INTERNATIONAL
ENERGY
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MASTER

ASSESSMENT OF NATIONAL SYSTEMS
FOR OBTAINING LOCAL ACCEPTANCE OF NUCLEAR
WASTE MANAGEMENT SITING AND ROUTING ACTIVITIES

BELGIUM

CANADA

FEDERAL REPUBLIC OF GERMANY

FRANCE

JAPAN

SWEDEN

SWITZERLAND

UNITED KINGDOM

PREPARED FOR THE U.S. DEPARTMENT OF ENERGY
UNDER CONTRACT DE-AC06-80ET44113

BY

INTERNATIONAL ENERGY ASSOCIATES LIMITED

JULY 1980

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INTRODUCTION

BACKGROUND AND PURPOSE

During early 1979 IEAL conducted for the Department of Energy a survey of the technology being employed by the European democracies and Canada in their HLW and/or spent fuel immobilization programs. Although this technology updating was a timely and important input to the U.S. program, it became evident in the meetings with the seven countries visited that the technologies involved were not their primary waste management concern. Waste management officials visited were generally satisfied with the safety and projected costs of the technologies being employed but were, in contrast, quite concerned about how to deal with the "Yes, but not in my back yard" syndrome. There was a widespread feeling that even if they had the perfect technical solutions there would still be great difficulty in obtaining local acceptance for waste management sites, and particularly permanent waste disposal sites.

Since this syndrome is a problem common to all nuclear democracies it was felt the U.S. could benefit from a better understanding of the approaches being used and the progress being made by these countries in dealing with it.

It was thus proposed and accepted that the writer revisit these countries to survey and assess the plans and approaches of each for dealing with the problems of obtaining local acceptance for national waste management facilities and activities. It was also requested that while there, the procedures for obtaining national agreement on waste management technologies and practices be discussed and documented.

INTRODUCTION

METHODOLOGY

Information Gathering:

Information was gathered from three sources:

1. Literature research by IEAL staff of U.S. and European periodicals covering the 12 months preceding the preparation of the report.
2. Visits by IEAL personnel with staffs of Washington embassies of countries to be visited.
3. One to two day visits by H. W. Paige of IEAL to subject countries. (Three days were devoted to the Federal Republic of Germany to allow for a day at the controversial Gorleben site and an evening with the political leaders of the nearby town of Luchow.) Visits were preceded by a letter of introduction and explanation (see Appendix "A"). The questionnaire used during the visits is included in Appendix "B". Persons visited are listed in Appendix "C".

Information Organization:

Information gathered was organized for each country as follows:

1. Progress/status regarding waste management decision-making
2. Political structure and environment for waste management and decision-making
3. Formal system for obtaining local acceptance on siting and routing for nuclear waste activities
4. Approaches used (informal system) in support of and/or in addition to formal system
5. Observations/conclusions (re obtaining siting decisions)
6. System for obtaining agreement on waste management technologies and practices

Information Verification:

After a first draft of each countries' status and approach was prepared per the above format, copies were sent to the Washington embassies and to the principle contact in each country for comment and verification. Responses were received from each and have been incorporated.

Observations and Conclusions:

These were reviewed, with Alex Perge (DOE sponsor for this study) and Kent Harmon of Battelle Pacific Northwest Laboratories (Contract Project Officer) prior to issuing the report, but they are IEAL's and do not necessarily represent the thinking of either.

Charts 1, 2, and 3, included at the end of the Observations/Conclusions section, are an attempt to develop a cross-comparison between countries re their:

1. Political structures for waste management decision-making (the formal system)
2. Progress/status in waste management decision-making
3. Approaches used (informal system) to supplement formal system for obtaining waste management decisions

SUMMARY

There is a rich mixture of formal and informal approaches being used in our sister nuclear democracies in their attempts to deal with the difficulties of obtaining local acceptance for siting of waste management facilities and activities. Some of these are meeting with a degree of success not yet achieved in the U.S.

Although this survey documents and assesses many of these approaches, time did not permit addressing in any detail their relevance to common problems in the U.S. It would appear the U.S. could benefit from a periodic review of the successes and failures of these efforts, including analysis of their applicability to the U.S. system.

OBSERVATIONS/CONCLUSIONS

GENERAL

- 1 The survey and analysis confirms the most serious waste management problems being encountered are in getting decisions that can hold up under the pressures inherent in a democratic form of government. These difficulties center almost entirely on siting decisions; only in the U.S. have the government's technical decisions encountered serious challenge.
- 2 Protracted and bitter as the process may be in arriving at waste management siting decisions, once the process is completed and the government has made a decision, acceptance, even by those most effected, appears to follow. Objections from that point on are more apt to originate from professional intervenors than from the locals.
- 3 There are two sets of factors that determine a nation's ability to deal with its waste management problems:
 - a. The political structure and environment (laws, government policies, etc.) which is the framework on which the formal system for getting waste management decisions is based (See Chart #1).
 - b. The informal, unwritten, usually ad hoc approaches used to supplement the formal system (see Chart #3).
- 4 The informal approaches used fall into five general categories:
 - Political
 - Economic
 - Siting
 - Timing
 - Education(See Chart #3)

Their effectiveness appears to have been roughly in the above order.

Some observations on each (political, economic, siting, timing and education):

Sustained, prudent exercise of political will appears to be the most effective of the informal approaches.

The appeal of direct economic inducements to accept nuclear waste installations and/or activities varies considerably between countries.

Siting at existing nuclear facilities is always a powerful aid to getting local acceptance.

Judicious use of timing re seeking site approvals has proven advantageous (so far) where used. Some countries have structured their programs so that siting of a HLW geological repository does not need to be addressed for the next 50 years.

Education, hearings, and communications programs are a must, but have to be handled skillfully. They can backfire.

Listed below are some examples of approaches being used, grouped by the above general categories*:

Political

Extraordinary assertion of will by political leaders

- Full use of "power of the office"
- Will to use national government's pre-emptive rights if necessary
- Willingness to speak out in defense of nuclear power

* Chart #3 indicates use by country. Chart is not complete and is meant only to be indicative of degree and emphasis.

Win local politicians over: Use central and provincial governments' political clout

- Government contracts for local area
- Other political favors or "understandings"

Crutches for cautious politicians: Broaden involvement in controversial decisions

- Setting up special commissions
 - .. Bring political and technical considerations together
 - .. Bring provincial and national considerations together
 - .. Draw on credibility of persons of national stature
- Calling on referenda
- Passing decision over to the parliament
- Passing decision down to impacted locals
- Sending back to drawing board for "proven" technical solutions

Economic

Play up local economic benefits to flow from project

- Jobs, higher wages, lower taxes, etc.

Create special economic benefits for locals

- Direct cash "compensations"
- Special allocation of federal funds for new/improved schools, roads, hospitals, etc.

Siting

Siting waste management facilities and activities in least objectionable locations

- Existing nuclear installations
- On government or utility property
- In areas economically dependent on cheap electricity
- In remote locations
- Ocean dumping (LLW)
- Regional sitings - geographical spreading of political burden

Timing

Judicious timing in going for acceptances

- Enhance acceptance of activities and facilities required for near-term by decoupling from those that can wait

Education

Government and/or utility-sponsored education and communications programs

- Consistant, sustained, and wide-spread presentations and answers re pros and cons of nuclear power vs other options
- Utilization of government-owned radio/TV to serve "truth-squad" function
- Special emphasis on obtaining understanding and support of media leaders

OBSERVATIONS/CONCLUSIONS

COUNTRY - RELATED

- 1 Of those countries (Germany, Sweden, Switzerland, Japan, Belgium, and the U.S.) who are working to a time table for the preparation of a HLW repository, Germany is the only country to have gained local siting acceptance for theirs. With this (the most difficult of siting problems) behind them they appear to be in the best overall condition relative to waste management progress and plans. This has been achieved without a particularly favorable political structure, made up for by determination on the part of the political leadership.
- 2 Of the remaining three countries studied (France, U.K. and Canada) France, with its AVM production facility, is clearly the world leader in the HLW immobilization aspect of waste management. It is difficult, however, to compare the progress/status of these three relative to the other countries. With no stipulation laws requiring early solutions they have no HLW geological repository time tables. They are thus able to finesse, for the foreseeable future, the politically sensitive HLW siting issue without having to continually readjust politically dictated schedules.
- 3 France, Belgium and the U.K., appear to have the most favorable political structures and environments for arriving at waste management decisions (See Chart #1).
- 4 U.S., Switzerland and Canada appear to have the least favorable political structures and environments for arriving at waste management decisions (See Chart #1).

