

## Excerpt from Paper Delivered by Chauncey Starr, March 7, 2000

### IV. The IMRSS Concept:

The Internationally Monitored Retrievable Storage System (IMRSS) is proposed as a practical interim warehousing method for managing the worldwide spent fuel stream. It is an intermediate step that balances most of today's planning constraints listed above. In its most condensed form, the concept proposes that a new international entity become operationally responsible for the spent fuel exiting the cooling ponds, and provide the transportation required to utilize a small number of surface (or near surface) storage facilities. The IAEA would be responsible for verifying adherence to safeguarding criteria. The economic and political arrangements would be similar to those of an international bank with operating branches worldwide. Each nation would maintain title to its spent fuel, and be able to withdraw it for peaceful purposes (e.g. recycle or burial). Transparency, accountability, and security of the stored material would be openly verifiable by all participants on a real-time basis, so each would know what others are doing. All operations would be on a self-sustaining commercial basis, funded by a megawatt-hour charge (e.g. the US \$1/Mwhr) on nuclear power. The international entity would use both multinational and local subcontractors. The substantive details of the proposal have been discussed at three international workshops, and it has been favorably reviewed by SAIC for the US DOD and DOE (2). It was also presented, among other places, at a Seminar at Sarov (Chelyabinsk-70), Russia (3).

The IMRSS proposal recognizes the essentiality of public trust by placing the day-to-day management responsibility for spent fuel in an international institution whose Board of Directors represents all countries that participate in the storage program. The very countries that might face each other in a nuclear conflict would be part of the IMRSS Board, and so will always be aware of their mutual state of spent fuel security in real time. The operational arrangement proposed for IMRSS is thus particularly protective against national diversion.

The question of storage sites is not definitively answered as yet. Based on our informal discussions, we believe these would emerge after a consortium of governments initiates an international approach such as the IMRSS. The political barriers of nationalism and acceptance of interim storage would be removed by such a step. And this would open the door to commercial economic proposals to engage in the business of warehousing spent fuel. We believe competitive site proposals would then be forthcoming.

IMRSS is designed to optimize world-wide acceptance of spent fuel storage based on arrangements that are non-threatening militarily or to public health, are economically self-sustainable, and are foreseeably secure for the next century or longer. It is encouraging that, on a limited scale, BNFL and COGEMA are already offering storage services of this nature.

#### V. Commentary:

Criticism of all storage proposals arises from a public distrust of the unpredictable urge of governments to obtain plutonium for weapons during a future wartime fervor. No public wants a nuclear war, but many fear that political demagoguery might escalate into one. Example: the recent India/Pakistan confrontations. We must recognize that any nation with modest technical resources can eventually manufacture weapons material without recourse to civilian nuclear power, if it is dedicated to do so. The technology is in open literature. However, an independent military program is hard to hide. Nationally stored spent fuel represents a clandestine alternative to obtain Pu. With either recycle or burial of spent fuel, what is needed is to make the barriers to diversion so great that military planners avoid the civilian cycle. International management adds another barrier to such diversion, both practical and diplomatic.

The alternative of permanent geologic isolation in underground cavities is intuitively attractive, but, as previously mentioned, the geologic storage cavities are always available as potential mines for extraction of a few spent fuel elements. Aged fuel provides desirable weapons Pu. Thus geologic storage in national repositories is a latent weapons threat for thousands of years. Neighboring countries will always be uncertain of their security, and such suspicion might be the initiating seed for a future arms race. Similarly, any recycle concept under national control has opportunities for diversion at various stages of the separation process. It can be made difficult technically to divert material if the recycle occurs in fast reactors, as limited separation of fission products is adequate for such reactors.

Public opinion-leaders do not trust their own governments to weigh long-term consequences when they adopt convenient short-term fixes for immediate problems. Politicians are suspected of intuitively deferring costly and burdensome management to future generations, as they do now with most of societies' wastes. The public does not expect the weakness of human nature to ever disappear from political processes. So, deferral is always a temptation.

