never been used in VVER 1000 reactors before, NCI called for further research before proceeding with the current plans.

d) Project Management

One key question remaining is who will manage the funds for the Russian disposition. The institution widely mentioned is the European Bank for Reconstruction and Development (EBRD), the London-based financial institution that currently hosts the Nuclear Safety Account, the Decommissioning Fund for Accession countries and the International Shelter Fund for Chernobyl. Clearly, the EBRD does have experience in dealing with multi-source nuclear funds, but not disarmament issues, which are deemed as more complex politically. EBRD staff responsible for the nuclear programmes do not wish to host the plutonium fund, but accept that it will be the decision of the G8. The reasons they give for not wanting to host the project are:

- The EBRD already hosts a number of nuclear projects and they does not wish to become even more dominated by nuclear issues.
- G8 countries are not unanimously in favour of the current programme.
- The project is likely to have two elements, one for construction of the facility —paid for by grants— and the other for the operation of the facility, through a commercial venture. This creates additional complications and would require further exploration of how it would work.

e) United States Programme

Although it was originally envisaged that the US would undertake a ‘dual track’ approach, whereby around 20% of the US plutonium would be disposed of by immobilisation, it appears that this approach may now have been delayed or even abandoned. In mid March the Bush administration announced that plans for a US$1.2 billion immobilisation plant at Savannah River had been withdrawn from the 2002 budget, with proposals for Mox use remaining unchanged.[9]

Canada

CANDU: What is it?

CANDU is a registered trademark of Atomic Energy of Canada Limited (AECL) which stands for Canadian Deuterium Uranium reactor. Its generic name is Pressurised Heavy Water Reactor (PHWR). In Candu reactors, heavy water is used as a coolant and moderator, and fuel bundles are inserted in horizontal tubes (instead of in one large pressure vessel, as in light water reactors).

The use of heavy water makes CANDU reactors more expensive than other reactor designs. After ten to twenty years, the CANDU design faces an increasing risk of a major Loss of Coolant Accident (LOCA) due to tube failure. This occurred in 1983 at the Pickering station in Ontario, when an accident forced the shutdown and retubing of all four reactors at Pickering A over a period of ten years. A decline in performance is typical for CANDU reactors after 12 to 13 years of operation.

Early History

In 1942, European and British scientists came secretly to Montreal to conduct research aimed at nuclear weapons production. By April 1944, The 'Combined Policy Committee' (consisting of representatives from the United States, Britain and Canada) agreed that the Montreal group should build a large-scale heavy water reactor prototype – the NRX reactor at Chalk River Nuclear Laboratories, 130 km northwest of Ottawa.[29] The first reactor to be constructed at Chalk River was the Zero Energy Experimental Pile (ZEEP), which started up on September 5th 1945. It was a US$200,000 pilot heavy water reactor which produced design data for the NRX, and the first reactor to be designed and operated outside of the United States.[30]

The NRX reactor started in July 1947, and produced plutonium and uranium-233 for American nuclear weapons. The NRX used water directly from the Ottawa River for cooling, resulting in significant releases of radioactive contamination over the years until it was closed in 1993. The NRX had a devastating accident on December 12th 1952 that needed 14 months and 1,200 personnel for the clean-up and rebuilding of the reactor.[31] Shortly before this accident, on April 1st 1952, the government created the Crown Corporation, Atomic Energy of Canada Limited (AECL), replacing the National Research Council in charge of Chalk River.

The 200 MW national research universal (NRU) reactor began operation in 1957, primarily to produce plutonium for nuclear weapons. The NRU is scheduled to close in 2005, and two 10 MW MAPLE reactors are under construction to take over production of medical isotopes. Another reactor, the 40 MW Canadian Neutron Facility (CNF), is planned for materials and reactor research.

Four major prototype reactors were built in the 1960s:

1. The nuclear power demonstration (NPD) at Rolphton, Ontario, was the first prototype CANDU.

2. The 220 MW Douglas Point Reactor at the Bruce site in Ontario was a larger CANDU design, intended as a commercial plant. Like the NPD, it was a technical and financial disaster.

3. The Whiteshell Reactor-1 (WR-1) was a prototype organic-cooled reactor built at the Whiteshell

laboratories near Winnipeg Manitoba. The design was not pursued.

4. The 250 Mw Gentilly-1 Reactor In Quebec was a Boiling Light Water (CANDU-BLW) design. It was another complete failure.

Commercial Power Reactors

Canadian Power Reactors (Chronological by date of Commercial Operation)

Reactor	MW(e) net	Cons. Start	Comm. Op.	Laid Up	Shut Down
NPD (Rolphton)	22	1958	Oct 1962	—	Aug 1987
Douglas Point	220	Feb 1960	Sep 1968	—	May 1984
Pickering-1	515	Jun 1966	Jul 1971	Dec 1997	—
Pickering-2	515	Sep 1966	Dec 1971	Dec 1997	—
Gentilly-1	250	1966	May 1972	—	Jun 1977
Pickering-3	515	Dec 1967	Jun 1972	Dec 1997	—
Pickering-4	515	May 1968	Jun 1973	Dec 1997	—
Bruce-2	848	Dec 1970	Sep 1977	Oct 1995	?
Bruce-1	848	Jun 1971	Sep 1977	Mar 1998	?
Bruce-3	848	Jul 1972	Feb 1978	Mar 1998	—
Bruce-4	848	Sep 1972	Jan 1979	Mar 1998	—
Point Lepreau	635	May 1975	Feb 1983	—	—
Pickering-5	516	Nov 1974	May 1983	—	—
Gentilly-2	635	Apr 1974	Oct 1983	—	—
Pickering-6	516	Oct 1975	Feb 1984	—	—
Bruce-6	860	Jan 1978	Sep 1984	—	—
Pickering-7	516	Mar 1976	Jan 1985	—	—
Bruce-5	860	Jul 1978	Mar 1985	—	—
Pickering-8	516	Sep 1976	Feb 1986	—	—
Bruce-7	860	May 1979	Apr 1986	—	—
Bruce-8	860	Aug 1979	May 1987	—	—
Darlington-2	881	Sep 1981	Oct 1990	—	—
Darlington-1	881	Apr 1982	Nov 1992	—	—
Darlington-3	881	Sep 1984	Feb 1993	—	—
Darlington-4	881	Jul 1985	Jun 1993	—	—

Source: IAEA

Pickering Nuclear Stations

In August 1964, AECL and Ontario Hydro reached an agreement to build two 500 MW CANDU reactors at Pickering, Ontario, just east of Metropolitan Toronto on Lake Ontario.[32] The federal and provincial governments provided most of the financing for Pickering reactors 1 and 2, the total cost

being reported at US$393 to US$420 million (dollars of the year).[33] The release estimate for all four reactors in 1965 was US$508 million (dollars of the year)[34], while the total cost for all four Pickering A units was US$716 million (dollars of the year).[35]

The four Pickering A reactors maintained reasonable performance until August 1983, when a disastrous pressure tube rupture occurred in Pickering Reactor 2, and all four reactors were shut down in succession to have their pressure tubes replaced. The retubing of the four reactors cost about US$1 billion (dollars of the year)[36] – more than their original capital cost.

In 1974, construction started on the four Pickering B reactors immediately beside Pickering A. All eight reactors share common safety systems, resulting in a significantly higher risk of accidents than at other facilities. The 1974 release estimate for the four Pickering B reactors was US$1.585 billion, and the final cost in 1986 was US$3.846 billion.[37]

Bruce Nuclear Stations

The 1969 release estimate when Ontario Hydro began construction on the four Bruce A reactors was US$930 million (dollars of the year)[38] and the final cost was US$1.8 billion (dollars of the year).[39] Performance was reasonable until the late 1980s but by 1993, Bruce A performance had decayed to an abysmal load factor of less than 40%.[40]

The initial release estimate for Bruce B in 1976 was US$3.929 billion and the final cost was US$5.994 billion (dollars of the year).[41] In July 2000, Bruce A and B were leased (subject to regulatory approval) to the Bruce Power Partnership, 80% owned by British Energy PLC.

