

Securad's Monitored Retrievable Disposal (MRD) An Engineering Project with a Communication Twist

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ABSTRACT

The safe management of spent nuclear fuel using deep storage at an appropriate geological site is now a well established and accepted concept. Its implementation however depends on unpredictable political and economic variables. **Securad's Monitored Retrievable Disposal (MRD)** concept meets both challenges in combining standard mining knowledge with a sound awareness strategy. One of the key strategies is to dispel the public notion of nuclear "waste" and rather offer a sustainable approach towards the safe management of a *valuable and recyclable resource*.

INTRODUCTION

Securad Inc. is a private, independently-owned, development-stage company which was incorporated under a Canadian federal charter in 1995. The Company's organizers include Guy Lacroix, a PhD in physics, in charge of financing; Guy Arbour, M.Sc., an expert in engineering and geophysics; Roger Belanger an expert in relations with First Nations; and Normand Champigny, an expert in environmental mining techniques.

The Company's business objective is to build and operate a safe and secure underground storage site for spent civil radioactive fuel originating from Canadian nuclear power plants which would strictly conform to the objectives of the Nuclear Waste Management Organization (NWMO) mandate for the disposal of spent nuclear fuel, summarized as follows:

- Protect human health and the environment and make it as safe as possible from harm, now and in the future
- Allow Canadians to accept responsibility as creators of spent nuclear fuel and put in place a long term management approach, including a plan that is flexible enough to adopt to changes in nuclear fuel management as new technology becomes available

- Recognize that the nuclear industry does not have all the answers for spent fuel management today, and that Canadians need to invest in more research and expand global cooperation to develop other and possibly better ways to manage used nuclear fuel.

Spent nuclear fuel is currently stored temporarily in cooling pools, within service buildings adjoining nuclear plants or outside these facilities, in ground level concrete containers, in silos, or in dry storage containers within these buildings.

Securad is proposing that this irradiated fuel be safely stored and monitored at a depth of approximately 300 metres in massive Archean rocks (Cambrian or Precambrian), out of reach of the food chain, safe from sea level variations, on an uninhabited site, accessible by sea, either in Quebec's Lower North Shore or in the Labrador-Newfoundland area. This site will be managed like a highly automated "reverse mining" operation, with real-time monitoring and an opportunity to reuse or recycle the uranium in the future as new technologies permit.

Approximately \$770 million is already under the stewardship of NWMO to be used only to implement a solution for the long-term disposal of spent nuclear fuel. Before any project can be approved, NWMO has been asked by the Canadian Minister of Natural Resources to submit a report (due by November 2005) which identifies the best of three possible options, (i) deep geological storage in stable rock formations, (ii) storage at nuclear reactor sites or, (iii) centralized or underground storage. The Company believes that deep geological storage with constant monitoring and the ability to recycle and reuse some time in the future, is the only sensible long-term solution.

In short, MRD is *safe, secure and sustainable*

Based on these figures, the Company believes that a business case can be made for building and operating a for-profit corporation to manage the long-term repository of this spent nuclear fuel. Securad seeks to be the first Canadian company to present a serious and acceptable project, with the participation of the relevant groups, to utilize the funds in trust, earmarked specifically for implementing a solution for spent nuclear fuel storage.

For the past ten years the Company has been preparing a well-defined Project plan that would with be acceptable to Canadian authorities, the communities within Canada that have been following the spent fuel issue, the Province of Labrador-Newfoundland or Quebec and Native authorities. The Company's timetable is to submit its plan to NWMO prior to November 2005 when NWMO is scheduled to submit its recommendations to the Minister of Natural Resources.

The Company has made a preliminary pre-selection of favourable locations, and is ready to begin pre-feasibility engineering and environmental impact studies required for the public hearings process leading to the authorization to develop the

site. It has initiated conversations with SNC-Lavalin, with its extensive mining capabilities and its nuclear background through Canatom, to prepare these pre-feasibility studies once funding has been approved.

AWARENESS

Most engineering feasibility studies outline the cost of a project in terms of steel, concrete and man-hours. Recent experience however consistently showed that many of these projects simply don't happen, not because of cost but because of local and public opposition. Public awareness must therefore be built-in and budgeted for, prior to any large project having a possible impact on the local environment and communities. This is the approach that **Securad inc.** developed and started implementing nearly ten years ago, through meetings with Band Councils in Eastern Canada. Further steps were taken such as presenting the project in aboriginal language to the chiefs, doing extensive field trips in their villages with a scale model of the **MRD** facility, organizing a tour of Gentilly II with band council members and sponsoring a summer camp at *École Polytechnique* for young Canadian natives.

