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Sorry. No Candu.

Exporting Apocalypse: CANDU Reactors and Nuclear Proliferation

by

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It is now clear that the use of 'peaceful' nuclear technology cannot be separated from the threat of nuclear weapons proliferation. In fact, this past decade has provided damning evidence to show that civilian nuclear technology has become the dominant means of acquiring nuclear weapons capability throughout the world.

India's detonation of a 15-kiloton nuclear 'device' in 1974, with materials obtained from a Canadian designed and engineered research reactor, shocked the world and brought the Indian sub-continent, if not the rest of us, one step closer to apocalypse.

The Indian explosion provided dramatic proof that the distinction between the peaceful and warlike atom was a hoax -- a hoax contrived in a spirit of commercial expediency and orchestrated naivete, to allow the unrestricted vending of nuclear technology and material around the globe.

Six years later, international nuclear salesmen and their apologists are still portraying the Indian explosion as an aberration -- an incident that, for both technical and political reasons, cannot be repeated. These assurances are pure sugar.

The plain fact is that there is no technical basis for a distinction between the 'peaceful' and military atom. There never has been. And with the present political safeguards on nuclear technology and materials, continued belief in this distinction is a recipe for global suicide.

Suicide, by definition, is no accident. Neither was India. Neither is the fact that within the next decade, according to analysts from such diverse organizations as the CIA and the Stockholm International Peace Research Institute, as many as a dozen additional countries could be cooking up nuclear bombs in their national kitchens. Among these 'threshold' nations are: Pakistan, Argentina, South Korea and Taiwan -- all Canadian reactor customers.

Until 1974, the general public had little reason to suspect that there was no such thing as a peaceful reactor. After all, we had it from President Eisenhower and General Electric that the Peaceful Atom was going to provide the universe with electricity that would be safe, clean, and too cheap to meter.

But even in 1953, when Eisenhower made his famous "Atoms for Peace" speech, the physicists and the generals knew that every nuclear fission reactor -- regardless of size, model, or ideological origin, produces material that can be made into a nuclear weapon. In fact, virtually all A bombs and H bombs to this day are made with plutonium from fission reactors.

In 1953 the Americans, displaying typical Yankee enterprise, decided to take their military production reactors (bomb factories) enlarge them, weld on a few miles of steam pipe, bolt on a few turbines and generators, hook them into the electrical grid.....and presto!! they had the "Atoms for Peace" program.

Those early bomb factories weren't in principle any different from the latter-day fission models we see around North America: The CANDU at Pickering, the Slow-Poke reactor at the University of Toronto, or what used to be Unit #2 at Three Mile Island. They all produce, in varying quantities and concentrations, the ingredients to make a nuclear bomb.¹

The "Atoms for Peace" program kept the U.S. generals happy -- they were building bomb factories that produced electricity on the side. It kept the engineers happy -- they were building electricity factories that made bombs on the side. And this arrangement kept the corporate defense contractors like Dow, Rockwell and Westinghouse very, very happy. It still does.

Thankfully, we don't have many generals at Ontario Hydro. They're mostly just engineers trying to do their best for the beleaguered taxpayer. So it's not surprising that they don't see the CANDU as a piece of military equipment.

Neither do officials at the Department of External Affairs, or the people at Atomic Energy of Canada Ltd., our international nuclear sales clerks. They argue that technically, exported CANDU reactors could provide weapons material, there are less expensive and technologically formidable routes to the bomb than building a billion-dollar Pickering. Which is true. But when you ask them; "What is the cheapest and simplest way to make electricity and 20 or 30 bombs per year simultaneously?" they answer you only with uncomfortable silence.

There should be no doubt that this is the reason that our wondrous, benign, and indispensable CANDU technology has been bought, not by relatively peaceful, democratically elected governments in nations like Japan, Sweden or Mexico -- but by military dictatorships who rule their own people by terror. The CANDU, in the hands of a madman like General Videla of Argentina, or General Zia of Pakistan, is a bomb factory. And, they know it.