**Example: US AEC peacetime decisions on the disposal of the waste products from nuclear weapons production during the "cold-war" of 1950-80.**

**Deferral has been the politically convenient approach to peacetime spent fuel disposal, especially as the flow of spent fuel seemed initially small enough for on-site storage. Causes for this deferral were sometimes economic (to minimize current expenditures and taxes) and sometimes inability to agree on long-term disposal criteria and technologies (e.g. Yucca Mt), aggravated by scientific uncertainties of long-term natural processes. Environmental pressures tend to push for solutions now.**

**Spent fuel seems to be trapped by such a triumvirate: -- the environmentalists seek to have spent fuel disappear but distrust storage or recycle concepts; countries disagree on eventual future use of spent fuel (permanent disposal vs. recycle of plutonium as a fuel); the technologists are uncertain of the long-term physical performance of alternative disposal schemes. The IMRSS accepts the reality of these positions, and provides a century long care-taking until they are resolved for each nation by more experience, information, and negotiation. The point is that we believe it is better to store securely for the coming decades than to risk prematurely the implementation today of uncertain back-end cycles, or alternatively to accept the uncertain risks of a "do-nothing" policy. The IMRSS is not being proposed as a solution for perpetuity, or as a means of deferring work on the problem. Its acceptance assumes continuing development of long-term solutions, so that people's trust with regard to both weapons and health is maintained. Its purpose is to buy time and security until the long-term solutions are assured.**

**The concerns raised by various environmental groups on the need to protect future generations from leaking radioactivity should be seriously addressed technically, and can be. The environmental questions have focused on the quality of the physical containment in geologic repositories, either for "once-through" spent fuel rods or for recycles separated fission products. Containment is being carefully researched currently, but will take many decades to verify in situ. We believe that acceptable burial will eventually be demonstrated with appropriate geochemical sites and containers. We also believe that eventually acceptable recycle will also be demonstrated. We consider that today, the long-term uncertainty of such successful outcomes to be much less than the near-term risk of allowing the stream of spent fuel to spread out in a globally disorderly fashion.**

**The environmental movement should embrace the IMRSS as a positive step for orderly handling of a growing worldwide problem, which they cannot erase by fiat. The IMRSS offers a positive step to enhancing world peace and**

public health. For the reasons given above, it removes the option available to individual countries to build a nuclear weapons arsenal by diversion from their civilian nuclear power. It also permits constant monitoring and response to any radioactive leakage. The nuclear age is here and growing. It cannot be turned off. The IMRSS is today a politically and operationally feasible model for spent fuel management. What it needs now is intergovernmental arrangements and negotiation leading to implementation.

The final sentence of the SAIC report (2) states "At the least, the time may well be ripe for the United States, working with other countries, to take the types of actions discussed in this report to explore the concept of IMRSS or an IMRSS-like regime and to determine whether sufficient incentives exist to take this next step toward greater internationalization of nuclear management."

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\* The Association for Studies on the Management of Surplus Nuclear Materials; Vienna, Austria

(1) "A Review of the Economic Potential of Plutonium in Spent Nuclear Fuel"; W. Burch, E. Rodwell, I. Taylor, M. Thompson; Electric Power Research Institute; EPRI TR-106072, February 1996.

(2) "Internationalizing Spent Fuel Storage: Concepts, Issues, and Options"; Lewis A. Dunn & Stephen Carey; Science Applications International Corp (SAIC); Feb. 25, 1998.

(3) "Prudent Management of the Ever Increasing Amounts of Spent Fuel Elements and Plutonium: The Concept of an Internationally Monitored Retrievable Storage System"; Wolf Hafele, Chauncey Starr; International Science and Technology Center (ISTC) Scientific Advisory Committee Seminar on "New Approaches to the Nuclear Fuel Cycles and Related Disposal Schemes, taking into account the existing excessive quantities of weapons grade U and Pu and reactor grade Pu"; Sarov, Russian Federation, 22-25 June 1998.