Gentilly 2 Nuclear Station

Hydro Québec undertook an agreement in 1973 with the federal government to build Gentilly-2 – a standard AECL-designed 645 MW(e) CANDU-6. The federal government agreed to finance 50% of the estimated US$302 million capital cost of Gentilly-2 at a special low interest rate.[42] However, with the relatively successful initial operation of Pickering Units 1 and 2 in Ontario, the federal government was less willing to accept the financial burden and risk of subsequent projects. Thus Hydro Québec was solely responsible for the billion dollar cost overrun which saw the capital cost soar to US$1.36 billion by the time the plant achieved first criticality in September 1982, a quadrupling of the original estimate.

Point Lepreau Nuclear Station

AECL and New Brunswick Electric Power Commission signed an agreement in January 1976 to build a 635 MW(e) CANDU-6, like Gentilly-2, at Point Lepreau on the Bay of Fundy, in New Brunswick. The federal government, through AECL, agreed to finance half of the estimated construction cost including interest, up to a maximum of US$350 million.[43] The Point Lepreau release estimate was US$400 million,[44] and the final cost was US$1.215 billion.[45]

While Point Lepreau achieved good performance in its early years, it encountered performance difficulties in the mid-1990s. It is now estimated that the reactor will have to be shut down or retubed between 2008 and 2010. In February 2000, the NB Power Board of Directors approved the expenditure of $40 million (Cdn) for an engineering and business case study of retubing the reactor.[46]

Darlington Nuclear Station

The four reactor Darlington nuclear station is located in the municipality of Clarington, east of Oshawa in the province of Ontario. Work began on Darlington in 1978, and was followed promptly by the Three Mile Island accident in 1979. For the first time in Ontario, construction of a nuclear station prompted large opposition demonstrations and it remained highly controversial during its construction in the 1980s and 1990s. An early cost estimate for Darlington in 1973 was US$2.5 billion,[47] and the initial release estimate in 1978 was US$3.950 billion.[48] The final cost in 1993 escalated to a staggering $14.4 billion (Cdn) (dollars of the year).

Darlington experienced serious technical problems in its early years, causing delays in start-up and operation, and which required modification of all four reactors.[49]

1997 Ontario Hydro Reactor Shutdown

On August 13th 1997, Ontario Hydro announced that over the next 6 months it would temporarily shut down the Pickering and Bruce reactors.[50] (One Bruce reactor had already been closed in 1995.) It was the largest single shutdown in the international history of nuclear power – over 5,000 MW of nuclear capacity. Ontario Hydro called for the 'phased recovery' of its nuclear reactors, including 'extensive upgrades' to the operating stations Pickering B, Bruce B, and Darlington, before bringing all the Pickering and Bruce reactors back into operation.

A controversial environmental assessment on the restart of the four Pickering A reactors was approved by the Canadian Nuclear Safety Commission in February 2001. It excluded any review of severe accidents with widespread radioactive fallout, as well as any review of alternatives. The Pickering A restart requires a license amendment scheduled for mid-2001. Actual restart would occur over the following two years.

In April 2001, Bruce Power (owned by British Energy PLC) announced its intention to restart reactors 3 and 4 of the Bruce A station by the summer of 2003.

EDC Support for Canadian Nuclear Exports

Canadian Reactor Exports (Chronological by date of Commercial Operation)

Reactor/Country	MW(e) net	Cons. Start	Comm.Op.	EDC* Corp $M (Cdn)	EDC** Can $M (Cdn)	Gov't Aid US$M
CIRUS/India	40 (t)	Dec 1955	Jul 1960	—	—	9.5^{+}
KANUPP/Pakistan	125	Aug 1966	Oct 1972	$25.5	—	25.5^{++}
RAPP-1/India	207	Aug 1965	Dec 1973	$37	—	—
RAPP-2/India	207	Apr 1968	Apr 1981	$38.5	—	—
Wolsong-1/Korea	629	Oct 1977	Apr 1983	$50 (US$112.5)	$250	—
Embalse/Argentina	600	Apr 1974	Jan 1984	(US$60)	$124	—
Cernavoda/Romania	633	Jan 1980	Dec 1996	(US$820)§ (US$19.4)§	(US$300)	—
Wolsong-2/Korea	665	Oct 1991	Jul 1997	—	—	—
Wolsong-3/Korea	665	Nov 1993	Jul 1998	—	—	—
Wolsong-4/Korea	665	May 1994	Sep 1999	—	—	—
Qinshan-1/China	678	Feb 1997	UC	—	$1,500	—
Qinshan-2/China	678	Feb 1997	UC	—	(US$350)	—

* Export Development Corporation, Corporate Account (Cdn $million) (dollars of the year).

** Export Development Corporation, Canada Account (Cdn $million) (dollars of the year).

$^{+}$ Columbo Plan.

$^{++}$ External Aid Organisation (later Canadian International Development Agency).

§ US$820 million loan date: 1978; US$19.4 million loan date: 1992

Sources: IAEA, AECL, see text for finance references.

India: CIRUS

In 1956, Canada agreed to provide India with a reactor modelled on the NRX at Chalk River, which became known as 'CIRUS'. The deal included complete design information, all reactor components and construction.[51] CIRUS was not financed by export credits, but was given to India as direct aid, with payments from the Colombo Plan for Canadian purchases of US$9.5 million out of a total cost of US$17 million.[52] CIRUS was controversial because the Canadian government did not require a guarantee that it would not be used for plutonium production for nuclear weapons. Motivated by the opportunity to establish a commercial nuclear beach-head in the developing world, Canada chose to ignore the nuclear proliferation risk.

India: RAPP-1 and RAPP-2

Canada's first sale of a power reactor was to India in 1963. The Rajasthan Atomic Power Plant-1 (RAPP-1) was a 200 MW(e) CANDU built at Rawatbata, in Rajasthan, modelled on the Douglas Point

reactor. AECL reported that finance was provided by the Export Credit Insurance Corporation (ECIC – predecessor of the Export Development Corporation) *"for the purchase of services, material and equipment from Canada up to a value of US$37 million out of the total estimated cost of US$76 million for the station".*[53] Another estimate of the total cost put it at US$79 million, of which US$35 million was to be spent in and financed by Canada.[54] The plant's first criticality was in August 1972.

A second deal between AECL and the Indian Department of Atomic Energy (DAE) provided free exchange of information on heavy water reactors for a period of eight years. It gave to India the design and specifications of the Douglas Point reactor, allowing its full commercial use. This information was valued at US$5 million by India, but was provided freely by Canada as part of an aid programme.[55] The Douglas Point reactor design would subsequently become the basis of most of India's nuclear capacity. These so-called 'CANDU clones' would not be subject to IAEA safeguards, as RAPP-1 and RAPP-2 were.

In 1966, another agreement was signed by Canada and India for construction of a second 200 MW reactor (RAPP-2) with some improvements at the same site as RAPP-1. AECL suggested that ECIC would provide US$38.5 million financing for the project's Canadian services and equipment.[56] It has also been suggested that the Canadian government financed half of the US$140 million cost of RAPP-1 and RAPP-2 payable over fifteen years at 6% interest with about six years' grace.[57] The DAE was involved with the construction and commissioning of the two RAPP reactors, and also fabricated some fuel. Indian content in RAPP-1 was 55% and 75% in RAPP-2.[58]

In 1974 India exploded a nuclear bomb fuelled with plutonium made in the CIRUS reactor, and Canadian personnel stopped work on RAPP-2. Canada's nuclear non-proliferation safeguards were subsequently strengthened, and after the failure of negotiations, Canada ended nuclear assistance to India, delaying commercial operation of RAPP-2 until 1981.

Pakistan: KANUPP

In 1964 an agreement was made between Canadian General Electric and Pakistan to build a 137 MWe CANDU reactor near Karachi. The reactor, known as the KANUPP (Karachi Nuclear Power Project) cost US$63 million, US$51 million of which was financed by Canada. Half came as external aid at 3/4% interest over 40 years, with 10 years' grace; the other half at 6% over 15 years with 5 years' grace.[59] The ECIC provided the 6% financing, and the concessional financing came from the External Aid Organisation (EAO). Wallace described the terms of the EAO loan somewhat differently: *"Between 1966 and 1978 a total of US$12.4 million was provided in export credits, and US$29.4 million was loaned through the EAO/CIDA account.... Its terms included a 10-year period of grace followed by a 50-year repayment schedule with no interest charges."*[60]

The EDC took over the accounts of the ECIC in 1969, and the EAO's account was taken over the Canadian International Development Agency (CIDA).[61]

Canada ended nuclear cooperation with Pakistan on January 1st 1977, shortly after its December 1976 decision that nuclear trading partners with Canada must sign the Non Proliferation Treaty. Loan payments continued despite the end of nuclear cooperation between Canada and Pakistan.