CHART #1

POLITICAL STRUCTURE FOR WASTE MANAGEMENT DECISION-MAKING

	BELGIUM	CANADA	FRANCE	GERMANY	JAPAN	SWEDEN	SWITZERLAND	UNITED KINGDOM	U.S.	NOTES
* Favorable for Getting Waste Management Decisions										
<u>Government Nuclear Position</u>										
* Clear-cut or Generally Pro	✓	✓	✓✓	✓✓	✓✓			✓		
Luke-warm or Divided						✓	✓		✓	
<u>Central Government Preemptive Rights</u>										
* Has and Uses			✓					✓		
Does Not Have or Does Not Use	✓	✓		✓	✓	✓	✓		✓	
<u>Head of Regional Governments</u>										
Elected		✓		✓	✓		✓	✓	✓	
* Appointed	✓		✓			✓				
<u>Stipulation Law</u>										
*(Yes)	No	No	No	Yes	Yes	Yes	Yes	No	Yes/ No (1)	(1)No at national level, but some states have
<u>Local Land Use Veto Law</u>										
*(No)	No	No	No	Yes	No	Yes	Yes	No	No	
<u>Referendum System</u>										
*(No)	No	No (1)	No	No	No	Yes	Yes	No	No (1)	(1)At provincial or state levels only
<u>Public Hearings</u>										
*(No) Required	No	Yes (2)	No (1)	Yes	Yes	No	Yes	Yes	Yes (2)	(1)Written questions/objections & answers
*(No) Binding	No	No	No	No	No	No	No	No	No	(2)Defacto
<u>Reprocessing Policy</u>										
*(Yes)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	
"Favorable" factor	7/9	4/9	8/9	5/9	6/9	5/9	3/9	6/9	3/9	

CHART #2

PROGRESS/STATUS REGARDING WASTE MANAGEMENT DECISION-MAKING

	BELGIUM	CANADA	FRANCE	GERMANY	JAPAN	SWEDEN	SWITZERLAND	UNITED KINGDOM	U.S.	NOTES
<u>National/Regional AFRs</u>	(1)	(1)	(1)		(1)			(1)		(1) Not needed per present planning
Site concurrence				Yes		Yes	No		No	
Under construction				No		Yes				
<u>Reprocessing</u>		(1)							(1)	(1) Indefinitely deferred
Contracted for	Yes			Yes	Yes	Yes	Yes			
Plants operating or planned	Yes		Yes	Yes	Yes	No	No	Yes		
Required site concurrence	Yes		Yes	(2)	No			Yes		(2) Hesse has agreed to take one of three proposed sites. Some opposition expected.
<u>National Waste Management Company Established</u>	Yes	No	Yes	Yes	No	Yes	Yes	Yes	No	
<u>HLW Immobilization</u>		(2)				(3)	(3)			(1) AVM selected as base-case. National improvements under development
Material selection	Yes		Yes	Yes	No	Yes	Yes	Yes	No	
Process selection	Yes (1)		Yes	Yes (1)	No			Yes	No	(2) No: reprocessing (3) Supplied by URG
<u>Pre-Disposal Aging of Immobilized HLW</u>		(1)							(1)	(1) Indefinitely deferred
Facility design complete	No		Yes	Yes	No	Yes	No	No		(2) At repository
Site concurrence	Yes		Yes	(3)	No (3)	No (2)	No (2)	Yes		(3) At reprocessing plants
<u>National Geological Repository</u>										(1) Only on govt./util. land
Exploratory drilling proceeding	Yes	Yes	Yes	Yes	No	Yes (1)	No	No (2)	Yes	(2) One hole drilled-Three refusals
Geological medium selected	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	(3) Have agreed on Province of Ontario
Site concurrence	No	(3)	No	Yes	No	No	No	No	No	
<u>Waste Form/Repository Integration</u>										
Plans completed	No	No	No	Yes	No	Yes	No	No	No	
<u>LLW Disposal</u>										(1) Utilize sea dumping
Required site concurrence	Yes (1)	Yes	(2)	(2)	No	Yes	Yes (1)	Yes (1)	(2)	(2) Need new sites-having difficulty siting.
<u>Transportation of HLW</u>										
Technology/safety criteria established	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Required routing concurrences	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	

APPROACHES USED TO SUPPLEMENT FORMAL SYSTEM FOR OBTAINING WASTE MANAGEMENT DECISIONS

[Activity Level: ++, +, -]

	BELGIUM	CANADA	FRANCE	GERMANY	JAPAN	SWEDEN	SWITZERLAND	UNITED KINGDOM	U.S.	NOTES
POLITICAL										
<u>Extraordinary Assertion of Will by Political Leaders</u>			++	+	+			+		
<u>Win Support of Local Politicians</u>										(1) Moved uranium mill to test drilling area
1. Government contracts for area		+(1)		+(2)						(2) 6 alternate energy development contracts awarded in Garleben area
2. Other political favors or understandings				+						
<u>Crutches for Prudent Politicians</u>										
1. Special commissions		+	+	+		+	+	+	+	
2. Calling referendum						+	+			
3. Pass decisions in parliament	-							+(1)		(1) Windscale decision
4. Pass decision to local voters				+(1)						(1) Garleben AFR
ECONOMIC										
<u>Emphasize Normal Economic Benefits</u>	+		+			++		+		
<u>Create Special Economic Benefits</u>										
1. Direct "compensations"			+(1)		++					(1) Used for reactor siting only. Studying their use for RRM activities
2. Offers of new/improved schools, roads, etc.			+	+	++					
SITING										
<u>Judicious Choice of Sites</u>										
1. Existing nuclear facilities	+	+(1)			+	++(2)	-	+	+	(1) Test drilling at existing borehole (2) AFR
2. Government or utility property	+	+(2)				++(1)	+(2)		+	(1) Drilling (2) Used for LLW
3. Areas relying on low-cost electricity		+	+	+(1)						(1) Hesse for new reprocessing plant
4. Remote locations		+(1)			+			+(2)	+	(1) may employ remote siting if they receive no other permission (2) published list of desired drilling sites all in remote areas
5. Ocean Dumping	+						+	+		LLW only
6. Selection of regional sites				+(1)					(2)	(1) AFRs, reprocessing plants (2) Under study
TIMING										
<u>Judicious Timing in Going for Acceptances</u>	+	+	++		+	+	+	++		
EDUCATION										
<u>Government Sponsored Education/Communication Programs</u>										
1. Sustained, consistent education programs	+	+(1)	+	+	+(2)	++		+/(1)		(1) Part of system (2) Utilities' program only (3) Just beginning -- preliminary success
2. Utilize government-owned media			++							
3. Enlist support of private media	++			+(1)						(1) Good coverage for Garleben hearings
4. Special communication programs for locals	+	+	+(1)	++		++	+			(1) Public tours of La Hague

BELGIUM

BELGIUM

I. PROGRESS/STATUS REGARDING WASTE MANAGEMENT DECISION-MAKING

Belgium has an extensive and well developed nuclear energy program. The nuclear share of electricity production is almost 25%, one of the largest percentages in the world; the 225% planned increase in installed MWe would raise this to 43% by 1985. Belgium's lack of indigenous resources and its very high percentage of nuclear generated electricity have resulted in a rather broad acceptance of nuclear power.

In 1976, a commission of experts was established by the Minister of Economic Affairs to analyze the global energy situation and produced a White Book, "Elements for a New Energy Policy." The elements described therein will, it is hoped, eventually be the subject of a parliamentary debate on the directions for Belgian energy policy; these include the various target percentages for each primary resource, as well as the role and degree of government participation. The debate was scheduled to begin four years ago, but parliamentary crises and discussions concerning constitutional reform have delayed it indefinitely.

Belgium's operating reactors have already expanded their spent fuel storage pools. Those plants currently under construction have modified their construction plans to upgrade pool capacities. Now, Belgian reactors annually discharge approximately 44 MTU and have an at-reactor (AR) storage capacity of roughly 190 MTU. In 1985 these figures will become respectively 146 MTU/year and 1100 MTU.

No plans are currently known for the construction of a new AFR storage facility. Belgian utilities have contracted to have their spent fuel reprocessed, to prevent at-reactor storage congestion. In addition to AR storage, the utilities envisage the possibility of making use of the Eurochemic spent fuel storage pools which could have a capacity of about 250 MTU.