This sounds too sinister to be true? After all, how could any government, especially Canada's, knowingly hand such a potentially destructive technology over to governments which conduct political witch-hunts, practice systematic torture, and create concentration camps for people who are guilty only of belonging to trade unions?

The answer is partly, I think, that over the past 25 years the international nuclear industry and its disciples have convinced themselves that there is a technical and political Rubicon dividing the peaceful and warlike atom. And along the way, they have managed to convince a lot of other people -- including many members of Parliament.

Their first argument was established around 1947. It's thesis? That an atomic bomb is too expensive and too technically sophisticated to be manufactured by anyone except the most advanced industrial nations. For illustrative purposes, we were reminded of the enormous expense and concentrated expertise of the Manhattan Project.

History, however, has proven this a weak argument. Once the nuclear genie was let out of the bottle in August 1945;

once the U.S. lost its exclusive domain over the secret of the bomb, it became increasingly less difficult and expensive for the Soviet Union, Britain, France, China and India to follow suit.

And now that six nations have managed to fit together all the pieces in the nuclear puzzle, it's no more reasonable to expect the secret to remain confined to this select circle, than it is to expect bath salts to remain at one end of the tub.

In fact, the basic recipe for building an atomic bomb has been available since 1964 in such classified 'cookbooks' as the Encyclopedia Americana. For a basically lousy, inefficient but devastating bomb, you need:²

- 10 kilograms of plutonium 239, or
20 kilograms of uranium 235 enriched to 75-90% purity,
- a neutron initiator,
- a reflector: uranium, steel, copper, magnesium, lead aluminum, beryllium, water, solder or wax,
- TNT or plastic explosive (C4).

The other key ingredient, of course, is a competent designer, someone who knows the exact shape and mass of each ingredient. Dr. Theodore Taylor, a nuclear physicist who worked at the U.S. Los Alamos laboratory for seven years, and designed over a dozen atomic bombs which were exploded at test sites in Nevada and the Pacific, believes there are tens of thousands of people technically capable of constructing such a crude atomic bomb.³

He is a worried man. For the past ten years he has devoted most of his time and resources to warning government officials, the nuclear industry and the public about indiscriminate traffic in nuclear materials and information around the globe.

He has pointed out that the Los Alamos Primer, for instance, which contains the mathematical fundamentals of fission bombs, was declassified in 1964, and is available from the U.S. government for \$2.06. Four dollars can buy you your own personal copy of the Manhattan District History, Project Y, from the U.S. Office of Technical Services. It is a technical summary of the problems encountered in building the first atomic bombs. It was de-classified in 1961.⁴

Where the foreword should be, there's a legal notice which begins: "Neither the U.S. nor the Commission, nor any person acting on behalf of the Commission...assumes any liabilities with respect to the use of, or from damages resulting from the use of any information, apparatus, method or process disclosed in this report".

Dr. Taylor is convinced that the prospect of a 22 year old Einstein building a nuclear bomb in his basement is not as ludicrous as it sounds. The critical mass summaries are available for \$3.00 from the Washington Technical Information Service; details on plutonium processing are published in the Plutonium Handbook (Gordon and Breach, 1967, two volumes \$81.50), and all the materials and equipment can be purchased over the counter in places ranging from metallurgical supply firms to local hardware stores; for a few thousand dollars.⁵

"Technically that may be true", concede nuclear proponents, shifting to defense position #2, "but in order to get the plutonium or the enriched uranium, you'd have to have your own plutonium re-processing plant or a uranium enrichment plant. And that's impossible."

Wrong. First of all, this argument ignores the potential for nuclear theft, and the increased dispersion of nuclear materials that have drifted to every corner of the globe. Nuclear materials have been stolen in the past, and they will be stolen in the future. For instance, in 1977 the world learned that a 200 ton shipload of natural uranium had been stolen in the Mediterranean ten years earlier!