It will be necessary to ensure that the facts concerning the Project's environmental aspects are completely transparent and presented with rigorous supporting information. The two most promising sites that have been identified are in Labrador-Newfoundland and the Lower North Shore of Quebec. Further awareness campaigns will be necessary to reach local agreements.

Securad's specific goals in this respect are:

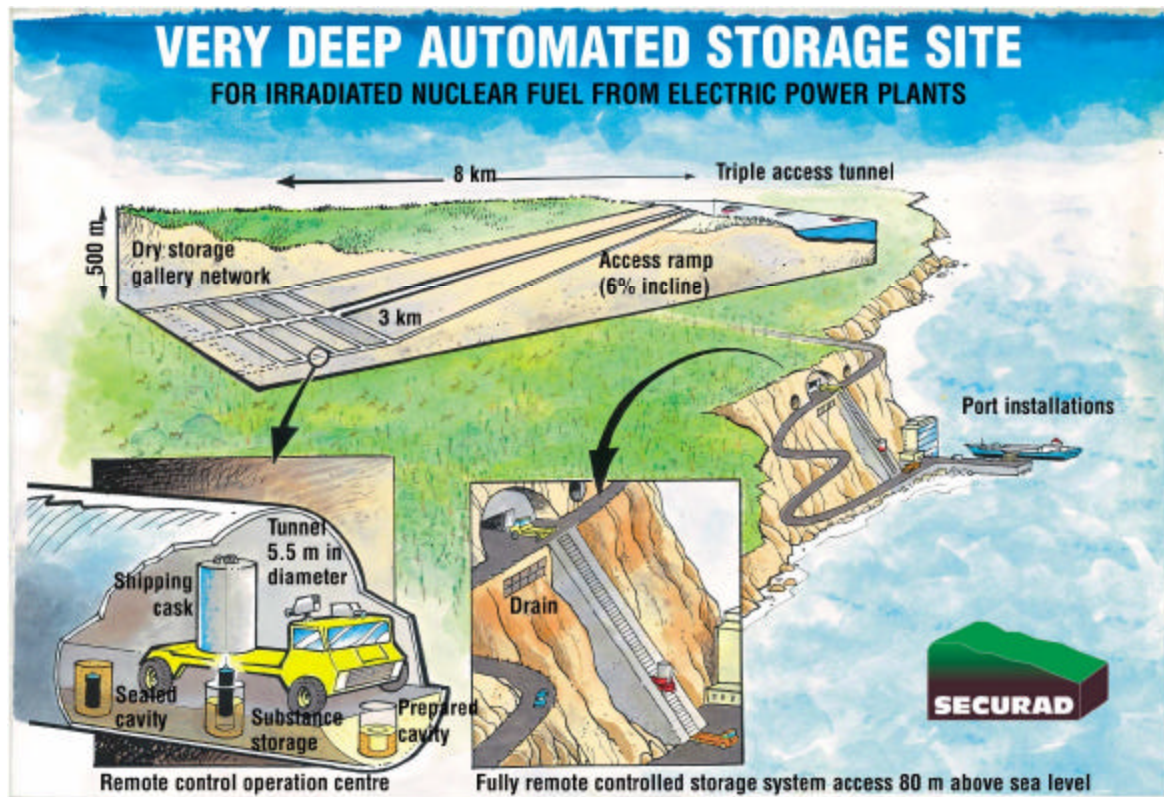
1. To identify Canadian sites that are acceptable for storing irradiated Canadian uranium clusters from civilian nuclear electric power plants.
2. To develop awareness and participation among people living near the sites to be supportive of the issues raised.
3. To gather the best possible expertise in order to obtain the necessary permits in view of the environmental impact studies and the specific characterization of each of the sites.
4. To recruit highly qualified professionals, use the most dependable technologies in carrying out the Project and be completely transparent in delivering such information to all interested parties.
5. To encourage all interested parties to take part in the development and completion of the Project.
6. To build, own and operate a highly secure, monitored storage site in conjunction with the authorities responsible for public security in Canada,

together with the participation of the most highly renowned scientists and engineers in this field.

