CORE MELTDOWNS IN CANDU REACTORS – KNOWN FACTS

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QUOTATIONS FROM:
The Safety of Ontario's Nuclear Reactors (1980)
by the Select Committee on Ontario Hydro Affairs (Ont. Legislature)

"It is not right to say that a catastrophic accident is impossible . . . . The worst possible accident . . . could involve the spread of radioactive poisons over large areas, killing thousands immediately, killing others through increasing susceptibility to cancer, risking genetic defects that could affect future generations, and possibly contaminating large land areas for future habitation or cultivation."

"The AECB should commission a study to analyze the likelihood and consequences of a catastrophic accident in a CANDU reactor . . . directed by recognized experts outside the AECB, AECL and Ontario Hydro*." [NOTE: this study has never been done]*

QUOTATIONS FROM:
A Race Against Time – Report on Nuclear Power in Ontario (1978)
by the Ontario Royal Commission on Electric Power Planning

"When we talk about the safety of a nuclear reactor, we are referring essentially to how effectively the fantastic amount of radioactivity contained in the reactor core can be prevented from escaping into the ground and atmosphere in the event of major malfunctions."

"Clearly, if a major release of this accumulated radioactivity occurred, as discussed in the previous section, the consequences would be extremely serious and could involve several thousand immediate fatalities and many more delayed fatalities."

"Assuming, for the sake of argument, that within the next forty years Canada will have 100 operating reactors, the probability of a core meltdown might be in the order of 1 in 40 years, if the most pessimistic estimate of probability is assumed."

QUOTATIONS FROM:
Submission to the Treasury Board of Canada (1989)
by the Atomic Energy Control Board (predecessor of the CNSC)

"When modern nuclear power plants were being designed in Canada two decades ago, their complexity and potential for catastrophic consequences were recognized. . . ."

". . . through the combination of a series of comparatively common failures which, on their own, are of little consequence, accidents can develop in a myriad of ways (as demonstrated most vividly at Three Mile Island and Chernobyl). This makes the calculation of consequences of potential accidents very difficult."

"The consequences of a severe accident can be very high. The accident at Chernobyl has cost the Soviet economy about $ 16 billion including replacement power costs. The accident has generated anti-nuclear sentiment in the USSR and throughout the world. Three Mile Island has cost the USA $ 4.8 billion . . . ."

"The likelihood of serious accidents cannot be judged from statistics . . . and CANDU plants cannot be said to be either more or less safe than other types."

QUOTATIONS FROM:
Nuclear Policy Review Background Papers (1982, Report ER81-2E)
by the Dept of Energy Mines and Resources, Government of Canada

"Core meltdown accidents of the type to be described here have never occurred in any commercial power reactor, although the sequence of events at Three Mile Island went partway along the path. Nor has any study on core meltdown accidents been done for the CANDU reactor. . . ."

". . . if the ECCS *[EMERGENCY CORE COOLING SYSTEM]* failed to act, melting of metallic components of the core and eventually

of the uranium oxide fuel itself would probably occur. . . . [or] if the reactor fails to shut down or the decay heat removal systems fail, melting of the core would ensue."

"Much larger consequences could be associated with core meltdowns which also cause failures in the containment structure above ground. If the containment sprays malfunction or are damaged by flying debris (generated by a LOCA *[LOSS OF COOLANT ACCIDENT]* or transient) the steam being released from the reactor core would not be condensed."

"This steam, along with various vapours and noncondensible gases, could cause failure of the containment structure due to overpressurization. Hot zircaloy from the fuel sheaths and steel would also react with water to produce large volumes of hydrogen. Detonation of this hydrogen (reacting with oxygen) might damage the containment or, if not, the heat of combustion combined with high steam pressure would at least add to the pressure loads on the structure."

"A further contributor to containment pressurization would be the large quantities of carbon dioxide generated as the molten core melts through the concrete base slabs. Another possibility is one in which the molten fuel falls into the pool of water in the bottom of the reactor vessel with the formation of flying debris which could, in turn, damage the containment structure. All post-meltdown occurrences which threaten to damage or breach the containment structure can result in the release of substantial amounts of radioactive material to the environment."

"The Reactor Safety Study *[by the U.S. NRC]* calculated the health effects and the probability of occurrence for many possible combinations of radioactive material release magnitude, weather conditions, and population exposure *[see the next page]* . . . . In addition to these health effects, a nuclear accident may contaminate the surrounding area and require relocation of the populace."

SOME BACKGROUND ON:
The Rasmussen Report (1974, "Reactor Safety Study", WASH-1400) by the U.S. Nuclear Regulatory Commission

G.A. Pon, Vice President of AECL Power Projects, said of WASH-1400:

> **"Although the study was prepared in the U.S. assessing the risks associated with their light water nuclear power plants, the findings should not be significantly different for the CANDU reactor."** ***Porter Commission, Exhibit 28 (1977), p.5***

In sworn testimony before the Cluff Lake Board of Inquiry into Uranium Mining in Saskatchewan, Dr. Norman Rasmussen -- the principal author of WASH-1400 -- commented about CANDU meltdown possibilities:

> **"although the Canadian design philosophy differs in some of its approaches . . . it achieves, in my judgment, about the same safety level as far as I can tell."** ***Transcript, Cluff Lake Inquiry, (1977)***

Worst case consequences as reported in WASH-1400 (1974):

45,000 cases of radiation sickness (requiring hospitalization)
3,300 prompt deaths (due to acute radiation sickness)
45,000 fatal cancers (over 50 years)
250,000 non-fatal cancers (over 50 years)
190 defective children born per year after the accident
$14 billion in property damage (1974 dollars; not insurable)

FOR MORE INFORMATION SEE http://ccnr.org