There is now wide consensus that the uranium cargo was hijacked by Israeli commandos, its eventual destination being the core of the Dimona military reactor in Israel. A CIA officer estimated in 1977 that Israel has built 10-20 clandestine weapons.⁶

In 1974, 50 kilograms of plutonium simply disappeared in Argentina. No explanation.⁷ In 1979, 20 lbs. of enriched uranium was discovered missing after an inventory check at a fuel fabrication plant in Erwin, Tennessee.⁸ In 1964, 60 kilograms of plutonium were found missing at a similar plant in Pennsylvania.⁹ The list goes on...

Dr. Fred Ikle, former director of the U.S. Arms Control and Disarmament Agency, has warned that by 1990 there will be enough plutonium in transit to manufacture the equivalent of 20,000 Nagasaki bombs. If even one percent of this material were to get into terrorist or military hands, the next century could usher in an age of international blackmail.¹⁰

It is true, as the nuclear industry often claims, that uranium enrichment has proven, in the past, to be a formidable technological barrier for nations wishing to develop independent nuclear weapons programs. Enrichment plants are necessary to turn natural uranium directly into weapons grade material.

Originally, the U.S., Russia, Britain, France and China shared a monopoly on this technology. In the early days, by the way, each plant came with a billion dollar price tag, and used as much electricity as the city of Cleveland.

In the past decade, however, newer, cheaper, and increasingly clandestine enrichment technologies have been developed: centrifuges, jet nozzles, lasers, and magnetochemical devices. These technologies will allow countries to achieve nuclear weapons capability independently, and subsequently to remain immune from international embargoes.

Perhaps the best way to illustrate this new, terrifying trend is to trace the story of Pakistan's race to develop the bomb. After India's first and (so far) only atomic explosion in 1974, Pakistani president, Ali Butto, vowed that his country would "eat leaves and grass" if necessary to develop nuclear parity with India. Within a year Pakistan had arranged to purchase a plutonium re-processing plant from France.

By this time Pakistan was already operating a small CANDU reactor near Karachi, and there is little doubt that the original Pakistani plan was to imitate the Indian route to the bomb -- using a 'peaceful' Canadian reactor.¹²

India, however, had blown the cover for this kind of operation. Canada immediately cut off all nuclear assistance to Pakistan in a desperate attempt to prevent another Canadian linked gate-crash into the nuclear weapons club. Intense international pressure, led by the U.S., compelled France to reluctantly cancel the sale in 1976. An arms race on the Indian sub-continent had apparently been averted, and our relieved Canadian government celebrated by selling a CANDU reactor to the generals in Argentina.

By 1978, however, the CIA and western intelligence operations had discovered that Pakistan had succeeded in acquiring, piece by piece, all the highly sensitive technology necessary to build a centrifuge uranium enrichment plant -- from private companies in Switzerland, Britain, West Germany --and the United States!¹³

In April 1979 the Carter Administration cut off all military and economic aid to Pakistan in a last-ditch attempt to prevent the determined Pakistani generals from completing their secret uranium enrichment plant. But it was a case of too little, too late; the plant is expected to begin operation within two years. Most diplomatic officials now concede in private that there is no technical or political means to stop Pakistan from building a bomb. The horse is out of the barn.

The same grim story can be told about South Africa -- except that the South African uranium enrichment plant was completed three years ago, with a little clandestine help from their friends in West Germany and the United States. In 1977, satellite photographs provided unmistakable evidence

that the South Africans were about to detonate an atomic device at their test site in the Kalahari desert. The test was apparently cancelled at the last minute, after behind the scenes negotiations with the United States and the Soviet Union.¹⁴

Nevertheless, South Africa has the bomb. And they are apparently prepared to use it. Dr. Andreis Viesser of the South African Atomic Energy Commission said in 1963: "We should have such a bomb to prevent aggression from loud-mouthed Afro-Asiatic states. Money is no problem. Such a bomb is available."¹⁵

Uranium enrichment is still the Cadillac of nuclear weapons technology. Plutonium reprocessing is the Volkswagen: it's the simplest, cheapest and fastest way to make a bomb if you already have a fission reactor of any kind. Canadian nuclear industry officials don't like to talk about the connection between CANDU and nuclear weapons. And they especially don't like to talk about plutonium reprocessing. It's not hard to see why; each Pickering reactor produces annually enough plutonium for about 20 nuclear weapons.¹⁶