Belgium currently has four reprocessing contracts with Cogema committing 540 MTU, 36 MTUs of which have already been reprocessed. In 1978, the Belgian government concluded an agreement with the OECD Nuclear Energy Agency (NEA) to take over the Eurochemic reprocessing plant at Mol. Pending parliamentary acceptance and the official establishment of an organizational structure, Belgoprocess, a syndicate founded in 1976, 50% owned by the government and 50% by the utilities, is examining the work to be done in order to carry out modernization and improvement. It could be recommissioned for operation by 1987 at its present nominal capacity of 300 kgU/day or 60 MTU per year.

The storage tanks are currently filled with approximately 800m³ of high level liquid waste left over from previous reprocessing operations and the Belgians are presently negotiating with Cogema for a turn-key contract for an AVM-HLW waste immobilization plant at Mol. The AVM process has the additional advantage of being sufficiently well developed to enable accurate cost and operational planning for the integrated facility at Mol.

LLW coming from Eurochemic is currently managed by the CEN. The LLW is shipped off-site to Mol by the utilities, concentrated or incinerated and encased in bitumen or concrete and disposed of in the Atlantic. Ocean dumping is conducted under the supervision of the NEA and applies only to LLW with very low plutonium content. Shallow land burial has not received much attention yet. The future plan for LLW envisages purification at the production site of large volumes of liquid LLW.

Transportation of spent fuel to Cogema is undertaken by shippers as sub-contractor of Cogema according to Belgian legislation.

In 1975, Belgowaste, also a 50:50 (private and public) non-commercial association (syndicate) was founded in order to prepare a technical and administrative plan for radioactive waste management in Belgium and to take the preliminary steps for

establishing an organization which would be responsible for this activity. It is now expected that the entire responsibility for disposal, and long term storage of all waste will be entrusted to a public organization. This organization will take primary responsibility for waste disposal and help the utilities manage their LLW. Assuming public acceptance is obtained, it is intended to establish their facilities and services near Mol.

Belgium favors using the Mol site for the ultimate disposition of HLW. A deep clay layer situated below the nuclear site at Mol has been selected for detailed study. Experimental drilling has been carried out over the past year under the direction of CEN. Preliminary findings, after four years of research, are favorable regarding the storage of conditioned wastes.

It is planned that high level liquid wastes from reprocessing will be stored in tanks and vitrified. It is anticipated that a period of more than 50 years will be utilized to allow cooling of the borosilicate glass waste form prior to transfer to ultimate disposal in a geologic (clay) repository. Tests to determine the thermal conductivity of clay, and specifications with regard to maximum temperature in the clay will be conducted to confirm this cooling period. A clay medium was selected because Belgium has neither salt domes nor suitable crystalline rock formations as accessible as the clay.

CEN has begun work on an underground laboratory which will be placed at a depth of 220 m. The laboratory is planned to be operational in 1982 and will permit an in situ characterization of the clay beneath Mol. Tests to be performed will include: soil mechanics, hydrology, heat transfer and verification of data obtained from previous tests. At first, only non-radioactive heat sources will be used. It is expected, however, that tests with radioactive sources will follow appropriate public hearings for acceptance of this next step. Since the beginning of 1976, this program has been carried out by CEN under a contract from the EEC.

Work focused on basic research and drilling began a year ago. Organizations such as the Belgian Geologic Service, the State Geotechnic Institute and specialized university laboratories have also participated in the research.

Only if the results of the above research are favorable, will steps be taken to secure permission to construct a repository. Belgium favors the site at Mol because 1) there appears to be suitable, deep clay; 2) there is already a nuclear facility in place. The Belgian nuclear establishment has coupled this research with a comprehensive education and public information program which is aiding the acceptance of nuclear power (see Section IV). Since the first immobilized HLW from France will not arrive for at least 10 years and a lengthy surface cooling period is envisioned, there appears to be ample time to finish research, select a technically suitable site, engage in local acceptance activities and construct a repository.

II. POLITICAL STRUCTURE AND ENVIRONMENT FOR WASTE MANAGEMENT DECISION-MAKING

Parliamentary Position

As of mid-May 1980, the Belgian government was formed by a coalition of the country's three major parties -- Christian Democrats, Socialists, and Liberals -- under Prime Minister Martens of the Flemish Christian Democratic Party. The Parliament, however, is principally focused on Belgium's central issue, constitutional reform involving decentralization of power, and continues to put off a long awaited debate on nuclear power. These factors have so far not impacted the Parliament's generally pro-nuclear sentiments.

Preemption

The central government has pre-emptive rights in local siting matters, but so far has not had to use it.

Local Officials

Governors of the different provinces (regions) are appointed for "life" i.e., until retirement. Other local officials, such as mayors, are elected. The Permanent Provincial Delegation, the executive organ in the provinces, has some members which are elected and a few that are appointed.

Stipulation Law

There is no stipulation law which links reactor licensing to waste disposal plans.

Land Use Veto

There is no land use veto in Belgium.

Referendum System

No national referendum system has been used in recent years. There have been local and regional referenda, one about the Tihange nuclear power site. The results were viewed by the government as

inconclusive. The extent to which local referenda are legally binding will depend on the outcome of the constitutional reforms, which address the issue of local autonomy.

Public Hearing Process

Public meetings are utilized for imparting information on the nuclear program. Public hearings are not, however, part of the approvals process. Instead, parliamentary debate on the issue is considered as a "public" hearing.

National Waste Management Company

According to present law, the disposal and storage of radioactive waste will be the responsibility of a public company owned 100% by the State.

III. FORMAL SYSTEM FOR OBTAINING LOCAL ACCEPTANCE ON SITING AND ROUTING FOR NUCLEAR WASTE ACTIVITIES

Formal System for Siting

The Belgian public approvals process is characterized by a high degree of centralism. The ultimate decision-making authority is on the national level although a full range of opinions are solicited from the regional and local (commune) levels. Belgium employs, in addition, an extensive information campaign which involves close contact with the media. In these ways, the central decision-making process is given wide public exposure and input through elected officials.

Approval for test drilling may be given by local authorities if they so desire. However, if they veto a drilling request, it can be overridden by the Minister of Interior. In an attempt to sell rather than force, each year the CEN chairs an information meeting in Antwerp Province where Mol is located. Local authorities, ministers, and journalists are briefed on the test drilling and research at Mol. In fact, the Governor of Antwerp Province asked to have a special meeting, timed to coincide with the start-up of heat conductivity tests at Mol. The special presentation was requested for local political considerations and to explain future plans (as described in Section I).

There is a broad approvals procedure for the construction and operation of nuclear facilities. Under Belgian law, waste facilities are considered a Class II establishment and the applicant must follow the procedure described below for approval according to the law of 1954 relative to the control of organizations in the public interest.

An application for construction, initiated by the applicant, is submitted to the governor of the particular province who transmits a copy of the request to the mayor of the town where the site will

be constructed. The governor also submits copies to the mayors of towns situated within 500 meters of the site. The mayor(s) then pass the request to their city councils who have thirty days to send their advice back to the governor of the province.

The governor then transmits all documents to a Provincial Advisory Committee who have two months to give their opinion back to the governor. If they take longer than the allotted time, they must justify doing so. The Provincial Advisory Committee is composed of:

- the Chief Inspector for Public Health or his deputy;
- the Health Inspector of appropriate jurisdiction;
- the Chief Inspector for Occupational Safety, the Chief in the relevant district or this deputy;
- the Regional Engineer for Occupational Safety;
- the Chief Physician for Occupational Health or his deputy;
- a delegate from the mining administration when the site is under the jurisdiction of that administration;
- a secretary jointly designated by the Ministry of Employment and the Ministry of Public Health.

The Provincial Advisory Committee can seek expert advice (from anywhere in the country) on the general or specific aspects of the safety and security of the proposed establishment; equally, they may seek such information from the applicant.

The governor forwards the request, and the advice and opinions from the Provincial Advisory Committee, to the Provincial Permanent Delegation who have one month to decide on the application. This body is the executive organ of the province and is composed of both elected and appointed officials. If the advice of the Advisory Committee is unfavorable, the Permanent Delegation is bound to reject the request. If the advice of the Advisory Committee is favorable, the Permanent Delegation is free to refuse or grant construction authorization.

The governor transmits the decision of the Permanent Delegation to the applicant, the mayor of the locality concerned, and to the members of the Provincial Advisory Committee. The mayor informs the citizens of the decision by posting it on the town hall and making copies available to interested parties. The entire process requires approximately five months. Naturally, extended debate in the Provincial Advisory Committee can lengthen the time frame.