Argentina – Embalse

In 1972, AECL submitted a bid to Argentina's Comision Nacional de Energia Atomica (CNEA), in partnership with the Italian company Italimpianti (Societa Italiana Impianti), to build a 600 MW turnkey CANDU in Argentina, now known as Embalse. Italimpianti was to handle marketing and the plant's conventional equipment, and AECL was responsible for the nuclear side.

The total estimated cost was US$420 million, of which about US$150 million went to AECL.[62] The EDC initially provided a loan of $124.05 million (Cdn) in April 1974.[63] The loan was payable over 25 years, with repayment starting only when the reactor entered service. This was a 'Canada Account' loan was, made on the grounds that it was 'in the national interest'.[64]

The original contract was for a 25 year period, and had a 25% ceiling on inflation.[65] With the 1973 OPEC oil embargo and a period of high inflation, by 1975 AECL was heading for a substantial loss.[66] Subsequent attempts to renegotiate the contract were interrupted in March 1976 by a bloody military coup. The contract was subsequently amended in February 1977, but in that same year AECL made provision for a loss of US$130 million on the deal.[67] In other words, the possible loss was as much as the original contract. After further renegotiations, AECL claimed that there was no loss on the sale.[68]

The Embalse deal was not just complicated by inflation and underpricing – defective boilers costing US$15 million were also supplied by Babcock & Wilcox Canada.[69] Repairs delayed the project for over a year. The Embalse sale was also controversial because bribes in the form of 'agent fees' were paid to secure the contract.[70] An Argentinean investigation in 1985 revealed that José Ber Galbard, then Argentine Minister of Economic Affairs received US$2.4 million, plus another US$1.1 million in May 1974, and an additional US$300,000 two years later.[71]

South Korea: Wolsong-1

In January 1975, AECL and the Korean Electric Power Company (KEPCO) signed a deal for a 600 MW CANDU.[72] The total cost of the reactor was US$576.5 million, of which US$430 million was arranged by the EDC. This initially included a $250 million (Cdn) loan under the Canada Account and $50 million (Cdn) under the Corporate Account. A further loan of US$112.5 million was made under the EDC Corporate Account in May 1979.[73] The loans were to be repaid in 30 semi-annual repayments over 15 years, starting no later than six months after the commissioning of the reactor, which took place in November 1982. The interest rate on the loans has never been revealed.[74]

The Wolsong-1 deal was odd in two ways: first, Korea had not issued a call for international bidding, and second, it was a dramatic shift in nuclear technology for Korea. Their first nuclear power reactor had been a 560 MW Westinghouse Pressurised Water Reactor (Kori-1) ordered in 1970.[75] The reason for the surprising decision is that AECL influenced the decision through bribery. AECL President Lorne Gray had agreed to pay an 'agent' (Shaul Eisenberg of Tel Aviv) a fee of US$17 million plus another US$3 million at a rate of US$500,000 a year for six years.[76] Despite the public outcry over this blatant corruption, Eisenberg's 'commission' was only reduced to US$18.5 million, and AECL retained him to negotiate the sale of a second reactor.

Romania: Cernavoda-1

In November 1977, a licensing agreement was initialled between AECL and Romanergo, the state trading company, which gave the design of the CANDU-6 (a 600 MW reactor) to Romania. The licensing fee was to be US$5 million per reactor for Romania's first four reactors, decreasing to US$2 million per reactor thereafter up to a total of 16 reactors that were anticipated.[77] On this first reactor, the Canadian content was estimated at US$100 million of the total US$800 million cost, or 12.5%.

In April 1979, a financing agreement of up to US$1 billion was announced by EDC. EDC loaned US$680 million and a consortium of banks loaned US$320 million,[78] US$140 million of which was guaranteed by EDC for a total commitment of US$820 million by the EDC under its Corporate Account.[79] The repayment period was 30 years. It was the largest long-term loan in Canadian history for a single export sale. AECL has stated that about US$600 million of this loan was actually drawn down and repaid.[80] The financing agreement was for four reactors, but detailed agreements were only signed for one reactor. It has been suggested that a US$1 billion line of credit was easier to justify for four reactors than to admit that the loan was really for one reactor with an estimated Canadian content of only 12.5%.[81]

In March 1982 EDC froze loan payments after Romania stopped payment on international loans.[82] EDC was joined by the US Export-Import Bank in the freeze.[83] In August 1983, the freeze was lifted after intense lobbying by AECL and its private sector allies.[84] A unique concession was that Romania would be allowed to negotiate directly with the private sector suppliers on a barter or 'countertrade' basis. Although companies refused to disclose the nature of their trade deals, reports stated that reactors would be traded for a variety of goods, including strawberries, wine, tractors, clothing, and shoes, even though the Canadian Energy Minister at the time, Jean Chretien, was famously quoted as saying *"We are not bartering CANDUs against strawberries".*[85] It was reported that while AECL was paid in cash, a number of Canadian manufacturers took 100% countertrade on their sales to Romania.[86]

Throughout the 1980s, 15 to 30 AECL personnel remained at Cernavoda in an advisory capacity, while construction floundered because of poor management and lack of quality control. Construction was interrupted by the 1989 revolt in which Ceausescu was deposed and executed. At that time, all of the Canadian personnel and many Romanians abandoned the project.

In September 1991, the Canadian government announced a new agreement to form the AECL/Ansaldo Consortium (AAC) to salvage the initial reactor. As originally announced, the salvage package included: a loan of US$315 million through the EDC; takeover of project management by AECL and Nuclear Construction Managers; and provision of services and components from other Canadian companies.[87] EDC has since reported that the actual loans were US$300 million from the EDC Canada Account and US$19.4 million from the Corporate Account this totalled about US$320 million, or approximately $370 million (Cdn).[88]

It has been reported that the financial package of foreign funding to complete Cernavoda-1 was US$419 million, implying that about US$135 million for Ansaldo's participation came from the Italian Medio Credito Centrale.[89] The Romanians had only confirmed funding five years later in an undisclosed amount of *"something less than US$100 million"*.[90] By April 1995, US$222 million of the 1991 EDC loan was still outstanding on the Cernavoda reactor, and costs had mounted to

US$2.2 billion.[91] The Cernavoda-1 reactor finally achieved first criticality on April 16th 1996 – more than a decade after the initial target start-up date of December 1985.[92]

The Campaign to Finance Cernavoda-2

Despite the nightmarish history of Cernavoda-1, AECL has been lobbying intensively to arrange Canadian financing for a second reactor at Cernavoda. Much of the equipment for Cernavoda-2 was supplied earlier, but many components were borrowed for use on the first reactor. Work on Cernavoda-2 had stopped *"with 80% of the civil work and 5% of the mechanical work completed"*.[93] The target date for completion of Cernavoda-2 is December 2006.[94] AECL remains in a consortium with the Italian state-owned nuclear company Ansaldo, and both companies have been trying to arrange financing from the export credit agencies in their respective countries.[95] In April 1995, the parties apparently initialled, but did not sign an agreement to do some work on the second reactor.[96]

On April 27th 1998, AECL announced an interim programme, providing about US$142 million (about $200 million Cdn), with the EDC providing an unconfirmed percentage. The AECL news release stated that the *"Canadian scope of the project [is] worth $80 million..."*.[97] During his May 1998 visit to Canada, former President Constantinescu asked Prime Minister Chretien for a further US$1 billion loan,[98] with a lower guarantee, a longer payback period and a delay before repayments started.[99] This related not only to the interim US$200 million financing but to the total completion package for Cernavoda-2, which will cost (according to the former utility RENEL) an additional US$750 million or over US$1.1 billion Canadian.[100] AECL has stated that Canada would finance only one-third of that (US$250 million, or $375 million Cdn).[101] In March 2000, the Chairman of EDC Board of Directors stated that *"EDC is presently participating in interdepartmental meetings to determine whether Canada Account funds would be available in support of AECL's contract and, if so, under what conditions such support would be extended"*.[102]

Ansaldo has approached Mediocredito Central and SACE, the Italian export credit agency for financing.[103] Romania has also applied to Euratom for a US$350 million loan,[104] leaving a balance of US$150 million, which may be financed by other European export credit agencies for goods and services from European nuclear companies. In May 2001, a commercial contract was signed between Nuclearelectrica and AECL and Ansaldo Energia. Once the contact becomes effective, it is expected that the completion of unit 2 will take 54 months. The total completion is expected to cost US$689 million.

