

Excerpts from:

## A Race Against Time Interim Report on Nuclear Power

Ontario Royal Commission on Electric Power Planning  
~ commonly known as the Porter Commission Report ~

Toronto, September 1978.

*from A Race Against Time: The Porter Commission Report*

- The extreme lethality of a freshly removed spent fuel bundle is such that a person standing within a metre of it would die within an hour. During the next forty years (and probably for thousands of years), the management of hundreds of thousands of such bundles (in Ontario alone), which at all times must be isolated from the earth's ecosystem, will clearly present a problem of massive proportions. (p. 87)
- An independent review committee should be established to report to the Atomic Energy Control Board (AECB) on progress on waste disposal research and demonstration. If the committee is not satisfied with progress by 1985, a moratorium on additional nuclear power plants would be justified. (Major Findings and Conclusions, p. xiii)
- Uffen [Dr. R. J. Uffen, then Dean of Applied Science at Queen's University and former Vice-Chairman of Ontario Hydro] is unequivocal in recommending that no nuclear programme be committed in Ontario, of "capacity greater than 20,000 MW", until "it has been demonstrated beyond reasonable doubt that a method exists to ensure the safe containment of the long-lived, highly radioactive waste for the indefinite future."
- We endorse the Uffen conclusion. However, we go further and conclude that continuous monitoring of waste disposal research should be undertaken by an independent panel of experts reporting to the AECB. This corresponds to the Uffen proposal for a "Canadian Nuclear Waste Management Advisory Council." If adequate progress is not being made, say, by 1985, the nuclear power programme should be reassessed and a moratorium on additional nuclear stations should be considered. (p. 95)
- There is some evidence, admittedly based on some United States work, that the waste disposal problem may prove appreciably less tractable than was originally thought. (p. 95)
- In particular, a group of United States Geological Survey geologists and, independently, a panel of eminent earth scientists have concluded that, at present, there is an inadequate scientific basis upon which to build the technology of high-level radioactive waste disposal. The panel, which reported to the United States Environmental Protection Agency, stated:
 

We are surprised and dismayed to discover how few relevant data are available on most of the candidate rock types even 30 years after wastes began to accumulate from weapons. These rocks included granite types, basalts, and shales. Furthermore, we are only just now learning about the problem of water in salt beds, and the need for careful measurement of water in salt domes. (p. 101)
- Granite plutons are currently the favoured disposal medium in Canada.... These formations contain little or no circulating ground water, have no known mineral value, and have remained stable, exhibiting few joints or fractures since they were formed over two billion years ago.

Granite is, however, a brittle rock. At present we possess inadequate knowledge to ensure the integrity of the rock at the comparatively high temperatures generated by the radioactive waste materials, or under pressures from deep drilling and construction of the depository itself. (p. 99)

- The hazards associated with transportation, in particular the possibility of accidents and the threat of hijacking, are real possibilities. Hence, the minimization of handling and transporting spent fuel is a desirable objective. (p. 91)
- Spent fuel reprocessing and advanced fuel cycles should not be part of Ontario Hydro's system planning to the year 2000. Hence, there is no need for a central interim storage facility for spent fuel. All spent fuel should be stored at nuclear generating station sites, either in circulating water storage bays or in "dry storage" if this proves feasible. (Major Findings and Conclusions, p. xii)
- We prefer on-site (i.e. generating station site) spent fuel storage to a centralized facility. We believe that a central facility would presuppose the reprocessing of spent fuel; it would also involve more transportation and social and environmental problems. (p. 95)
- Nuclear energy should no longer receive the major portion of energy research funding. There should be much greater expenditure on the development, demonstration and commercialization of energy storage, energy-efficiency (co-generation and fluidized bed combustion) and renewable technologies which are compatible with Ontario's energy needs. (Major Findings and Conclusions, p. xvii)
- An assessment of the acceptability of the risks and benefits of nuclear power must include an assessment of the social, ethical and political implications of its use. (Major Findings and Conclusions, p. xv)
- New and imaginative approaches to inform and involve the public in nuclear decisions which extend well beyond the public hearing process must be developed. (Major Findings and Conclusions, p. xv)
- The principle of "openness" of the regulatory process is important. Public participation should increasingly be recognized as an essential component of decision-making on nuclear matters. (Major Findings, p. xvii)
- Governments must recognize that decisions about nuclear power are fundamentally political in the widest sense of the word; they relate to quality of life and quality of the environment; they cannot be left to the utility alone. (Major Findings and Conclusions, p. xviii)

Excerpts from:

Nuclear Power and the Environment  
Sixth Report  
UK Royal Commission on Environmental Pollution  
~ commonly known as the Flowers Report ~

Sir Brian Flowers.