Fifteen days after the posting of a decision, interested parties may initiate an appeal. All recourse is addressed to the King of Belgium who transmits it to a Special Commission. The Special Commission, organized on the national level, is composed of:

- the Director General of Public Health or his deputy;
- the Inspector and Chief Director of Public Health or his deputy;
- the Director of the Institute of Health and Epidemiology;
- the Director-General of the Occupational Safety Administration;
- the Engineer and Chief Director of Technical Inspection of Employment, chief of the district concerned, or his deputy;
- Director General of Occupational Health and Safety Administration;
- the Commissar for Atomic Energy or his deputy;
- ten scientists, nominated jointly by the Minister of Employment and the Minister of Public Health, whose disciplines include:
 - nuclear physics
 - nuclear chemistry
 - radiobiology
 - radiological protection
 - nuclear safety
 - metallurgy
 - meteorology
 - geology
 - hydrology
- a secretary, jointly designated by the ministers.

This commission may, itself, seek advice from other national or international bodies or experts including the EEC.

If the advice of the Special Commission is unfavorable concerning the appeal, the Ministry of Employment, the Ministry of Public Health and the Ministry of Economic Affairs must refuse the appeal. If, instead, the advice of the Special Commission is favorable, the ministries are free to grant or reject the appeal and must give their reasons for doing so.

The final decision is issued in the form of a royal edict. The decision is communicated to the Special Commission and the governor of the province who transmits copies to the applicant, the mayor, and the Provincial Advisory Committee.

After construction of the waste facility, an operating license for the facility is required. Authorization is granted by an ad hoc committee formed by the Ministries of Public Health and Employment. Approval is in the form of an acceptance of minutes which state that the installation conforms to the terms of the construction authorization. Operation of the facility may begin upon verbal authorization if the Committee is favorable.

Formal System for Routing

Spent fuel transportation is subject to regulation by the central government and no public consent is required. Private shippers must receive a license from the Ministry of Public Health. Transportation of radioactive material has not been a sensitive issue in Belgium.

IV. APPROACHES USED (INFORMAL SYSTEM) IN SUPPORT OF AND/OR IN ADDITION TO FORMAL SYSTEM

The Belgian utilities and government authorities have engaged in a wide information campaign for the media. Belgium has had some success with its information program; nuclear energy seems to be accepted in Belgium probably due to the public relations/public education campaign, although anti-nuclear groups are quite active.

Although the Belgian government has wide preemptive powers in all nuclear matters, it relies for the most part on education and selling rather than on exercising these powers.

The Belgian Nuclear Forum organized different symposia (6 up to now) for radio, television and newspaper journalists. In all the symposia, papers were presented by specialists from utilities, design offices, universities. Ample time was available for discussions.

A first one was organized in France for 3 days with visits to the diffusion plant of Tricastin, the nuclear power station of Le Bugey. Four others took place in Belgium, where nuclear fuel fabrication plants were visited, also Eurochemic (reprocessing) and the nuclear center at Mol. There were briefings on reprocessing, HLW, MLW, LLW, plutonium plants, different aspects of the waste program, alternative energies, etc.

Another symposium took press people to Marcoule in France (vitrification plant) and Asse in Germany (storage of wastes in a salt mine).

At the beginning of June 1979 the media people were brought, for one week, to the USA where they visited Three Mile Island, Westinghouse (Pittsburgh), training center of Zion and Washington (NRC).

A trip to the French reprocessing plant at Cap La Hague is scheduled later this year.

The symposia appear to have been successful, and the media have requested that more of them be conducted. The information programs have broadened into other forms of energy. A main theme has been the placing of nuclear energy in context with other possible energy sources, thereby illustrating some of the present benefits of nuclear technology. The Belgians have chartered special planes to take 30-40 journalists to nuclear sites throughout Europe, with emphasis on waste management activities.

The program has resulted in the media getting more correct and current information in its proper context as well as making valuable personal contacts. The information campaign has been extended to include a public education program in schools and other civic organizations. These center on the need for electricity and the role of nuclear and other energy forms in Belgium.

The presentations and public hearings concentrate on getting local approval of waste activities and building credibility by divorcing, as much as possible, research drilling from site selection. No additional pressure has been used; Belgian government strategy in siting matters has been to review progress in research and explain future steps at intervals to the public.

V. OBSERVATIONS/CONCLUSIONS

The strength of the Belgian nuclear program confirms the conclusion that the centralized structure of the government (i.e., no linkage laws, no binding public hearings, no local land use veto, plus appointment by the central government of regional officials) is conducive to approval of nuclear projects when coupled with an extensive public information campaign.

This education program (bolstered by a strong national pro-nuclear policy) explains the need for nuclear power in the total energy context, the safety of radioactive waste management, and makes liberal use of instructional visits to related waste management activities in foreign countries by members of the Belgian media. Additionally, jobs and other economic spin-offs have been provided as a result of the siting of nuclear facilities; they have proven powerful incentives to local acceptance. Thirdly, the Belgian government has followed a siting policy of locating waste management activities at existing nuclear facilities where the public has already experienced the benefits of having nuclear facilities located nearby.

The selection of Mol for test drilling, and the probability of its acceptance as a waste repository, is due to these factors. Aside from having a suitable geology, it was already a well developed nuclear site having a small power reactor, a mixed-oxide fuel fabrication plant, the CEN headquarters, and the Eurochemic reprocessing plant which operated for eight years. The local political climate, therefore, has been one of acceptance of an expansion of the facility located there. The town of Mol has also reaped large economic gains from the prior establishment of nuclear facilities. Its population has grown from 1500 to 10,000 in a relatively short time, bringing economic prosperity. Public hearings and briefings have been regularly held at Mol, many timed to coincide with various stages of research related to waste management.

VI. SYSTEM FOR OBTAINING ACCEPTANCE OF WASTE MANAGEMENT TECHNOLOGIES AND PRACTICES

Belgium abides by the OECD and London Convention regulations regarding sea dumping. Similarly, the IAEA, NEA, and EEC criteria on underground storage facilities are also followed as are IAEA standards on HLW transportation.

Overall regulatory authority is vested in the Ministry of Economic Affairs which also is responsible for financial aspects of research, development, and deployment of waste technology. The Ministry of Public Health is responsible for drawing up and ensuring the application of regulations concerning protection of the population against radiation hazards. Similarly, the Ministry of Employment is responsible for occupational health and safety regarding nuclear installations. In case of disputes or disagreements over waste management technologies and practices, interministerial committees and expert groups are utilized to settle such differences.

Most of the research on waste technology (aside from immobilization research) is conducted by government research institutes, primarily the CEN. Research is also contracted to various university-affiliated research institutes.

Waste Form

CEN presently conducts research on waste form. Upon completion of this research, the final results will be evaluated by those Authorities who will make the final decision regarding waste form.

Transportation

The Ministry of Public Health has regulatory authority over transportation of radioactive material. The shipment must conform to IAEA criteria and is protected by the Belgian national police.

Geology

Technical decisions regarding geologic disposal will be taken by a group comprised of the Ministry of Economic Affairs, for feasibility and financing aspects; the Ministry of Public Health, for safety and health matters; the Ministry of Employment, for occupational health and safety. Additionally, national geological institutes will be consulted.

Observations/Conclusions

To date, there have been no major challenges to the government's decisions on waste management technologies and/or practices.

CANADA

CANADA

I. PROGRESS/STATUS REGARDING WASTE MANAGEMENT DECISION-MAKING

In Canada, nuclear energy accounts for 10% of total electricity generated and 3% of all primary energy sources. In Ontario Province, where all but one of Canada's eleven reactors are located, 30% of electricity comes from nuclear power. Fourteen new reactors have been approved and Canada plans to increase its installed MWe 75% by 1985.

Atomic Energy of Canada Ltd. and Ontario Hydro in 1975 proposed an integrated waste management center which included a reprocessing plant and waste immobilization units. Since 1977, this concept has been in abeyance due mostly to the Carter Administration's non-reprocessing stance. Canada has not completely rejected reprocessing. She has developed retrievable storage techniques for spent fuel and is developing technology applicable to disposal of waste from reprocessing as well as irradiated fuel.

Until a decision has been reached on reprocessing, and pending the development of an operational repository, Canadian policy is to indefinitely store spent fuel at-reactor in water filled pools. At present, 2700 MTU are stored in this fashion and annual discharges at present are about 850 MTU per year. Current spent fuel storage capacity is adequate for many years. While the Canadian government has not ruled out the possibility of storage at a centralized away-from-reactor (AFR) site, results obtained from design studies so far support the conclusion that successful at-reactor (AR) storage of CANDU spent fuel is possible for over 50 years.