There is strong opposition in Canada to further Canadian financing for Cernavoda-2. In March 1999, 164 members of parliament —a majority of MPs including one third of the governing Liberal Party— came out publicly against federal government financial support for Cernavoda-2.[105] A petition from the Romanian environmental group Mama Terra (For Mother Earth) opposed the second reactor at Cernavoda, and was endorsed by more than 50 Canadian environmental groups, and over 80 organisations in 40 countries.[106]

The proposal to proceed with Cernavoda-2 is absurd given the fact that Romania has a huge three-fold surplus of generating capacity. In 1999, total installed capacity was 19,676 MW,[107] and peak demand in 1998 was only 6,000 MW.[108] Construction of the nuclear plant will cause dislocation of the existing system, and ultimately depends on electricity exports which are still unconfirmed and dubious at best.

South Korea: Wolsong – 2, 3 & 4

In December 1990, AECL signed a contract with South Korea for a 680 MW CANDU (Wolsong-2). Of the total plant cost of US$1.2 billion, the AECL contract reportedly accounted for about US$600 million, of which about US$200 million went to Korean sub-contractors, US$200 million to Canadian manufacturers and about US$200 million to Nuclear Project Managers Canada Inc., Canatom and AECL-CANDU.[109] The deal did not require financing from EDC.

In September 1992, AECL announced another sale to South Korea, this time for two CANDUs, Wolsong-3 and -4. AECL contracts amounted to US$950 million, of which US$450 million went to Korean subcontractors, with about US$500 million coming to AECL and Canadian suppliers.[110] As with Wolsong-2, this deal did not require financing from EDC, but the percentage of Canadian content (in dollar terms) was about 40% less. The dollar amount of contracts going to the private sector may have been about US$300 million. In order to achieve a short-term sales objective, AECL gave South Korea the knowledge and skills to build its own CANDU reactors. It has been reported that Korean content in Wolsong-3 and -4 was 'close to 75%.[111]

AECL has tried to sell two 900 MWe CANDU reactors to South Korea, but in February 2001, officials in the Korean government finally disclosed that Wolsong-5 and -6 would be built as 1000 MW PWRs.[112] This decision closed the door on AECL's last best hope for more reactor sales in the foreseeable future.

Qinshan Phase III

On November 8th 1994, AECL signed a Memorandum of Understanding (MOU) with the China National Nuclear Corporation (CNNC) to begin negotiations on the sale of two CANDU-6 (i.e. 700 MW) reactors. Former Chinese Premier Li Peng and Canadian Prime Minister Jean Chrétien had just previously signed a Nuclear Cooperation Agreement (a bilateral agreement on nuclear weapons proliferation). A second phase of the CANDU deal was signed a year later in Ottawa. Former AECL President Morden stated that *"the Chinese terms are onerous"* and that price and financing *"are the key issues and we have not crossed these hurdles yet"*.[113] By that time, the Canadian government had already committed to a US$1.5 billion credit guarantee through the EDC.

The Chinese clearly drove a hard bargain. Canadian CANDU subcontractors were asked to cut their bids by a further 15%.[114] Nuclear industry insiders speculated that AECL was willing to sell the CANDUs at cost in order to secure the contract.[115] The Canadian government of Jean Chrétien pulled out all the stops to save the CANDU deal. On July 12, 1996, a "Project Award Agreement" was signed which *"finalise[d] the price and commercial terms for Qinshan Phase III CANDU nuclear power project as well as the fees, the financing scope and conditions from the Export Development Corporation and other export credit agencies"*.[116]

Because Canada Account support through the EDC was limited to $1.5 billion (Cdn), AECL had to seek foreign partners with their own financing for the remainder of the $4 billion (Cdn) project. The successful consortium, Hitachi-Bechtel (Japan-USA), brought financing from the Japan Export Import Bank (JEXIM), and the United States Export Import Bank. [117]

AECL reportedly retained Korea Heavy Industries and Construction Company (Hanjung) for heavy components worth more than US$120 million.[118] As Korea's first major nuclear export order,

inclusion of the Korean Company may have been an added enticement in AECL's attempt to sell more reactors to Korea.

The signing of the July 12th 1996 agreement was prompted by an impending change in the Consensus interest rate of the Organisation for Economic Cooperation and Development (OECD). After July 12th, it rose above 7.49%.[119]

On November 26th 1996, the final contract was announced for the sale of two CANDU-6 reactors, valued by AECL at $4 billion (Cdn). It was originally announced that the EDC provided $1.5 billion (Cdn)[120], for goods and services within Canada.[121] The EDC has since confirmed that the actual loan agreement signed in January 1997 included a loan of $1.47 billion (Cdn) and US$350 million or approximately $1.94 billion (Cdn).[122]

In January 1997, the Export-Import Bank of the United States approved a US$323 million loan for Qinshan's balance of plant equipment and services by Bechtel Power Corporation, Gaithersburg[123] (the amount having been reduced from an initially approved amount of US$383 million). This was provided at 7.49%, with a 15 year term, with repayment starting 6 months from final acceptance of goods, and not later than April 15th 2004 (in other words after the commercial operation of the nuclear station).[124]

In January 1997, the Export-Import Bank of Japan (JEXIM) announced that a US$280 million loan was being provided for Qinshan III. The loan was co-financed with Industrial Bank of Japan and Bank of Tokyo, with JEXIM providing 60% or US$168 million of the total.[125] The loan was for the purchase of turbines, generators and other equipment from ITOCHU and Hitachi. It also noted that the US Ex-Im Bank was providing funding for Bechtel Corporation to supply the transformer facility for the station.

All of the loan agreements were signed with the State Development Bank of China, 100% owned by the Chinese government. The site of the two CANDU reactors is known as Qinshan Phase III.

Qinshan Concessions

The $1.5 billion (Cdn) government guarantee and loan for the Qinshan reactors was the largest loan in Canadian history, and as an EDC Canada Account transaction, it will be a liability on the government's account. The loan was far too large and risky for either private sector banks or the EDC to handle on their own. However, few details about the deal have been revealed. They are at pains to note that the $1.5 billion EDC loan for Qinshan was not 'concessional', with the contract allegedly meeting the terms of the OECD Consensus Agreement, including an interest rate reportedly of 7.49%[126] – a lower rate than any normal commercial deal. Although AECL originally claimed that the deal was worth $4 billion (Cdn), it has since stated that it was $3 billion (Cdn).[127] There have clearly been other concessions.

During the visit of former Minister of Natural Resources Anne McLellan to China in May 1996, CNNC President Jiang Xinxiong identified four areas where they were seeking concessions: *"economics, financing, heavy water lease, and the training and simulator".* On the question of price, the CNNC President argued that CANDUs were more expensive than the PWRs at Daya Bay Phase 2, and he stated *"There was still a big gap, roughly 10 per cent or $300 million [presumably US$]. So each side should take a step".* McClellan responded by saying it was impossible for AECL to cut

US$150 million.[128] On the financial question Minister McLellan responded by saying that "there could be further discussion on financing fees. Movement is possible".[129]

On the question of heavy water supply, it seems likely that by leasing the heavy water, Canada made a significant concession to avoid the impact of an outright sale of the expensive commodity. The Qinshan reactors require about 1,000 tonnes, at a purchase cost of over US$200 (Cdn) per kilogram.