The CANDU is also particularly valuable as a "cover" for weapons development because the advanced on-line fuelling capability of the CANDU means that material can be diverted from the reactor to the reprocessing plant without shutting down the reactor or interrupting electric power service. This also allows fuel to be pushed through the reactor at up to 10 times the normal rate, thereby creating a continuous supply of fresh weapons-grade plutonium.¹⁷

Another double-edged 'advantage' of the CANDU is that its natural uranium fuel cycle frees any country with its own uranium reserves from dependence on external uranium supplies or enrichment technologies. Thus, once the CANDU is under operation, the customer is immunized against external efforts to prevent weapons diversion -- including those that might come from Canada.

It is usually at this point that the people from AECL get most incensed. "It's true that CANDUs produce a lot of plutonium", they agree bitterly, "but dammit, the stuff is so radioactive you'd have to have your own reprocessing plant to extract it, and besides, you just can't make a real atomic bomb out of reactor-grade plutonium! These are irresponsible charges!."

It is, in fact, those kind of statements that are irresponsible. First of all, there is now no question that an effective atomic bomb can be made with plutonium from a power reactor. Such a bomb was deliberately constructed and detonated by the U.S. government in August 1977, in order to test the theory.¹⁸ A detailed analysis of the physics involved can be found in the February 28, 1980 issue of Nature.

The myth that plutonium from a power reactor could not be fashioned into weapons material was circulated freely in the Canadian Parliament -- and our reckless nuclear sales program was the result. If the physicists at AECL did not actually manufacture this myth, at the same time they did precious little to dispel it.

This same shameful episode took place in the United States and Europe. Dr. Ikle of the U.S. Arms Control and Disarmament Agency: "This misunderstanding (about proliferation) was compounded by the persistence within the U.S. government of a specific piece of misinformation: the claim that the plutonium from power reactors was normally not suitable for making bombs.

It is not quite clear why so many technically competent people helped to propagate this erroneous notion. It is clear, unhappily, that some used it deliberately to deceive their superiors as to the dangers of reprocessing."¹⁹

There is also no question now that a small plutonium reprocessing plant designed to isolate plutonium from spent reactor fuel is within the financial and technical reach of almost any nation on earth. Unlike uranium enrichment, plutonium reprocessing is a relatively cheap and simple chemical process.

Any government, or even a well-financed and resourceful terrorist group, could build a small, dirty, dangerous but effective reprocessing plant. In fact, a stunning 1978 United States government report, released by the Comptroller General of the United States, concluded that a small, secret reprocessing plant, built in less than a year and operated by a dozen technicians, could produce enough plutonium to build one nuclear weapon per week.²⁰ Estimated cost: \$1-3 million dollars.²¹

The technical information necessary to build such a plant was long ago scattered to the wind. Again, Dr. Ikle: "In some instances the dividing line (between the peaceful and warlike atom) was mindlessly weakened. For example, to reprocess spent reactor fuel the designers chose the Purex method, which had been developed to produce especially pure plutonium -- for what purpose? For making bombs.

"This Purex method, subsequently, was distributed by the U.S. Atomic Energy Commission throughout the world. Over 11,000 technical papers were declassified in the proliferation avalanche released by the Atoms for Peace program."²²

In retrospect it seems incredible, but the fact is that while our Canadian members of Parliament were being convinced that CANDU spent fuel could not be manufactured into weapons material, all our customers -- Pakistan, South Korea, Argentina and Taiwan were simultaneously attempting to purchase plutonium reprocessing technology from France and Russia!