London, September 1976.

*from Nuclear Power and the Environment: The Flowers Report*

- There should be no commitment to a large programme of nuclear fission power until it has been demonstrated beyond reasonable doubt that a method exists to ensure the safe containment of long-lived, highly radioactive waste for the indefinite future. (Summary of Principle Conclusions and Recommendation, para. 533)
- There are two reasonable options for the permanent disposal of vitrified wastes: to geological formations on land and below the ocean bed. But neither of these has been sufficiently studied nor demonstrated as a feasible option. (Summary of Principle Conclusions and Recommendations, para. 533)
- There should be no commitment to a large nuclear programme until the issues have been fully appreciated and weighed in the light of wide public understanding. A procedure for consultation is required to this end. (Summary of Principle Conclusions and Recommendation, para. 535)
- We must assume that these wastes will remain dangerous, and will need to be isolated from the biosphere, for hundreds of thousands of years. In considering arrangements for dealing safely with such wastes man is faced with time scales that transcend his experience. (para. 178)
- We are confident that an acceptable solution will be found and we attach great importance to the search; for we are agreed that it would be irresponsible and morally wrong to commit future generations to the consequences of fission power on a massive scale unless it has been demonstrated beyond reasonable doubt that at least one method exists for the safe isolation of these wastes for the indefinite future. (para. 181)
- The creation of wastes which will need to be contained for such periods of time, and hence of a legacy of risk and responsibility to our remote descendants, is a matter of great concern to many people. We think, however, that some continuity must be assumed in human affairs and institutions, and in the ability of future generations to maintain the necessary containment. (para. 179)

A belief that the necessary vigilance and continuity could not be adequately guaranteed in any normal organisation led Alvin Weinberg to postulate a "nuclear priesthood"; this would be a dedicated, self-perpetuating body of people forming a technological élite which would be entrusted through the generations with the task of safeguarding society from the hazards of nuclear power. The idea of such a "priesthood" may seem unthinkable, but it is an indication of the extent of the anxiety felt by some responsible people about the hazards. (para. 184)

Excerpts from:

"Nuclear Energy's Dilemma:  
Disposing of Hazardous Radioactive Waste Safely"  
Report to the U.S. Congress  
by the Comptroller General of the United States

Washington DC  
September 9, 1977

*from Nuclear Energy's Dilemma: Disposing of Hazardous Radioactive Waste Safely*

- Growth of nuclear power in the United States is threatened by the problem of how to safely dispose of radioactive waste potentially dangerous to human life. Nuclear power critics, the public, business leaders, and government officials all concur that a solution to the disposal problem is critical to the continued growth of nuclear energy.
- Radioactive wastes, being highly toxic, can damage or destroy living cells, causing cancer and possibly death depending on the quantity and length of time individuals are exposed to them. Some radioactive wastes will remain hazardous for hundreds of thousands of years. Decisions on what to do with these wastes will affect the lives of future generations.
- To safeguard present and future generations, locations must be found to isolate these wastes and their harmful environmental effects. A program must be developed for present and future waste disposal operations that will not create unwarranted public risk. Otherwise, nuclear power cannot continue to be a practical source of energy.

Excerpts from:  
**Nuclear Policy Review  
Background Papers**  
Report ER81-2E  
Energy Mines and Resources  
Ottawa, 1982.

*from Nuclear Policy Review: Background Papers*

- Despite repeated assurances that nuclear waste disposal presents no insoluble scientific, engineering, or environmental problems, the issue remains in the mind of the public and some members of the scientific community as a serious unresolved issue associated with the development of nuclear energy. In several countries (Sweden, Germany, and the United States) public concern over long term waste disposal has become a major factor cited in opposition to nuclear power.
- In Canada, the Royal Commission on Electric Power Planning in recommendation 5.17 of their Final Report [1980] , states that:

If progress in high-level nuclear waste disposal R&D, in both the technical sense and the social sense, is not satisfactory by at least 1990, as judged by the technical and social advisory committees, the provincial and federal regulatory agencies, and the people of Ontario – especially in those communities that would be directly affected by a nuclear waste disposal facility – a moratorium should be declared on additional nuclear power stations.