When Liberal politico Roy MacLaren visited China in April 1996, his mission at least in part was apparently to offer a concession in the form of a CANDU training package, including a computerised CANDU simulator. CAE Electronics Ltd. of Montreal stated that value of the simulator it would supply for Qinshan was $20 million (Cdn).[130]

Finally, it is no coincidence that on the same day as the CANDU agreement, former Canadian Minister of International Trade Art Eggleton announced that the EDC would grant a concessional line of credit to China for up to US$75 million, noting at the same time that the EDC was providing commercial lines of credit for business in China of up to US$430 million. This was a barely concealed flouting of the OECD consensus agreement.

Other EDC Nuclear Support

The EDC has provided financial support for other smaller nuclear exports as well. It can be seen that often these smaller projects were financed as an incentive for possible CANDU reactor sales. The projects have been noted below.

Czechoslovakia

In 1983, EDC provided US$1.5 million under a line of credit agreement with Cekoslovenska Obchodni Banka , A.S., of the former Czechoslovakia. It was for the sale of nuclear valves by Velan Inc. of Montreal to Intersigma, the Czechoslovakian foreign trade organisation.[131]

Hungary

Canada has had a longstanding interest in nuclear trade with Hungary. In 1984, EDC provided US$1.26 million under a line of credit agreement with Magyar Nemzeti Bank of Hungary for *"a sale of nuclear valves by Velan Inc. of Montreal to Eromu Berahazasi Vallalat, a Hungarian foreign trade organisation".*[132]

In 1988, AECL signed a Memorandum of Understanding with three Hungarian companies to study the marketing and construction of Slowpoke reactors in Eastern Europe.[133] In 1989, AECL and New Business Ventures (a subsidiary of the former Ontario Hydro) signed an agreement with the Hungarian state utility to study the feasibility of building a CANDU reactor in Hungary dedicated to the export of electricity to western Europe.[134] In 1991, AECL reported that

"A market feasibility review and analysis for Czechoslovakia and Hungary has been completed and presented to marketing management. The purpose of the review is to confirm preliminary assessments of the long-term opportunity for CANDU in those countries."[135]

In 1996, Canada supported a Hungarian radioactive waste programme. In May 1996, it was announced that the federal government had already given Hungary US$230,000 to *"assist with*

drilling underground tunnels and to develop the disposal research programme". The Canadian International Development Agency (CIDA) was providing another US$500,000 to complete the project. Monies for the funding were committed in the 1996 federal budget.[136]

Indonesia

AECL made a bid on construction of what was to be Indonesia's first nuclear power plant in 1987. AECL was competing against Framatome (the state-owned French company); Mitsubishi Corporation of Japan; and Kraftwerke Union (then a subsidiary of the German company Siemens AG). However, it appears that the nuclear plant was cancelled because of its high cost.

In 1991, BATAN (Indonesia's National Atomic Energy Agency) retained a Japanese consulting firm to do a feasibility study for the nuclear power option in Indonesia, and selected an initial site on the Muria Peninsula, on the northern shore of Central Java. Possible reactor vendors were narrowed down to General Electric, Mitsubishi Heavy Industries/Westinghouse, Nuclear Power International/Siemens & Framatome, and AECL.[137]

That same year, former AECL President Stanley Hatcher and Chairman Robert Ferchat visited Jakarta to promote the CANDU. As an incentive, they established a programme to send Indonesian nuclear personnel to South Korea to gain experience on CANDU reactors operating there.[138] In 1992, AECL announced a programme to send Indonesian nuclear personnel to study at Canadian CANDU stations.[139] That same year, AECL submitted technical information on the CANDU to BATAN.[140]

In November 1994, Prime Minister Jean Chrétien personally promoted a CANDU sale with former Indonesian strongman Suharto in Jakarta. Chrétien announced that the Atomic Energy Control Board (the previous name of Canada's nuclear regulatory agency) would provide another sales sweetener for AECL, by training four Indonesians per year in the management of CANDU technology.[141]

In January 1996, Prime Minister Chrétien again visited Jakarta, heading a trade delegation of politicians and business persons ('Team Canada'), and again promoting a CANDU sale. It was Chrétien's fifth personal meeting with Suharto. Canadian media referred to discussions about CANDU sales, mentioning a 'technical cooperation agreement' between AECL and BATAN, and the possible sale of one or two reactors at US$2 billion each.[142] At some point in the mid to late 1990s, the EDC provided yet another incentive for a CANDU sale, by financing the sale of a nuclear laboratory to Indonesia. EDC and AECL have not disclosed any information about the project.[143] By this time, AECL had been operating an office in Jakarta for a number of years.

In 1996, Djali Ahimsa, Director General of BATAN, stated that Indonesia would proceed with a 1,800 MW nuclear station, with construction starting in 1998 or 1999, and the station entering service between 2004 and 2007. The station would consist of three 600 MW reactors or two 900 MW reactors, to be located on Java's Muria Peninsula.[144] Public opposition focused on the earthquake risk to nuclear power plants, as Indonesia has about one third of the world's active volcanoes.[145] Mount Muria, on the Muria Peninsula where the first nuclear station was planned, is a dormant volcano. NGOs also protested that the Suharto regime repressed and prevented any public debate on nuclear power.[146]

Following the collapse of Suharto's dictatorship in May 1998, Indonesia's proposed nuclear programme was quietly ended. It is likely that austerity programmes imposed by the International

Monetary Fund precluded expensive nuclear plants, and public opposition became possible with the restoration of democracy. During the crisis of Suharto's ouster in 1998, AECL shut down its Jakarta office and moved to Bangkok, Thailand.

Mexico

AECL lost out to General Electric in a 1969 bidding competition for the Laguna Verde reactor in the state of Veracruz. The plant eventually began operation in 1988. Despite massive cost over-runs and delays on that first reactor, Mexico's Instituto Nacional de Energia Nuclear (INEN) issued a call for bids in 1980 for a second reactor at the site. It was to be part of a massive nuclear expansion programme of 20,000 MW by 2000, estimated to cost US$32 billion. The same companies that had bid on the first reactor also put in bids for the second reactor by February 1982.

Canada launched a massive marketing effort, dubbed 'CANDU Diplomacy'. It included a US$2 million study performed by AECL looking at Canadian importation of Mexican oil.[147] As an official 'bribe', in 1980 the Canadian-Mexican Agreement on Industrial and Energy Cooperation was signed under which Ottawa said it would buy Mexican crude oil if Mexico considered buying a CANDU. In 1981, the EDC reported providing a line of credit for US$2,358,781 to the Comision Federal de Electricidad (CFE) of Mexico, ostensibly "to support the sales of a design and development study by Atomic Energy of Canada Limited (AECL) and a computer data acquisition system by Bailey Meter Co. Ltd. Of Burlington, Ont., to CFE."[148] By 1983, a million dollars worth of Mexican crude oil was coming into Montréal every day, despite the fact that Mexico had killed the whole nuclear deal in 1982.[149]

Mexico had pressured Canada to supply generous concessionary financing for 100% of the cost of the package, estimated at as much as US$6 billion for four CANDU-6 reactors. The Canadian government was apparently willing to borrow billions of dollars at commercial rates (then about 16%) to finance the project for Mexico at 7% or 8% – in effect a subsidy for as much as 40% to 60% of the station.[150] It was also suggested that Mexico was pressuring for a 'guaranteed cost agreement' putting the risk of cost overruns onto AECL.[151]

In January 1982, two weeks before the bid deadline, former Canadian Prime Minister Pierre Trudeau visited Mexico for the third time in a year to promote the bid. AECL had established an office in Mexico City, and one source reported that $50 million (Cdn) had been spent on the Canadian bid.[152] However, under the weight of falling oil prices, and its $70 billion debt, the Mexican peso had collapsed in February, 1982. Mexico announced the cancellation of its grandiose nuclear expansion plans in June 1982.[153]

Main Canadian Companies Involved with Reactor Exports

This section looks at some of the main suppliers of goods and services in the nuclear industry in Canada. It is not an exhaustive list and no comprehensive list is available of the companies involved in specific reactor sales, and their role or the value of their contracts. AECL has stated that about 150 Canadian companies (public and private sector) contributed to Qinshan Phase III contracts.[154]

Atomic Energy of Canada Limited (AECL)

Atomic Energy of Canada Limited (AECL) is a publicly owned crown corporation founded in 1952, that is primarily responsible for CANDU design, engineering, research and marketing. Unlike many other major international nuclear vendors, AECL does not have any in-house manufacturing capability. Therefore, in its export reactor projects, it has acted as a marketer and negotiator, a primary contractor, designer and procurer of equipment, and has general responsibility for nuclear projects. AECL's previously large research role in 'pure science' has been largely eliminated in the last decade.