7. To re-invest in new technologies for the reuse and recycling of spent fuel being stored at the Project.

REVERSE MINING

Securad's **MRD** concept is a modification of the **AECL (Atomic Energy of Canada Limited)** underground storage concept (reviewed by the *Seaborn* commission). This revised concept incorporates a "mining" perspective with added sustainable development constraints.



Securad Inc. concept (1995)

An **MRD** facility is a high tech "reverse mining" operation. The **MRD** design objectives are to build on existing and tested mining engineering techniques and to meet economical constraints. It also benefits from the latest mining automation techniques, widely used in Canadian mines, and uses remote operating and monitoring technology as much as possible.

Key aspects of the Securad Project incorporate some of the recommended specifications of the AECL report including:

- The site that will be as secure 10,000 years from now as it is today
- The site must be safe and closely monitored, and remain totally secure even if monitoring is interrupted (“Monitored Retrievable Disposal”)
- Access to the galleries through a ramp, intercepted by a passive evacuation channel (by means of gravity) for storm or ground water, will eliminate the need for permanent active pumping of the storage galleries
- The entrance to the galleries themselves, located more than 50 metres above sea level, will guarantee that they will remain watertight even if the oceans rise to maximum levels following a melting of the polar icecaps.

The solution offered by Securad is a safe permanent storage in deep, stable and isolated geological structures where spent fuel can be retrieved for reuse and recycling by future generations when technology makes this feasible.

The irradiated fuel bundles are brought by custom-designed vehicles to a network of underground tunnels dug in massive granite formations, 300 metres to 900 metres below ground. Vertical cavities are dug along the tunnels to deposit casks containing irradiated fuel within metal containers. The cavities are filled with bentonite cement (or an alternative, better, material) after receiving their steel casing. Heat recovery from the tunnels is under consideration for local heating needs.

The main visual impact on the surface will consist of a road for transporting workers from nearby communities, plus support housing and administrative buildings. The road will be built with material excavated from the galleries. The Company will seek employment from the surrounding communities for pre-feasibility, feasibility, construction, operations and maintenance jobs at the Project.

Once built, a little more extensive tunneling could possibly enable the facility to host a lot more than just Canadian fuel used in Canada. Canada exports over 30% of the uranium worldwide, has an ideal geology for storing spent fuel and is therefore a possible option for the management of uranium from Canadian origin, once spent outside of these political borders, therefore opening a profitability window for such a facility.

SUSTAINABILITY

Sustainability means that the facility must be safe for all future generations. Indeed, taken to the extreme, the facility must be safe over a period of time that far exceeds the life span of any prior civilization known to us. The access to the tunnel has to exceed the maximum seashore height if polar caps were to melt. In the **MRD** concept proposed by **Securad**, a passive (by gravity) evacuation system (without manned pumping) for ground surface or ocean water will prevent it from entering the galleries. **Securad** is also considering building a gigantic *Inukshook* on the surface to let future generations know about the presence of the facility below. In a **MRD** facility, the stored fuel is constantly monitored, but the site needs to remain totally safe even if for ever reason (epidemics, wars or others) monitoring was interrupted. There is also the clear possibility for the uranium to be recycled, after a few decades, should the price of this fuel reach a competitive level.

KEY SUCCESS FACTORS

The success of Securad project relies on nine interdependent factors:

1. The proposed site must be located in an extremely stable geological environment (ancient and stable rock base in areas with almost no seismic activity), with no water circulation at depths in excess of 300 metres.
2. The site must be accessible by navigable waterways and be suited to average-sized port installations.
3. The site must be suited to the most stringent security measures over a broad perimeter.
4. The site must be devoid of human habitation over an area of 100 square kilometres.
5. The surrounding Native communities must be actively involved as supporters of the Project.
6. The development plan must embrace environmental groups and seek supportive public opinion in the host Province.
7. One alternative site must be chosen in addition to the proposed site.
8. The Project must recruit a high-level interdisciplinary team including public policy, communications, public relations, social science practitioners, engineers, specialists in aboriginal and government relations and specialists in complex environmental impact and project management who will work together with the surrounding communities.

9. The transfer and conditioning of irradiated fuel must be conducted in compliance with the highest established international standards.

CONCLUSION

The Securad **MRD** concept offers a promising and attractive alternative to the long term management of nuclear fuel. Preliminary technical and cost analyses have shown that the concept is simpler and potentially more cost competitive than other deep disposal systems. The implementation of the **MRD** concept will build on existing Canadian mining and nuclear expertise and require only limited additional skills and specialties.