Since Canada is not currently engaged in reprocessing, and spent fuel is stored at-reactor, there is very little transportation of HLW. Transportation of spent fuel from test reactors is undertaken as required mainly from Chalk River to the U.S. (shipped by

private contractors) and has not been a problem requiring public acceptance.

There is no national mandate on LLW policy as yet. Four operational LLW sites are in existence; two are on Atomic Energy of Canada Ltd. (AECL) property and two are on utility property. LLW from research facilities and these from commercial reactors are reduced in volume, compacted on site and shipped to one of these sites for shallow burial or storage. Ontario Hydro is responsible for the safe storage of their own LLW and the AECL for all other Canadian LLW.

Despite the deferred decision on ultimate waste form, Ontario's Prime Minister and Parliament have agreed to a plan leading to a deep geological HLW repository in their province. The joint coordinating committee of the federal and Ontario Province governments has approved investigations of candidate research sites and renewed efforts to collect data from already-drilled sites. The geotechnical investigations will concentrate on the Pre-Cambrian Shield in Ontario, specifically, intrusive igneous rock known as plutons. To date, drilling has begun at one new site and boreholes have been instrumented at an existing second site. The usual local resistance to exploratory drilling is being encountered.

The joint federal/provincial R&D program is in three phases culminating in the operation of a demonstration disposal facility. The current phase is one of concept assessment which combines field drilling and research on the properties of various formations to prove that the hard rock plutons are a suitable disposal medium. The second phase would include the selection of the site for the demonstration facility. A demonstration facility is not planned before 1990. Transfer of spent fuel (or HLW from reprocessing) for commercial disposal is not envisioned before the end of this century.

In the concept assessment phase, AECL is responsible for the research on the permanent disposal of the spent fuel. Ontario Hydro, the provincial utility, has general responsibility for interim at-reactor storage and eventual transportation of spent fuel. AECL,

as part of its responsibility, carries on basic chemistry research, environmental research (with Environment Canada), geotechnical studies and LLW storage.

As part of the joint federal-provincial agreement on radioactive waste management, the Canada-Ontario Coordinating Committee is responsible for coordinating those activities in the program involving the public. Established by the national and Ontario Province parliaments, the Committee is chaired by AECL with representatives from Energy, Mines and Resources Canada, the Ontario Ministry of Energy and Ontario Hydro. While AECL is taking the lead, the Government of Ontario, including Ontario Hydro, will provide appropriate support in the public information activities (see Section III).

Another important element in the waste disposal program is the extent to which Ontario Province is involved with nuclear power. The work of the Coordinating Committee is greatly aided by the support of Ontario Premier William (Bill) Davis (Progressive Conservative) who has maintained the provincial commitment to nuclear power and its fuel cycle (including disposal) established by his predecessors. Davis agrees that since:

1. almost all nuclear plants are in Ontario, and
2. it has the suitable geology,

Ontario would accept a nuclear waste disposal facility. This decision was taken as part of the total recognition of Ontario's need for, and commitment to, nuclear power. While the complete details of Davis' agreement has not yet been released, the joint Canada/Ontario waste management program states:

"A further agreement on a program leading to the selection and acquisition of a site and the subsequent demonstration of geological waste disposal, will be concluded between the two governments as quickly as possible."

The federal government has raised the question of Ontario accepting, for disposal, waste generated in other provinces. Such pressure is the result of large federal outlays for the waste

disposal program in Ontario which would be uneconomical, and perhaps more politically difficult, to duplicate in other provinces. The result so far has been for all parties to effectively avoid the issue, given its present lack of urgency.

II. POLITICAL STRUCTURE AND ENVIRONMENT FOR WASTE MANAGEMENT AND DECISION-MAKING

Parliamentary Position

The two major political parties at the national level, the Liberals (52%) and the Progressive Conservatives (37%), are both basically pro-nuclear. The current cabinet is relatively new and their orientation is still difficult to judge.

The Parliament and government of Ontario Province, led by Progressive Conservative Premier William (Bill) Davis, is also pro-nuclear. Both levels of government, however, maintain a low profile on all nuclear issues.

Preemption

The 1946 Atomic Energy Control Act gave the federal government responsibility over nuclear affairs including the production, use, and application of atomic energy; research and investigation with respect to atomic energy; and refining or retreatment of prescribed substances. The Act does not address provinces rights per se in siting matters though Federal pre-emptive rights are stipulated.

To date, federal-provincial relations regarding radioactive waste management have been relatively harmonious because of Ontario's willingness to accept a repository in their province, and because the national government has not been forcing the issue.

Local Officials

Provincial parliaments are elected and pick their own prime ministers. Reeves (Mayors) and local officials are also elected.

Stipulation Law

There is currently no stipulation law in Canada. The findings of the Porter Commission, established in 1974 by the Ontario government to examine the experience of Ontario Hydro, states that "there

should be a moratorium declared on additional power stations if progress in HLW R&D, in both a technical and social sense (as judged by technical and social advisory committees, provincial and federal regulatory agencies, and the people of Ontario, especially in those areas directly affected), is not adequate by 1990."

Land Use Veto

There is no land use veto in Canada.

Referendum System

A national referendum has not been held in Canada since World War I. While provinces can and do hold referenda on their own (such as the one recently held in Quebec) its results could only be binding within that province. It is not anticipated that the nuclear issue will be the subject of a national referendum.

Public Hearing Process

Public hearings are a formal part of the environmental acceptance process (described below) but are not required by law in nuclear siting issues. Test drilling in Madoc, Ontario in 1977 raised such a local furor that the joint Canada-Ontario Radioactive Waste Management Coordinating Committee has developed an approvals process for research site selection which will henceforth involve public hearings and community relations activities.

National Waste Management Company

There is not, now, a Canadian waste management company. AECL has informally assumed this role and AECL personnel would likely play a significant role in this responsibility if a national waste corporation is established.

III. FORMAL SYSTEM FOR OBTAINING LOCAL ACCEPTANCE ON SITING AND ROUTING FOR NUCLEAR WASTE ACTIVITIES

The present approvals process is a relatively new one, replacing a previous informal working agreement between AECL and Ontario Hydro. No prior explanation to or approval by the local people of the test drilling was required under the old plan. The only alternative to public outcry and strong objections by parliamentarians was to cease the field research, even after drilling had already commenced. Under the new formal agreement, the AECL must get Coordinating Committee approval at five stages before beginning field research. This committee established an approvals procedure for acceptance of field research work in Ontario. Activities in Ontario, whether related to public information or field research, must be approved by the Coordinating Committee. The committee also monitors the work at two other stages before allowing the drilling to start. Time for approvals, objections and other alternatives is built into the process.

In the concept verification phase, the approvals process begins with a regional public information program involving the dissemination of literature and presentations to brief local and national parliamentarians, the media and local town councils, and includes public meetings. On the basis of feedback from localities after the public information program, permission is sought by AECL to conduct a community relations program in communities near potential research areas. This aspect is similar to the public information program except that it is concentrated in smaller geographic areas and focuses on details of the proposed field research and possible social and economic impacts. Briefings of local legislators, town councils, local media and other groups are conducted. There is also provision for a public meeting co-sponsored by the town council and AECL. Public reactions are again reported to the Coordinating Committee.

If a town council formally agrees to permit a field research program involving drilling in their area, AECL may submit a proposal for field research work to the Coordinating Committee. The other members of the Coordinating Committee review the proposal, including comments of national and provincial parliamentarians, and approves or rejects it. With the final approval of the Coordinating Committee, the work can proceed.

To date, eight regional information programs are in various stages of development in Ontario. In two cases, community relations programs were initiated and, following local council acceptance, field research was approved at White Lake and Atikokan. So far, over thirty-five presentations on the Canadian RWM program have been made to town councils, chambers of commerce and community organizations. Briefings have been held for over sixty provincial and national parliamentarians.

It is important to note that this process precedes the actual drilling. Every attempt is made to separate in the minds of the public, the research drilling from the site selection process.

The results of the first concept assessment phase should allow the selection of candidate sites for the waste facility. In this phase, AECL would submit a concept verification report, which includes the test data, to the AECB and the AECL's Technical Advisory Board. Since the site selection phase is not scheduled until 1984, the precise details of the public approvals process for site selection have not yet been detailed. The First Annual Report of the Canadian Nuclear Fuel Waste Management Program states, however, that specific information on the proposed facility, including details on economic factors, community impact, health and safety considerations and environmental effects will be discussed with communities near the candidate sites. Their elected representatives will participate in the decision on whether the facility will be built in their area. Mention of provincial veto rights or federal pre-emption do not appear in this document.