AECL remains highly dependent on government subsidies for its existence, having received US$16.6 million ($2000 Cdn) from 1952 to 2000. Despite government moves to reduce subsidies, AECL received an average of US$162 million per year from 1997 to 2000 inclusive.[155] AECL's future remains very uncertain with the collapse of its hoped-for reactor sales in Indonesia, Turkey, South Korea and China.[156] AECL has 3,500 employees, with 6 Canadian offices and international offices in Argentina, China, Indonesia, Korea, The Netherlands, Romania, Thailand, Turkey and United States.[157]

GEC Alsthom Canada

In 1991, GEC Alsthom NV[158], a Franco-British company that manufactures turbines and generators bought 65% of Mil-Tracy from the MIL Group, becoming GEC Alsthom electromecanique Inc.. The remainder of the company was purchased by a provincial crown corporation, the Societe de Developpement Industrielle du Quebec. This gave GEC Alsthom access to the North American market for power generating equipment, as well as the nuclear business, which Mil-Tracy had been involved with since the 1950s.

In 1990 Mil-Tracy had signed a joint venture with Sulzer of Switzerland in order to bid for the Wolsong-2 reactor in South Korea. As part of that deal, Mil-Tracy accessed new technology applicable to CANDU reactors. Mil-Tracy/GEC Alsthom have manufactured a variety of major nuclear equipment. The company produced £25 million worth of equipment for Qinshan Phase III CANDU reactors.[159]

Babcock & Wilcox

Babcock & Wilcox Canada, of Cambridge Ontario, is owned by McDermott Inc. of New Orleans, a subsidiary of McDermott International Inc. of Panama. B&W Canada specialises in steam generators ('boilers') for both fossil and nuclear plants, and also produces heat exchangers and provides a range of services including steam generator diagnostics, cleaning, and modifications.[160] Babcock & Wilcox has produced 222 of the 226 boilers for commercial CANDUs in Canada and abroad.[161] In the late 1970s, a flaw was discovered in the B&W manufacturing process, which resulted in a massive amount of defective manufacturing, with major defects in boilers at the Pickering A, Pickering B, Gentilly-2, Point Lepreau and Embalse CANDU nuclear stations.[162]

The company currently employs about 1,600 people, half of whom work on nuclear boilers, and the other half on fossil boilers. About 1,000 of the employees are at the Cambridge plant. B&W used its base of experience on CANDU boilers to move into the market for replacement steam generators for Pressurised Water Reactors in the United States, installing 209 boilers in 69 reactors over the last 14

years – about US$1 billion worth of business totalling about 20% of the market.[163] B&W Canada is the only manufacturer of nuclear boilers in North America.

General Electric Canada

GE Canada Inc. is a wholly owned subsidiary of the General Electric Company of Fairfield, Connecticut. GE Canada played a large historic role in the development of the CANDU reactor, including the design and construction of the prototype NPD reactor, as well as the KANUPP reactor exported to Pakistan, and the WR-1 reactor at Whiteshell. It abandoned the attempt to become an independent CANDU vendor in the early 1960s.

Based in Ontario, the company has manufactured a number of major CANDU components. GE Canada is also one of two CANDU fuel manufacturers in Canada.[164] It manufactured the fuelling machines and large electric motors for the Qinshan reactors.

Canatom NPM Inc.

In August 1998, Canatom and NPM Nuclear Project Managers merged to form Canatom NPM Inc..[165] Prior to the merger, the engineering/construction corporations SNC-Lavalin and Monenco-Agra jointly owned Canatom. SNC-Lavalin and Monenco-Agra, along with Foundation Nuclear and AECL also formed the Nuclear Projects Management (NPM) consortium. In addition to the contracts that Canatom obtained on its own, it apparently also did most of the work coming to its parent companies through NPM.[166] Canatom was founded in 1967 to provide nuclear engineering services, and NPM was formed in 1982 for project management, construction management, commissioning assistance and procurement of nuclear equipment. At the time of the merger, Canatom NPM had 250 employees. Since 1998, the ownership of Canatom NPM has changed to to SNC-Lavalin (62%), and BFC Construction (38%). BFC Construction Group Inc. is a subsidiary of Armbro Enterprises Inc., which in turn is is 49% owned by Hochtief AG, a large German construction company.

Canatom has been the traditional contractor for CANDU exports, and it or NPM was involved with all previous CANDU reactors, as well as heavy water plants and research reactors.[167] Canatom NPM is currently involved with the CANDU-6 projects in China, South Korea, and Romania. Canatom NPM now describes itself as the *"largest Canadian private-sector engineering company operating exclusively in the nuclear field".*[168]

Canatom NPM Inc. has its head office in Montreal, Quebec, as well as offices in Oakville, Ontario, and Seoul, Korea. It has four affiliated companies: CS&W Nuclear, Amag, CTECH (radioactive material management with AEA Technology of the UK) and CNUS (nuclear consulting and management services).

As noted above, Canatom in partnership with GEC-Alstom (UK-France) made an unsuccessful bid for work at Qinshan.[169] However, the company reportedly received sub-contracts from Bechtel, and also AECL

The Export Development Corporation

The Export Credits and Insurance Corporation (ECIC), predecessor of the Export Development Corporation (EDC), became Canada's official export credit agency under the Export Credits Insurance Act in 1944. It was assumed that a buyers' market would reassert itself in the post-war years, and

that Canada would need a governmental export credit agency to protect Canadian corporations in foreign markets, and allow them to compete with foreign corporations whose governments had similar agencies.

In the 1960s, several amendments were made to the Act, allowing long-term financing, increased financial ceilings and expanding services.[170] In 1969, the Export Development Act converted the ECIC into the Export Development Corporation and made it a crown corporation. Crown corporations are state-owned corporations that often function on a commercial or partially commercial basis. However, they clearly have a public policy mission and serve as the vehicles of state intervention in the economy. The EDC's basic purpose is to promote Canadian exports, rather than to maximise profit. A notable change made in 1969 was that the EDC could now borrow on the government's credit to fund its activities. Prior to that time, all loans were made on the government account and funded with borrowings from the Consolidated Revenue Fund.

Since 1969, EDC has provided a number of financial services: short term export credit insurance; bonding and surety services; political risk insurance; short term credit guarantees; and medium and long term loans to foreign borrowers and buyers.[171] In 1993, amendments were made to the Act which substantially broadened the EDC's mandate. These new powers included the ability to: provide consulting services; incorporate subsidiaries; make equity investments in Canada and abroad; provide domestic credit insurance; conduct lease agreements where the user is outside of Canada; and enter joint ventures in Canada and abroad.[172] The government requires EDC to be self-sustaining, which means that much of its business must be done on 'commercial', as opposed to concessional terms. The EDC operates a government account on OECD Consensus terms, the 'Canada Account' but also has a 'Corporate Account' on commercial terms. Corporate Account transactions are subject for example to the World Trade Organisation's Subsidy and Countervail Measures (SCM) Agreement.[173] There have been bitter charges of unfair competition against the EDC, particularly from domestic credit insurance companies and banks, since the EDC has clear advantages over its private sector competitors,[174] including that it:

- is not subject to income tax;
- does not have to pay dividends;
- can borrow money in capital markets at the low interest rates of the government;
- is subject to a lighter regulation;[175]
- benefits from *"government debt relief provided ex gratia under Paris Club agreements to countries that experience financial distress"*; and
- is compensated above normal market rates for administration of the Canada Account (in 1999, the EDC retained US$25 million from Canada Account transactions).[176]

In addition, the government bails out the EDC for bad debts, having provided about US$750 million over the last ten years.[177]

Since it operates mainly as a direct lender, the EDC is different from most ECAs which act primarily as credit insurers and guarantors. The EDC's volume of business on its corporate account has expanded from US$17.237 billion in 1995 to US$40.055 billion in 1999.[178]

Canada Account vs Corporate account

Under Section 23 of the Export Development Act,[179] if the EDC decides that it will not enter into a transaction under normal 'commercial' terms, and if the Minister of International Trade (with the

concurrence of the Minister of Finance) decides that the transaction is 'in the national interest', the Minister may authorise the EDC to proceed. The monies needed for the transaction are then paid out of the government's Consolidated Revenue Fund (its main operating fund). Any transaction over US$50 million (which has included all Canada Account support for reactor exports) requires the approval of Cabinet.