- Three general issues can be highlighted. First, there is a concern that society is imposing a serious burden on future generations by leaving behind a legacy of radioactive wastes from which may prove difficult to manage. Presumably, clear proof that passive waste disposal systems will perform adequately is required to resolve this concern.

This naturally raises a second question. How can it be proven that waste disposal systems will perform adequately over very long periods of time? This is an area in which reliance must be placed on scientific experimentation and modeling -- concepts which non-scientists may often find both difficult to grasp and unconvincing.

Finally, there is the problem of establishing what the words "perform acceptably" mean. A clear general statement of overall principles applying to radioactive waste management has yet to be agreed upon within Canada or internationally.

Excerpts from:

The Management of Nuclear Fuel Waste:  
Final Report  
Select Committee on Ontario Hydro Affairs  
(Standing Committee of the Ontario Legislature)

Toronto, June 1980.

*from The Management of Nuclear Fuel Waste: Final Report*

- When fuel bundles are removed from the reactor, they are very hot, very radioactive and extremely dangerous. An individual standing one metre from a fresh spent fuel bundle would receive a lethal radiation dose of about 200,000 rem per hour. (The AECB limit for the exposure of workers is 5 rem per year and, for the general population, one half a rem per year.) (p. 3)
- The radioactive products in spent nuclear fuel pose a threat to human health for a period of time that is longer than the history of civilization. The initial threat is the most intense. It comes from the heat and radioactive emissions of the active fission products. After about 600 years these products will have decayed to relatively low levels. For several hundred thousand years, radioactive emissions from long-lived elements called actinides continue.

After about 17,000 years unprocessed spent fuel has about the same level of toxicity as the Elliot Lake uranium ore body from which it was taken. Given the very long life of these toxic materials, no man-made containment system can ever be predicted to give sufficient protection. All over the world scientists are looking for ways to use nature as a final barrier.

Many alternatives have been suggested and studied, including: shooting the waste into space or the sun; burying it in the Arctic or Antarctic ice caps; laying it on or under the deep ocean floor; or burying it deep within geologically stable formations such as salt, certain hard rock, shales or volcanic ash. The international consensus, after many different studies, is that deep burial in geologically stable formations is the best option for further investigation and development. Secondary consideration is being given to burial under the oceans. Throughout the world, countries are investigating the geological formations most appropriate to their own circumstances. (p. 6/7)

- When the overall plan was first put together, it was envisaged that the concept verification phase would be concluded in 1980. However, the work in this first phase of the program has been considerably delayed. Only two of the eight categories of plutons have been drilled and it is quite possible that no additional drilling will get underway this year. During the hearing AECL announced that 1982 is now seen as the earliest that concept verification could conclude. However, if field work delays continue, it could well be 1983 or 1984 before this phase concludes.

Since current interim storage arrangements have proved satisfactory, there is no indication that this or any subsequent delay will create a safety problem. The main concerns with ongoing delays are that they erode public confidence in the program, increase public confusion about its progress and add to the overall cost of research. (p. 8)

without creating false expectations about the real power of local communities to override provincial or national interest. (p. 25)

- The Committee recommends [Recommendation VII] that for purposes of field research, community involvement should include those people in the geographical area directly affected by the research, without specific regard to municipal boundaries. Those people should be assured that they will:
  - be fully informed about the exact nature of the work being undertaken, including any and all risks associated with it;
  - have an opportunity to ask questions on a regular basis of responsible officials relating to any aspect of the research program;
  - have an opportunity to express points of view about direct impacts of the research to the agency responsible either directly or through local representatives.
- The Committee recommends [Recommendation VIII] that in the selection of a site for demonstration leading to the emplacement of nuclear wastes, community involvement should include those people that feel affected by the decision. All citizens should:
  - have the right to be fully informed about the exact nature of the waste disposal program including any and all risks associated with it;
  - have an opportunity to ask questions on a regular basis of responsible officials relating to any aspect of the entire program;
  - have the right to express points of view to an independent decision-making body responsible for protecting public health and safety.

The decision making body will hold public hearings in the areas of the province most directly affected by the demonstration and operation of the repository.

In the light of so much vagueness on the matters that are most important to the public, the Committee is not surprised that the public is not reassured by AECL's information program. (p. 30)

- In Sweden, the Federal Parliament stipulated that reactor operators must show how and where spent fuel will be stored with absolute safety before fuel can be loaded into any new nuclear reactor....