When South Korea purchased a CANDU in 1975 they also began negotiations to buy a plutonium recovery plant from France. The deal was cancelled in 1976 following diplomatic protests from the United States. Last November, a U.S. Congressional Committee revealed that the South Korean government had begun a secret program to develop atomic weapons, in 1970.²³

The Pakistani attempts to purchase plutonium reprocessing technology from France were mentioned above. In 1976, intelligence agencies in the U.S. confirmed that Taiwan had begun operating a small reprocessing plant capable of producing enough plutonium for several bombs per year. Following intense U.S. pressure, Taiwan dismantled the plant in 1977. The reactor Canada sold to Taiwan is a virtual carbon-copy of the one India used to develop their bomb.²⁴

Finally the Argentinian case. In 1976 Canada sold the Argentinians there a CANDU reactor capable of producing 30 bombs worth of plutonium per year. It will be completed in 1982. Argentina already has, under construction, a small plutonium reprocessing plant. It tried to buy a larger one from France. It has a West German natural uranium reactor in operation, and another under construction. It also has significant reserves of indigenous uranium.²⁵

Two weeks after India exploded their 'peaceful' bomb, Argentina and India signed a nuclear co-operation agreement, which, among other things, was designed to "allow Argentina to enter the limited circle of nations endowed with nuclear arsenals."²⁶

Last May, the Argentine and Brazilian Argentinians signed a joint nuclear development agreement. Included were the sharing of uranium enrichment technology, reprocessing, and the eventual detonation of a 'peaceful nuclear device'.²⁷

The final card the nuclear industry always plays in their defense of nuclear export sales is international safeguards. They argue: "Well, maybe it is technically possible for nations to acquire nuclear weapons from civilian technology, but the political barriers, such as the Nuclear Non-Proliferation Treaty and bi-lateral agreements, will prevent this."

In principle this argument has some merit, but in practice -- and especially when it comes from AECL and the Canadian Nuclear Association -- it has a distinctly hypocritical ring to it. For three reasons. First of all, these people go to great lengths to defend nuclear export sales on the basis of our 'strict' safeguards, and then when a reactor order with the Argentine generals falls through, they turn around and say the deal collapsed because we wouldn't bend our safeguards agreements the way the Germans would!

Second, when the CANDU salesmen wax eloquent about the wonders of the Non-Proliferation Treaty, they usually neglect to mention that CANDU customers like Argentina, Pakistan and India have all refused to accept its terms, preferring to keep company with international nuclear outlaws like France, South Africa, Israel, Brazil and China.

Third, the Non-Proliferation Treaty itself is a case study in contradictions. While Article One does prohibit the international transfer of nuclear weapons under any circumstances, and Article Three insists that all nuclear facilities come under international inspection to prevent 'diversion', Article four allows, in fact encourages, the international

exchange of nuclear technology, information and materials, including uranium, plutonium, research and commercial reactors, and uranium enrichment and plutonium reprocessing plants! One could conclude that the fundamental objective of the Treaty is to prevent the misuse of nuclear technology by spreading it!

Article two prohibits any member state from developing its own weapons systems, but allows each state to construct, test or stockpile such things as plutonium separation plants, weapons grade uranium for nuclear submarines, guided missile delivery systems, bomb components etc. etc. In other words, you can be literally hours away from delivering an atomic bomb, but as long as the ingredients aren't assembled, it's OK.

As if that weren't enough, Article 10 allows each member state to formally withdraw from the Treaty on three months notice -- seven months later you can have thrown up a reprocessing plant and be getting your first 10 kilograms of plutonium. If you're not interested in building a 'legal' bomb, of course, you can do it sooner.²⁸

Let us be clear then about the meaning of the term 'safeguards'. It does not mean prevention; it means, at best, detection. They are two entirely different things. The NPT and its international inspection system cannot prevent any nation, including its own signators, from developing a nuclear bomb. Theoretically, it can detect a secret bomb program in time to allow other political, economic or even military measures to be taken.

But with the present Treaty dividing line between 'peaceful' and 'military' programs being only a matter of hours, even 'timely' detection is a hollow assurance.

Nevertheless, we can have a world without nuclear weapons, and I believe Canada has the ability, and the obligation, to initiate the disarmament process. Canada's nuclear export policy has been founded on three assumptions: that there is a dividing line between the peaceful and warlike atom; that this 'great divide' can be defended by a system of international safeguards; and that nuclear energy is absolutely necessary for world development.