Transactions taking place under Section 23 of the Act are commonly referred to as 'Canada Account' transactions. Canada Account transactions are by definition large and/or high risk, and would not be accepted by private sector financial institutions or the EDC, even with its higher tolerance for risk. EDC describes Canada Account transactions as those which, *"on the basis of prudent risk management, cannot be supported under the Corporate Account".*[180] Most, although not all, of AECL's reactor exports have required Canada Account support.

The EDC is required to maintain a separate account for all of its Canada Account transactions. The EDC is responsible for the management and administration of the Canada Account transactions, but the risk ultimately rests with the Canadian government. Under Section 24 of the Act, liabilities under the Canada Account are limited to US$13 billion. In 1999, the outstanding loans and commitments were US$5.133 billion (1998 – US$5.650 billion).[181]

EDC provides five financial services, of which only four are available through the Canada Account: export credit insurance; financing service; performance insurance; and political risk insurance. The Corporate Account also provides equity investment services.[182]

Eligibility considerations for Canada Account transactions are:

- EDC's usual lending criteria (Canadian content, qualifications of the exporter, viability of the project);
- the government's willingness to consider the country in question's risk and the credit worthiness of the borrower(s); and
- national interest considerations, including:
- economic benefits and costs to Canada, including employment generated;
- importance of transaction to the exporter;
- foreign policy implications;
- importance of the market to Canada.[183]

EDC has described Canada Account transactions as typically having *"long lead times and a high degree of uncertainty",*[184] so it is typical for the Minister, or Cabinet, to give approval in principle, before the project is too far advanced.

In 1996 a dispute arose between Brazil and Canada over each other's subsidies to their respective aerospace companies (Canadian Bombardier Inc., and Brazilian Embraer SA) for sales of regional aircraft. The Canada Account had been used in about half of Bombardier's sales since 1992.[185] Brazil charged that the EDC's Canada Account support and another subsidy programme, Technology Partnerships Canada, constituted illegal subsidies. A 1999 WTO ruling found Technology Partnerships illegal, condemned Canada for failing to provide adequate information on its provision of Canada Account subsidies, and found the Canada Account at least partly in contravention of the WTO Subsidies and Countervail Measures Agreement (SCM). The dispute evolved into a major international trade war, with appeals and counter appeals against the original ruling. In March 2001, Brazil served notice that it would again challenge the legality of the EDC's use of the Canada Account at the WTO's dispute resolution meeting.[186] The fate of the Canada Account is vitally

important to the Canadian nuclear industry, since it is the vehicle for most governmental financial support.[187]

EDC Consultation Review

The Gowlings law firm published a review of the Export Development Act in June 1999.[188] The review defended the status quo for EDC's role, while suggesting a few modest reforms. The Gowlings review fed into a legislative review by the Standing Committee on Foreign Affairs and International Trade (SCFAIT), which published a report in December 1999.[189] The recommendations included:

- in disclosure, distinguishing between Canada and Corporate Account transactions;
- creating an Ombudsman at EDC;
- the Auditor General (whose office includes the Commissioner for Environment and Sustainable Development) should review the EDC environmental framework;
- statutory authority should be given to the environmental review process being suggested by EDC within 12 months;
- the Auditor General should be given ongoing oversight of EDC's performance; and
- EDC's environmental framework should be subject to further public consultation[190]

The government responded to the SCFAIT report[191] by endorsing a few largely meaningless changes.

EDC Disclosure and Consultation Policy

EDC provides virtually no detailed information about its transactions. Clients are not even identified by name. By comparison, the Export-Import Bank of the United States routinely provides the following information: name of applicant, name of borrower, buyer, guarantor, exporter, supplier, product, name of project, amount of loan, loan commitment fee, interest rate, number of payments, frequency of payments, repayment starting date, 'not later than' repayment starting date, and finally the board decision (i.e. approved or not). Although the US Ex-Im Bank is not an ideal model, it reveals that EDC claims about the need for commercial confidentiality are greatly exaggerated.

In 2000, EDC hired the polling firm Environics to conduct consultations with the public on the issue of disclosure.[192] In December 2000, EDC released for comment a 'draft outline' for a disclosure policy.[193] EDC currently plans to release its draft disclosure policy for a 45 day comment period (no meetings, written comment only) in early April.[194]

Canada's EDC Working Group (a coalition of environment, development, social justice, and labour organisations) has recommended that basic information (such as that provided by the US Ex-Im Bank) should be made available at the proposal stage, along with evaluation reports on completed projects and environmental assessments.[195] The Working Group has also suggested that Canada's Access to Information Act should be applied to EDC. Other crown agencies such as the Canadian International Development Agency (CIDA) are subject to the ATI Act. In addition, both the US Ex-Im Bank and the United States Overseas Private Investment Corporation (OPIC) are subject to the US Freedom of Information Act.[196]

EDC Environmental Policy

In an attempt to defuse some of the criticism it was receiving for its deplorable environmental record, the EDC has taken several steps. In May 1999, it followed numerous Canadian and international private sector and multi-lateral financial institutions in signing the United Nations Environment Programme Statement by Financial Institutions on the Environment and Sustainable Development.[197]

In April 1999, EDC released its Environmental Review Framework (ERF).[198] The Office of the Auditor General is currently reviewing the ERF and this review is expected to be released in late May 2001. The EDC may invite public comment on this review.[199] The International Campaign for Export Credit Agency Reform has also made a detailed critique of the ERF.[200]

The ERF gives EDC complete discretion about what constitutes environmentally unacceptable projects.[201] Other agencies, for example, US Export Import Bank (Ex-Im), IFC, US Overseas Private Investment Corporation (OPIC), and other members of the World Bank Group; have specific prohibition or exclusion lists.

The ERF also only requires the EDC to 'consider' international environmental standards and states that *"Environmental covenants, If any, will be developed in consultation with contractual parties. Such covenants will, at a minimum, be consistent with the laws of the host jurisdiction..."*. In other words, EDC only requires compliance with host country laws. This undermines attempts by the World Bank Group and others to raise the standard of environmental practice.[202]

The EDC Working Group has recommended that World Bank environmental standards be accepted as the minimum standards for EDC and for export credit agencies internationally.[203] The Working Group has also suggested that the Canadian Environmental Assessment Act should be applied to the EDC, or that the Projects Outside Canada regulations should be amended to include, at a minimum, EDC's Canada Account transactions.[204]

The Environmental Review Framework provides absolutely no guarantee of public consultation or access to information. It absolves EDC of the need to disclose any information to the public without the consent of all parties. By contrast, WB, Ex-Im and OPIC all publish environmental assessments prior to decisions made on projects.[205] EDC's decision mechanisms remain a black box, with virtually no transparency on the sensitive issue of environmental protection.

On the question of consultation, EDC says that it 'may consider' information on projects from outside sources, making public consultation a totally discretionary practice. By not allowing access to information, this virtually guarantees that meaningful public consultation will not occur.[206] The ERF insures only accountability to the EDC Board of Directors, not to the public or any independent agency. Other financial institutions such as UNEP, IFC and OECD are not so dilatory, and support consultation with concerned groups.

The ERF was correctly characterised by the Gowlings report as an *"internal EDC process... which stops short of setting objective criteria or benchmarks".*[207] Canada, represented by the EDC, claims to have taken a leadership role in developing environmental standards of ECAs through the Export Credits Group of the Organisation for Economic Co-operation and Development (OECD). The EDC claims that *"Trying to impose Canadian standards on all commercial projects in foreign jurisdictions would place our exporters at a competitive disadvantage without ensuring any change in environmental outcomes".*[208] The EDC refuses to lead by example or even match the modest

disclosure and environmental standards of its competitors, thereby contributing to lower international standards.