A suggested procedure on concept assessment and site selection was submitted by the Coordinating Committee to the Ontario Select Committee for consideration and possible inclusion in the Select Committee's soon-to-be-released report, but it does not appear that the Select Committee is prepared to address the problem of site selection in detail at this time. The Select Committee "recognizes" the problem of local acceptance and are suggesting that a new federal-provincial "entity" be set up to deal with it. The decisions by national and provincial governments, technical confirmation, local acceptance, including public hearings, and licensing procedures through regulatory bodies will culminate in the selection of the site for the demonstration facility. In the site selection phase (and, to a certain extent, during concept assessment), there should be a large number of technically suitable sites. There will be a choice among many available areas as to the location of the facility should some communities not wish it to be located in their particular jurisdiction. This also sets up the possibility for competition among sites wanting to be picked.

IV. APPROACHES USED (INFORMAL SYSTEM) IN SUPPORT OF AND/OR IN ADDITION TO FORMAL SYSTEM

The Canada-Ontario waste management program is a relatively new one -- established in June 1978 -- and alternate approaches or strategies to gain public acceptance are still developing. Education and information programs, however, which are usually found to be mainstay elements of support to the formal siting system in other countries, are an intrinsic and essential part of the Canadian waste management program.

The Canadians have made use, in at least one instance, of economic incentives to make the acceptance of research drilling or the waste disposal facility more attractive. For example, Premier Trudeau shifted a uranium mill planned for southern Ontario to an area in which AECL wanted to do some test drilling and had previously been refused permission. Press releases have indicated a considerable softening in attitude of the locals since that decision.

Finally, in the event that no community indicates an interest in hosting a waste facility, the federal government has the option of establishing the facility in a remote area. Additionally, the national government could also exercise its pre-emptive powers.

V. OBSERVATIONS/CONCLUSIONS

The main theme of the Canada-Ontario Nuclear Fuel Waste Management Program is the close consultation and cooperation between the two governments. The agreement states that there be "full consultation and prior agreement at each step of the process." The key to achieving this cooperation is the Coordinating Committee. The program has only been tested at its first level: siting for research drilling. Even with all the elaborate educational and public participation programs, only two approvals for research sites have been received in almost two years.

While there have been indications of success during the concept assessment phase, the public approvals process has only just begun. Since the program requires approval at the local, provincial, and federal levels, the process will be a lengthy one.

The Select Committee's Staff Summary, released in May 1980, discussed some other shortcomings of the program. While the procedures that must be followed in the concept assessment phase have been established, the criteria on which approval is granted or rejected are not. Also, the consequences of a denial of approval are unclear. Similarly, there is confusion over what constitutes community agreement and the right of a community to veto proposed plans. As indicated, the repository site approvals process is not yet determined and this adds to confusion over the separation of research site selection and repository site selection.

The waste management program may also result in difficulties for Ontario, caught between the public and Ottawa. According to the joint statement, AECL will take the lead on the public information programs with appropriate support from provincial agencies. Opposition members on the Ontario Select Committee on Hydro Affairs have charged, however, that the provincial government is "playing games" to keep a low profile on the nuclear waste issue, to keep test drilling out of areas represented by government members and to confuse the public.

The impression is that, while the federal government is supportive of nuclear power and the waste program, the Ontario Ministry of Energy and Ontario Hydro have only a tangential relationship to the waste disposal program. There are, therefore, questions of ultimate responsibility that result in a certain vagueness over the institutional roles involved.

Ontario is caught between public pressure on siting/drilling issues and federal pressure to resolve the disposal problem effectively. To date, progress has been marked by a slow and deliberate process of consultation and approvals at all levels of government. Canada is taking the necessary time to educate the public while presently storing waste at reactor sites until a decision is made on reprocessing.

Canada is one of the few nations in the world that has an established public approvals process which allows for, at least in principle, considerable public input and participation. The program is basically sound and should, in time, accomplish the objective of identification of candidate sites. However, procedural vagueness about future phases and governmental responsibility may weaken the program's effectiveness.

VI. SYSTEM FOR OBTAINING ACCEPTANCE OF WASTE MANAGEMENT TECHNOLOGIES AND PRACTICES

Waste Practices

Technical criteria are established by the Atomic Energy Control Board (AECB). They are the primary regulatory body in the nuclear field but they bring in other interested government agencies and experts on an informal basis. While licensing is AECB responsibility, it is up to the developer of the technologies to research, prove and demonstrate its effectiveness to the AECB. In practice, this falls to the AECL and Ontario Hydro. The AECB has organized a review committee with the Ministry of Environment of Canada and of Ontario for ad hoc review and approval of plans.

Technical standards and practices promulgated by IAEA, NEA, ICRP, and the WHO (through the IAEA) are all considered and dealt with. Canada follows IAEA standards regarding criteria for transportation of nuclear material. Additionally, Canada is a party to the Great Lakes Water Quality Agreement involving the International Joint Commission (IJC) and the U.S. Nuclear Regulatory Commission and Environmental Protection Agency and the AECB and Environment Canada.

Atomic Energy of Canada, Ltd. (AECL), a Federal Crown Corporation, has the primary responsibility for the waste management program and provides overall coordination between the various involved agencies as well as between the federal and provincial governments. AECL is working on developing, demonstrating and proving an effective waste disposal solution. AECL has established a Technical Advisory Committee to provide expert technical review of its program by independent members of the scientific community.

Geology

The Ministry of Energy, Mines and Resources administers and coordinates geophysical and geological studies. They are funded by

AECL. Progress reviews are held with the Technical Advisory Committee. All activities related to field research must be approved by the Coordinating Committee. It is presently unsure who will make the final decision regarding geologic disposal.

The Select Committee has pointed to doubts about the Canadian reliance on one geologic medium. However, the process for resolving technical conflicts and challenges to technical solutions in Canada is yet to be clearly established, and research on the Pre-Cambrian Shield continues to gather support. Consideration has been given to other geologic media and reports on salt and shale are being developed.

Waste Form

Canada's basic waste form is spent fuel. However, research on the immobilization of reprocessing wastes is being carried out at the AECL Chalk River Laboratory. Reprocessing has been indefinitely deferred due to international political considerations and the marginal economics of reprocessing CANDU fuel. Ultimate regulatory approval rests with AECB.

Transportation

Regulations and licenses for spent fuel transportation are promulgated by the AECB in consultation with the Ministry of Transportation. Proof of cask integrity and responsibility for shipment rests with Ontario Hydro (or AECL in the case of spent fuel transport from research facilities).

Observations/Conclusions

The Canadian RWM program is characterized by a high degree of interaction between the various government agencies and between the national and provincial governments in technical decisions (also see section on Public Acceptance Process). For example, the AECB incorporated into its regulations Environment Canada's concerns regarding the increase in water temperature due to reactor operations near rivers and lakes.

The comprehensive R&D program on waste management technologies needed for ultimate disposal is well established. The program incorporates national and provincial scientific expertise involving government agencies, academia and industry. Ultimate responsibility for questions related to the acceptability of waste management practices and technology is unclear at this time.

FEDERAL REPUBLIC OF GERMANY

FEDERAL REPUBLIC OF GERMANY

I. PROGRESS/STATUS REGARDING WASTE MANAGEMENT DECISION-MAKING

West Germany's current commitment to nuclear energy envisions a 119% increase in generating capacity from the present 8,887 MWe to 19,534 MWe by 1985. Substantially lower than the projection a few years ago of 45,000 MWe, this reduced commitment reflects the controversy casting doubt on the future role of nuclear energy. The revised energy forecast places more emphasis on local conservation and reduced energy demand.

Plans for the back end of fuel cycle were focussed on the integrated waste management center to be located at Gorleben in the state (Land) of Lower Saxony. This center was to include facilities for acceptance and storage of spent fuel assemblies, reprocessing, recovery of plutonium and of the unused uranium, conditioning of radioactive wastes, and their storage in a permanent repository. The concept was rejected in May 1979 as "politically infeasible" by the Lower Saxony Prime Minister following the well-publicized Gorleben hearings. He did agree, however, to permit experimental deep drillings and to accept a permanent repository if the results of the deep drilling are favorable. The following paragraphs outline the current plans replacing the integrated facility.