Yet we have seen that the 'peaceful' atom is only as peaceful as the people who control it. The same thing can be said about shotguns. So let's be honest and admit we're exporting shotguns, mostly to generals who think only in bullets.

We have seen that the Nuclear Non-Proliferation Treaty is nothing more than a paper safeguard, and that: "Any NPT signatory, subject to the strictest safeguards, can quite legally be closer to having working bombs than the United States was in 1947!"²⁹ Let's be honest and admit that these kinds of treaties are not going to prevent anything.

Finally, the argument that nuclear energy is indispensable. And here we come to the critical question: Indispensable to whom? To Canada and the developed nations? To the Third World? Or to the multinational corporate contractors in North America, Europe and Japan?

It is quite clear that nuclear energy has a bleak future in the industrialized world. Reactor orders in the United States in the past six years amount to minus 27. West Germany: no new reactor orders since 1975. Japanese investments in energy efficiency 'supply' have outpaced those in fossil fuel and nuclear energy combined -- 10 to 1.

In fact, "of all new energy 'supplies' to the nine European Economic Community countries during 1973-78, about 95% came from more efficient use and only 5% from all supply expansions combined, including North Sea oil and nuclear power -- a ratio of about 19 to 1 in favour of conservation".³⁰

In Canada, nuclear energy currently provides less than 2% of our total energy budget. That puts it in the firewood league. And future sales have evaporated. The Canadian nuclear industry needs 48 reactor orders by the year 2000 just to stay alive -- so far none have been ordered.³¹

Which brings us to the claim that nuclear energy can release the Third World from poverty, malnutrition and economic chaos. In fact this is just a pious excuse for unloading our own expensive and unnecessary white elephants.

The World Bank estimated in 1971 that out of a population of 1.5 billion surveyed in rural areas, only 12% even had access to electricity. The figure for Africa, for the same year, was 4%.³² And most of this small fraction almost certainly went to wealthy families. Selling CANDU's to Third World countries before they even have electrical grids is another classic case of putting the neo-colonial

cart before the horse.

The most favourable geographical zone for collecting solar energy is within 35 degrees of the equator, where 80% of humanity lives (including most of the rural poor of the developing world). These people need clay stoves, biogas plants, New Mexican greenhouses and energy credit systems; they need labour-intensive, sustainable, and diverse sources of energy -- not capital-intensive, centralized, billion dollar technologies that turn into radioactive pumpkins after 30 years.

At one time, our nuclear export policy may have been founded on good, if poorly conceived intentions. The truth is now, however, that there is only one motive for export sales: keeping our terminally sick nuclear industry alive.

Prime Minister Trudeau said as much in the House of Commons last May: "We are not organizing an inquiry (into the nuclear industry) because the time schedule for keeping our industry viable is very, very short. We are now in danger of seeing the Canadian industry become obsolete and lose its chance to sell in other countries of the world unless we make some quick decisions."³⁴

Indeed, as Mr Trudeau unwittingly pointed out, nuclear energy is a technology which has already become obsolete. It is not an answer to proliferation: it is the driving force behind it. It is not an answer to our global dependence on oil: it actually precludes cheaper, quicker investments in conservation and renewable technologies. It is not a benevolent gift to the Third World, it is a way

of exporting our expensive and dangerous mistakes.

Nuclear proliferation and disarmament are the most urgent issues in the world. If the arms race isn't stopped, nuclear war will foreclose all other issues. There will be no issues.

Before the world begins to disarm, it must first decide nation by nation, nation with nation, to stop making more weapons. For Canada this means we must stop -- absolutely -- selling reactors and nuclear fuel on the world market. Because we know that, latent in these, are nuclear weapons.

Simultaneously, we must stop using Third World countries as dumping grounds for billion dollar white elephants like CANDU reactors, gas-guzzling tractors, and seed strains that survive only with petro-chemical based fertilizers. We must begin honest international development programs that meet the real needs of the world's poor -- not that make their world into our image. This means technology exchanges that are practical, that are sustainable, and that increase self-sufficiency.