Sierra Club of Canada Court Case: Environmental Assessment for an EDC Nuclear Deal

On November 6th 1996, the Canadian cabinet amended regulations under the Canadian Environmental Assessment Act that would have required a preliminary screening and a comprehensive study (environmental assessment) to be carried out on the proposal by AECL to build two CANDU reactors for the Chinese government at Qinshan. The revised regulations were given the force of law the next day, without the normal publishing in the Canada Gazette for a 60 day comment period. The revised regulations were only published the day after the CANDU agreement with China was signed. The regulations were triggered by the federal government authorisation of the $1.5 billion (Cdn) loan guarantee through the Canada Account of the Export Development Corporation (EDC).[209] This required the approval of Cabinet.

In January 1997, the Sierra Club of Canada filed an Application for Judicial Review with Federal Court of Canada-Trial Division.[210] The government has argued that the EDC loan emanated from the EDC, and not from the government, and refused to release background documents.

In November 1997, minutes of an April 1997 cabinet were leaked to the public. The document was primarily dealing with the financing of the proposed sale of two CANDU reactors to Turkey, but it commented on the Sierra Club court case.

"In the Sierra Club litigation challenging the CANDU China transaction, the government has taken the position that CEAA [Canadian Environmental Assessment Act] does not apply to projects which receive financial assistance from Crown corporations through the Canada Account. However, [the Department of] Justice has advised that its case is not strong and that the Federal Court may well rule in favour of the Sierra Club. If the government loses, Justice expects that the court could issue an order directing the 'responsible authority(s)' (RA), DFAIT [Department of Foreign Affairs and International Trade] and Finance, to conduct an environmental assessment which satisfies the Projects Outside Canada Environmental Assessment Regulations (POC)."[211]

In April 1998, on the eve of cross-examination of government officials by the Sierra Club, AECL filed a motion to become a respondent (full party) in the judicial review. On April 29, 1998, the Federal Court dismissed AECL's motion, although AECL was subsequently allowed to become an intervenor. AECL has subsequently engaged in a lengthy series of delaying tactics, while work has continued on the reactors in China.

The Sierra Club is currently engaged in actions to expedite the progress of the hearing.[212] It is clear that the AECL strategy is to delay the legal proceedings so that the question of environmental assessment will become moot when construction of the two reactors is complete. The projected first criticality for reactor #1 at Qinshan is October 2002, and July 2003 for Reactor #2.[213]

Footnotes (full report)

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350 The Future of the Export Credits Guarantee Department, Trade and Industry Committee, Session 1999 - 2000, Third Report. The duty to try and break even has been identified as a problem by analysts, who argue that, as one of the few ECAs with this duty, it puts the ECGD, and therefore UK trade, at a disadvantage. See, for example, KPMG, Risk Management Review for HM Treasury and ECGD, December 1999, Cm 4792

351 Export credits and investment insurance guarantees are almost always underwritten by sovereign guarantees from the importing country. However, in January 1999 the ECGD departed from this arrangement for the first time when it supported financing contracts for Rolls Royce without sovereign guarantees. The contract covered power generating equipment for Bilkent University (Snouts in the Trough; Export Credit Agencies, Corporate Welfare and Policy Incoherence, The Corner House, June 1999, Briefing 14).
352 Review of ECGD's Mission and Status 1999 – 2000, Cm 4790, July 2000, http://www.ecgd.gov.uk/downloads/missionstatusreview.pdf
353 Huw Evans, Evidence, The Future of the Export Credits Guarantee Department, Trade and Industry Committee, Session 1999 - 2000, Third Report, para
354 ECGD and US Ex-Im-Bank Sign Co-Operation Agreement, ECGD press release, 17 January 2001. While this is the first co-operation agreement for Ex-Im, the ECGD has signed agreements with agencies in 23 countries.
355 Review of ECGD's Mission and Status 1999 – 2000, Cm 4790, July 2000, http://www.ecgd.gov.uk/downloads/missionstatusreview.pdf, p 9
356 ECGD Annual report and accounts, 1998/99, p 42
357 ECGD Annual report and accounts, 1999/00, p 49. This was a scheme to indemnify UK cashmere exporters following the imposition of US customs duties measures.
358 House of Commons International Development Committee, 6th Report 1999 - 2000 Session, ECGD, Developmental Issues and the Ilisu Dam, para 10
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361 Review of ECGD's Mission and Status 1999 – 2000, Cm 4790, July 2000, para 1.11, http://www.ecgd.gov.uk/downloads/missionstatusreview.pdf
362 Review of ECGD's Mission and Status 1999 – 2000, Cm 4790, July 2000, para 1.25 http://www.ecgd.gov.uk/downloads/missionstatusreview.pdf
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373 Shandong PWR Project Beset by Problems that May Impact Bids, Nucleonics Week, 5 April 2001
374 Ling Ao Phase Heavily Favoured in Race for 10th Plan Projects, Nucleonics Week, 5 April 2001
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List of Main Abbreviations and Acronyms used in the Report

ABB	Acca-Brown-Bovi (Sweden)
AECL	Atomic Energy of Canada Limited
BNFL	British Nuclear Fuels Limited
BNP	Banque nationale de France
BWR	Boiling Water Reactor
CANDU	Canadian Deuterium Uranium Reactor
CEA	French Atomic Commission
CEE	Central and Eastern Europe
CIDA	Canada International Development Agency
CIRUS	Canada-India Reactor United States
CIS	Commonwealth of Independent States
CNNC	China National Nuclear Corporation
COFACE	Compagnie francaise d'assurance pour le commerce exterieur (France)
COGEMA	Compagnie générale des metières nucléaires
CTBT	Comprehensive Nuclear Test-Ban Treaty
DAE	Department of Atomic Energy (India)
DREE	Direction des relations économiques extérieures (France)
EAO	External Aid Organisation
EBRD	European Bank for Reconstruction and Development
ECA	Export Credit Agency
ECGD	Export Credit Guarantees Department (UK)
ECIC	Export Credit Insurance Corporation (Canada)
EDC	Export Development Corporation (Canada)
EDF	Électricité de France
EIBJ	Export-Import Bank of Japan
EID	Export, Import and Investment Department in METI (Japan)
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
Ex-Im	US Export-Import Bank
GE	General Electric
IAEA	International Atomic Energy Authority
IFO	International Finance Operations of JBIC
IMA	Inter-Ministerial Committee for Export Guarantees (Germany)
JBIC	Japan Bank for International Co-operation
KANUPP	Karachi Nuclear Power Project
KEDO	Korean Peninsula Energy Development Organisation

KEPCO	Kansas Electric Power Company
LWR	Light Water Reactor
METI	Ministry for Economy, Trade and Industry (Japan)
MINATOM	Ministry of Atomic Power (Russia)
MITI	Ministry of International Trade and Industry (Japan)
MOX	Mixed Oxide Fuels
NB Power	New Brunswick Electric Power Commission (Canada)
NEK	Bulgarian national Energy Producer
NEPA	National Environmental Policy Act (US)
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
NSA	Nuclear Safety Account
NSP	Nuclear Steam Plants
NSSS	Nuclear Steam Supply Systems
OECD	Organisation for Economic Cooperation and Development
OECF	Overseas Economic Co-operation Fund
OPIC	Overseas Private Investment Corporation
PHWR	Pressurised Heavy Water Reactor
PWR	Pressurised Water Reactor
ROSEXIMBANK	Russian Export-Import Bank
SACE	Sezione Speicale per l'Assicurazine del Credito all'esportazione (Italian)
SCFAIT	Standing Commission on Foreign Affairs and International Trade (Canada)
SCM	Subsidies and Countervail Measures Agreement (WTO)
UKAEA	United Kingdom Atomic Energy Authority
VEK	Federal Service on Currency and Export (Russia)
WH	Westinghouse Electric Corporation
WP ECG	Working Party on Export Credits and Credit Guarantees
WTO	World Trade Organisation