Although there is some disagreement whether or not to reprocess spent fuel prior to its permanent disposal, a recent agreement between FRG Chancellor Helmut Schmidt and the State Premiers has postponed the ultimate decision on reprocessing until 1985. In the meantime, the experimental reprocessing facility at Karlsruhe will continue to operate and foreign contracts with Cogema and BNFL will be honored. To keep Germany's reprocessing technology up to date, DWK, the utility-owned consortium responsible for

performing this service in the FRG, has initiated the licensing proceedings to prepare for site selection of a reprocessing plant of approximately 300 MTU in the state of Hessen. On February 28, 1980, the majority of Hessen Parliament agreed to accept such an application, prior to determining if it would be politically possible to build and operate a facility in the state. The recent application and technical description will help the Hessian administration decide whether a suitable site can be found; however, actual construction cannot begin until 1985 pending the federal government decision on reprocessing.

As an interim measure for spent fuel storage, West Germany's current plans include expanded at-reactors (AR) storage as well as 2 or 3 away-from-reactor (AFR) storage facilities. AR expansion beyond reracking of the original basin is difficult because of the German restriction on outdoor pool storage and restrictions on storage capacity within reactor buildings. Of the several nuclear power plants that have applied for expanded storage, only one, Biblis, located in Hessen has obtained state consent, and this is being challenged in court by local authorities.

Plans for AFR storage, projected to be needed by 1985, are also encountering problems. DWK began licensing procedures for an AFR to be located at Aahaus in Northrhine-Westphalia in February 1978. After receiving the approval of the town council in January 1979, it appeared that the facility would also be accepted by the state and federal governments. However, the Northrhine-Westphalia government recently decided that an operating permit could only be granted when it is clear that the temporary waste storage facility at Aahaus will not become permanent, i.e., when there is certainty about permanent disposal at Gorleben -- a verdict not expected until 1990.

The Prime Minister of Lower Saxony has also indicated that he would be willing to accept an interim spent fuel storage facility,

but only if the people were for it. Subsequently, the Luechow-Dannenberg County Legislature, where Goleben is located, did vote in favor of accepting an AFR within its boundaries. DWK has chosen the Gorleben site and licensing procedures are underway.

For these AFR projects serious consideration is being given to "dry" storage in aircooled transport/storage casks instead of "wet" pond storage. This relatively new technique, called CASTOR, has been developed jointly by DWK and the Steag/VEBA subsidiary, Gesellschaft fur Nuclear Service (GNS). Since the casks themselves constitute an impenetrable barrier, they are stored in a commercial-grade warehouse with reinforced concrete floors. Another advantage is that storage capacity is built up gradually, as needed, thereby reducing the initial outlay which would otherwise be necessary to construct an optimum-sized "wet" facility. Additionally, the CASTOR concept is felt to have important local acceptance advantages as it does not project the image of potential permanency that concerns the local populace regarding an AFR wet basin.

The West German HLW management strategy features a multi-barrier system with the waste form constituting one barrier, the geologic properties of the repository as the next barrier, and the overburden strata of the repository as the third barrier, preferably including clay content to retard nucleides. Emphasis is on the reliability of the "total system" with less focus on each component barrier. HLW will be immobilized utilizing borosilicate glass which will be stored in canisters at surface level until the canisters reach the desired temperature for geological emplacement -- several decades if necessary. Although West Germany is negotiating with Cogema to obtain a turn-key AVM plant because of the German regulatory requirement to demonstrate a "proven" waste form, R&D continues at various FRG laboratories in order to develop West Germany's own HLW immobilization waste form and the process for producing it.

Exploratory drilling activities to determine the properties of the Gorleben salt domes have commenced, but not without considerable opposition from members of the Greenpeace organization, some of which are local people and some not. Patient and prudent handling of the situation, although resulting in some delay, has enabled the program to continue. Many demonstrators were encamped on the test site until recently when the police forced them to leave.

West Germany is also experiencing difficulty in managing the disposal of LLW. Currently LLW is stored at temporary state collecting facilities, research centers, and nuclear power stations. Until 1978, LLW was then transferred to an abandoned salt mine at Asse in Lower Saxony. This mine, although licensed as an experimental emplacement facility, was used for both experimental and routine storage. Thus, when the operating permit expired in late 1978, the Lower Saxony government insisted upon extensive re-licensing procedures which could take from 2 to 5 years. Further, the Lower Saxony government has now decided that a new operating license for Asse will only be granted for either retrievable LLW storage or for experimental work on HLW storage, but not both. This creates a conflict of interests between the states who are running out of temporary LLW storage space, and the federal government who needs to use Asse for experimental HLW storage tests not yet permitted at the Gorleben site. Indications are that the HLW experimentation will take precedence over LLW storage.

Because of this licensing question, the Konrad iron ore mine is being investigated for the storage of LLW. In addition, the federal government is developing a comprehensive long-term management plan for LLW. This plan may be promulgated this summer pending the decision of the heads of the federal and state governments.

Transportation of nuclear waste has not yet become a problem. LLW and HLW are transported by rail or road in IAEA approved containers.

In spite of their agonies over managing the back-end of their fuel cycle, Germany has made more progress in meeting its waste management siting problems than any of the other countries analyzed.

They have found a community (Gorleben) willing to take both AFR and a permanent HLW storage facility, and a state (Hesse) willing to take a reprocessing plant. No other country has this many waste management siting issues resolved.

II. POLITICAL STRUCTURE AND ENVIRONMENT FOR WASTE MANAGEMENT DECISION-MAKING

Parliamentary Position

FRG Chancellor Helmut Schmidt is pronuclear. The Parliamentary coalition in power is made up of the Social Democrat Party (SPD) and Free Democrat Party (FDP), and is divided on the issue; however, the majority favor continued use of nuclear energy. In particular, the SPD has strong antinuclear factions at the national level and especially at the local level which hinder decision making and create problems for party leader, Helmut Schmidt. The major opposition party, the Christian Democrats (CDU) is, for the most part, pronuclear. Antinuclear contenders, the so-called "Green Parties", include the Federal Organization of German Berger Initiatives (BBU) and the Environmental Protection Party (GLU).

Although the "Green Parties" are not represented in the national Parliament, they have been somewhat successful at the state level, particularly in the Northeast and Southeast sections of Germany. For example, in the October 1979 elections in Bremen, the Green Party attained the required votes for representation in the state parliament, and did so by displacing votes which usually went to the Free Democrats. This has generated considerable concern on the part of the national leaders and is especially threatening to the Free Democrats who have only 7.9% of the votes at the national level, barely above the 5% minimum necessary to remain in Parliament.

Preemption

The German Atomic Energy Law, like that of the U.S., grants the federal government, and in particular the Federal Ministry of Interior, the right to overrule the states for nuclear projects considered to be of national importance. In practice, however, this has never happened. The federal government, while exercising its privilege in technical matters, does not overrule the locals on siting issues.

Local Officials

Members of the State parliaments and local councils are elected.

Stipulation Law

There is a stipulation-type law which links -- according to the disputed interpretation of the meaning of the German Atomic Energy Law -- the construction and operation of nuclear power plants to reprocessing and permanent waste disposal; however, in a recent agreement between Chancellor Helmut Schmidt and the State Premiers, nuclear power plants can be constructed and commissioned until 1985, if facilities exist to safely store spent fuel for at least 6 years. Contracts for reprocessing with Cogema and BNFL, could extend this period. After 1985, the states will have to guarantee the availability of reprocessing contracts, or at least have decided on a site for a reprocessing facility within West Germany, or made the decision to build permanent repositories for storage of unprocessed wastes.

Land Use Veto

The local town council or state licensing authority can veto a project based on its land use authority. Local land owners can also obtain court injunctions halting projects they oppose, if the court deems the reason for halting the project valid.

Referendum System

There is no national referendum process in West Germany.

Public Hearing Process

A formal public hearing process exists in West Germany in that the responsible state authority (which varies from state to state) informs the public of the envisioned project; convenes a hearing, and includes in its decision on the project application any objections raised by third parties. If that application is found to be acceptable under German law, the state licensing authority issues a license. At this point, every citizen directly affected by the license has the right to bring an action against the license in the local administrative court. In this event, the judge

decides on the license, and can revoke a license granted by the state licensing authority. The decision of the local judge can be appealed so the final decision can come from the Federal Administration Court.

The Gorleben Hearings from March 28-April 3, 1979, which received a great deal of attention, were not a part of the formal public hearing process. Prime Minister Albrecht, of Lower Saxony convened the hearings to aid the state government in making its political decision on the integrated waste facility. (See section IV, Approaches Used (Informal System) in Support of and/or in Addition to the Formal System for a discussion of the Gorleben Hearings.)