We must convince other nations to re-write the Non-Proliferation Treaty so that the cloak of innocence and ambiguity is removed from nuclear energy, once and for all. It is, after all, this ambiguity which protects the nuclear outlaw, and prevents us from identifying him.

We must press for Nuclear Weapons Free Zones, and declare Canada one. We must reject the 'double-think' logic that says 'our' nuclear bombs are necessary and patriotic, while 'theirs' are unnecessary and irresponsible. And we must never forget that our failure to stop this

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madness will haunt not only us, but our children.

If we do these things, we will begin to reclaim our future.

FOOTNOTES: CANDU REACTOR SALES

1. See 'Nuclear Power and Nuclear Bombs', Amory Lovins et al, published in the prestigious Foreign Affairs, Summer 1980. This has been an accepted principle of nuclear physics since the discovery of plutonium in 1940 at the University of California in Berkeley. "The irradiation of uranium fuel in any reactor produces plutonium, which is a bomb material regardless of its composition or chemical form". Pg. 1139. I am indebted to this article for its wealth of information, and thematic clarity.
2. See 'The Curve of Binding Energy', John McPhee, 1974, Farrar, Straus, and Giroux. pgs. 15, 16, 152, 214-218
3. Ibid, page 124
4. Ibid, pgs. 60, 61
5. Ibid, pgs. 152, 153
6. See 'Atoms for Peace?', in Amicus, Vol. 1, No.1, Summer 1979, published by Natural Resources Defence Council. pg. 22
7. See 'Nuclear Energy: The Unforgiving Technology', Fred Knelman, 1976, Hurtig, Edmonton. pg. 153
8. See Birch Bark Alliance, Significant Events Report: December 23, 1971. page 3
9. See 'Nuclear Power', Walter C. Patterson, Penguin, 1976, pg. 246
10. See 'Nuclear Energy, The Unforgiving Technology, pg. 152
11. Atoms for Peace?, pg. 21
12. Nuclear Energy, Unforgiving Technology, pg. 161
13. See 'Atoms for Peace?' pg. 22; also, a Pakistani nuclear official told a 1973 CNA meeting -- one year before the Indian bomb test -- that the "PAEC is interested in the recycling of plutonium from KANUPP in her future advance thermal and fast breeder reactors". (from M.A. Khan, Zaidi, and Bhwtta, "Karachi Nuclear Power Plant as part of the Pakistani Nuclear Power Program". CNA 73-401, v. 1, p.12)
14. See 'Atoms for Peace?', pg. 22, also, The Nuclear Axis Julian Freedman Publishers, London.
15. See 'Spies Expose Atomic Secrets', Montreal Star, October 11, 1975.

16. See Half-Life (Submission to Royal Commission on Electric Power Planning), pg. 37
17. See "Nuclear Power: Time to Stop and Think", Alternatives Magazine, Fall 1977, pg. 27
18. See "Report by the Comptroller General of the United States", EMD 78-103, October 6, 1978, pg. 7
19. See Bulletin of the Atomic Scientists, January 1980, pg. 41
20. See footnote 18
21. See "Soft Energy Paths", Amory Lovings, Ballinger, 1977, pg. 186
22. See "Bulletin of the Atomic Scientists, January 1980, pg. 41
23. See "Atoms for Peace?", pg. 22
24. ibid, pg. 22
25. See "Nazi A-bomb", Ian Adams, Today Magazine, Toronto Globe and Mail, April 30, 1979, Report on Business, July 5, 1980
26. See "Nuclear Agreements must be Airtight", Financial Post, January 10, 1976
27. UPI cable, May 1980
28. See "Safeguards", The Nuclear Non-Proliferation Treaty", published by International Atomic Energy Agency, Vienna
29. See "Nuclear Power and Nuclear Bombs, Foreign Affairs", Summer 1980, pg. 1147
30. Ibid, pgs. 1156, 1164
31. See "Ontario Royal Commission on Electric Power Planning", Final Report, pg. 74
32. See "Response to RCEPP Interim Report on Nuclear Power", Ralph Torrie, December 1979, pg. 41
33. Ibid, pg. 43
34. Hansard, May 1, 1980, p 6050606