The KBS Project produced a comprehensive set of reports [which] were sent to twenty-six organizations around the world for international comment.... The comments of the "foreign experts" were published and made available....

The comments gave a good indication of the range of uncertainty that still exists on the basic data and assumptions that underlie proposals for the disposal of spent nuclear fuel wastes. On corrosion of the man-made barriers, for example, the National Corrosion Service of the UK replied:

The proposal ... in the area of corrosion and indeed we must assume in other areas goes far beyond the currently available experimental data base.

On the natural, geological barrier, the Energy Resources Conservation and Development Commission of California stated that:

Generally we believe that the work in the US and Sweden is constrained by a certain lack of fundamental scientific knowledge in the application of earth sciences to the problem.

As a last example, in the translation of potential releases into effects on the health of workers at the repository, Energy Incorporated of the USA responded that:

... more detailed health physics work needs to be done to assure the safety of the personnel . . . .

These comments should not be construed as an outright rejection of the KBS proposal or of the international consensus approach. In fact, the Swedish Energy Commission accepted the KBS report for purposes of the Stipulation Law. It does indicate, however, that a finally accepted solution has not yet been found.

While AECL may well agree that, in fact, a fundamental scientific basis is exactly what they are trying to assemble in the Concept Verification phase, it is important to the perspective one takes in assessing institutional and political shortcomings to recognize that the technical solution is not yet assured. (p. 18)

- Each of the American witnesses before the Committee pinpointed the lack of criteria for the acceptability of a proposal as the glaring weakness of the Canadian program. In the words of one, "developing a proposal without criteria is like drawing the target around a dart after it has been thrown." (p. 33)
- The consensus of the Committee is that communities are not likely to easily accept the siting of what will be perceived as a garbage dump for frightening nuclear poisons. The waste must be disposed of. It must be disposed of safely and permanently. In the Committee's view, it is most likely that government will ultimately have to choose where the unpopular site will be located....

The Committee believes very strongly that a straight-forward, workable approach to community involvement is required. The approach taken must be practical and workable



- One of the major problems AECL must overcome is the public's perception that its entire program -- from basic research to public information -- is biased by its commitment to nuclear power and consequent desire to show that waste disposal is not an insuperable problem. The Committee's view is that AECL compounded its credibility problem by its one-sided, overly positive and broadly pro-nuclear presentation of information.
- In Atikokan, citizens were primarily concerned that there was no balance in the information they received. [Even those who support the research drilling agreed with program critics that more public information and community involvement is needed.]
- In the White Lake area, it appears that the contact AECL made with the public raised nothing but opposition to the research and distrust of AECL. [A Township Councilor near White Lake reported that he did not hear of any program weakness or uncertainty until he attended a special conference in Northern Ontario organized by citizens opposed to the program.]
- An analysis by Committee staff of the "newsletters" sent out by AECL revealed that the "news" aspect of the mailing ignored almost everything negative about waste management (such as a petition opposed to research drilling signed by 16,000 people in Northwestern Ontario) and included generally pro-nuclear information and arguments that were unrelated to the specifics of the waste management program. (p. 26)
- It is the view of the Committee that it is impossible for any public information program, no matter how well intentioned or conceived, to be successful as long as major program deficiencies outlined in this chapter remain uncorrected. The public information cannot provide answers to the questions the public is asking because the answers are not available.
  - There are no criteria for judging whether proposed solutions are acceptable.
  - There is no established procedure for approving or rejecting proposals or determining when a phase of the program has been satisfactorily concluded.
  - There is no assurance that public hearings will be appropriately structured to facilitate the airing of local concerns.
  - There is no decision on the ultimate responsibility for proposing particular sites.
  - There is no agency given the responsibility for finding and operating the repository.
  - There is no officially accepted realistic program schedule.

With so much uncertainty and so many critical questions left unanswered, even the best and most unbiased public information program is bound to appear weak and confused. It can only reflect the true state of the program. (p. 27)

- Local communities are assured they will definitely be "involved" in decisions on the location of a repository. But there is no definition of "community" or of "involvement".

There are promises of full public hearings and regulatory safeguards. But the kind of hearing, the degree of public participation, even the jurisdiction responsible is not decided.

The repository will be "safe" and have an insignificant effect on human health and the environment. But there are still no criteria for objectively specifying "how safe".