Waste Management Company

The utilities are responsible for all waste management activities up to the point of final disposal which then becomes the responsibility of the federal government. The utilities created the German Company for Reprocessing of Nuclear Fuels (DWK) in 1977 to take over the planning, construction, acquisition, and operation of the facilities for intermediate handling, reprocessing and storage of spent fuel assemblies, namely all activities in preparation for ultimate disposal.

The national scientific and engineering laboratory, the Physikalische-Technische Bundesanstalt, (PTB), under the Ministry of Economics, was given responsibility for permanent repositories. In general, the PTB is comparable to the U.S. Bureau of Standards, but regarding nuclear waste matters, its role is somewhat similar to that of the U.S. NRC in establishing the design criteria for the final waste repository. The PTB also conducts laboratory R&D work on the properties of the repository as they interact with emplaced materials. In December 1978, the federal government created the German Company for Construction and Operation of Permanent Repositories (DBE) to gather data for the PTB in planning and realizing deep drilling operations and the repository mine.

III. FORMAL SYSTEM FOR OBTAINING LOCAL ACCEPTANCE ON SITING AND ROUTING FOR NUCLEAR WASTE ACTIVITIES

Formal System

At the beginning of the licensing proceedings the application is not necessarily site specific. In this case, the applicant which can be either the DWK (pre-repository), or the PTB (repository) proposes a few sites for the waste facility within a particular region. The applicant submits an application and a technical review to the local town or district council which then agrees or disagrees to the location of such a facility within its boundaries. This local approval, a requirement of the general legal procedure, is not necessarily supposed to be first; however, in light of the controversy surrounding the siting of nuclear waste facilities, this procedure is considered a useful method in determining the types of acceptability problems the applicant may encounter. The local authority must have a valid reason for rejecting a project, so the applicant has the opportunity early on to alter the plans accordingly or abandon the project if the opposition appears insurmountable. If there is agreement at the local level, then the authorities involved collaborate with the applicant and choose a site which may or may not be one recommended by the applicant. After the site has been selected, the licensing documents are completed, and their formal authorization procedure can begin.

A formal review of the proposed project is conducted at both the state and federal levels. The federal review is primarily a technical/safety review while the state review is much broader in scope and covers the more specific aspects of the locality and their relationship to the proposed facility. The site-specific application is initially submitted to the responsible state authority, the "Supreme Land Authority" as designated by each respective state. This authority immediately forwards a copy of the application to the Federal Minister of Interior so that review proceedings

occur simultaneously. A copy is also sent of opinions from all involved local entities, such as planning authorities, building authorities, nature conservancy authorities, etc.

On the state level the review process begins when the state licensing authority commissions independent experts to evaluate the acceptability of the licensing documents. These experts are generally appointed from one of the eleven regional Technical Inspectorates (TUV) and/or from the Institute for Reactor Safety (IRS) which are both private consulting associations under government supervision. They are officially recognized as authorities for supervising technical safety matters on behalf of the state.

If the documents satisfy the expert panel i.e. they do not require modification or additional information, the state authority informs the public with respect to the project applied for, provides for public inspection of the licensing documents, convenes a public hearing, and then incorporates any objections/observations raised at the hearing into the licensing documents. On the basis of the information available, particularly that obtained from the public hearing, the experts make a recommendation on the proposed project. This recommendation is also attached to the licensing documents.

A similar review is conducted simultaneously at the federal level. The license application is reviewed primarily by the Reactor Safety Committee (RSK) and the Radiation Protection Committee (SSK) on behalf of the Minister of Interior. The Minister of Interior may also request the advice of other federal authorities such as the Federal Ministry of Defense, the Federal Ministry of Youth, Family and Health, etc. After having examined the above opinions, and if desired, the state licensing authority's files, this Minister can, if deemed necessary, issue a directive to the licensing authority. This directive is legally binding on the terms of the final decision; however, this measure has so far been avoided.

In practice, the final decision is made by the state licensing authority based on the conclusions drawn from all proceedings. All citizens or groups directly affected by that decision may challenge it in the local administrative court. Thus, both the applicants and the objectors may appeal unfavorable decisions to a local judge who in this event, inherits the final decision-making authority. Furthermore, his decision can be challenged in Appeals Court and finally with the Federal Administration Court.

Although involving both federal and state authorities, the formal licensing procedure for an intermediate storage facility (AFR) is simpler than the above procedure because the spent fuel is not altered in any way at the temporary location. In this case, DWK applies to the local authorities of the state for a construction permit. At the same time, DWK also applies to the PTB for an operating license. Although a public hearing is not a legal requirement for licensing an AFR, the federal government has decided to allow for public participation. Pending the advice of the state authority, the community associations and the PTB, the Prime Minister issues or does not issue the license. This final decision may also be challenged in the local administrative court by any or all parties effected by the decision, with the possibility of appealing.

Formal System for Routing

The procedure for establishing transportation routes is also much simpler than the formal siting procedure. It is the responsibility of the federal government agency, the PTB, to review the application and if all the various criteria for transport are met, authorize shipment. The state has no legal basis to challenge the federal government, but could challenge it on a political basis. Transportation has not, however, been a controversial issue. Transport casks are licensed under the German Atomic Energy Law and must adhere to IAEA stipulations for design criteria and testing performance.

IV. APPROACHES USED (INFORMAL SYSTEM) IN SUPPORT OF AND/OR IN ADDITION TO FORMAL SYSTEM

In West Germany, many approaches have been used in support of and/or in addition to the formal system. Several special government committees have been created to advise the federal government with respect to the nuclear power program. The establishment of these committees including both state and federal government officials reflects the serious effort on the part of the federal government to avoid using its preemptive authority under the Atomic Energy Act, and to consider the states' concerns regarding the development of a nuclear waste management program.

In 1977, the "Council for the Peaceful Uses of Nuclear Energy" was established including among others, federal ministers, the chairmen of three parliamentary party factions, the state Prime Ministers of Lower Saxony and Northrhine-Westphalia, and industry chairmen. This Council was established to advise the federal government on nuclear power and to provide the factual basis necessary for effective decision-making. Another joint committee of both federal and state under-secretaries of state was established in August 1979 to provide the background information that the State Premiers and Chancellor Schmidt would need in their meetings to arrive at an interim solution for waste management. The joint committee's first task was to determine when and how much temporary storage would be needed, and their second task involved the status of reprocessing in Germany and its relation to the commissioning of nuclear power plants. The information provided by this committee enabled the Chancellor and the State Premiers to thrash out together the details of the current waste management strategy discussed in Part I.

Various energy education programs have been set up by the Federal Government and the utilities to help the West German people understand the seriousness of the "energy crisis" and to explain nuclear

power in the context of all the various energy options available. For example, over the past five years the Federal Ministry of Research and Technology has been conducting a program entitled, "Citizen's Dialogue" to bring government representatives and the public into a series of town meetings to discuss energy matters. It has been found that the meetings are more productive if the government official addresses small homogeneous groups (such as labor organizations, church groups, housewives, etc.) who have similar interests and concerns. In addition, the utilities via DWK have increased promotional/educational activities, and have established strong channels of communications with local officials in areas where waste facilities are planned. The utilities' efforts are more specific in explaining the need and safety of a particular facility, as well as the reasons for the selection of the location. Economic benefits to be gained by the community are, of course, also stressed, and particular effort is made to communicate these benefits to the most influential and respected members of the community.

Another rather unique educational approach used by the federal government involves weekend retreats conducted by government officials. Leaders and members of local organizations from all over the country are encouraged to participate. Usually in homogeneous groups, they go away for the weekend and engage in a thorough discussion of the relationship of various forms of energy to their community, labor union, etc., thus getting a chance to have their questions answered and their concerns made known.

Other economic incentives are offered by the federal and state governments in the form of grants, loans, and/or subsidies to cover expenses incurred from locating the proposed facility in a certain area. The utilities also offer to help pay for related infrastructure items necessary to accommodate the new facility. Such arrangements were made for the proposed Gorleben facility between the federal government and the state as well as between DWK and the state.

A creative approach used by the Prime Minister of Lower Saxony to help air both the pro and anti feelings on the Gorleben project, was the provision of a hearing over and above that required by the Atomic Energy Law. Preparations for the hearing began in 1978 when the local antinuclear Burger-Initiatives had the opportunity to nominate nationally and internationally-known nuclear critics, and the PTB and DWK had the same opportunity to nominate countercritics. The "Gorleben Hearings" held from March 28 to April 3, 1979, received extensive media coverage, and were recognized as a politically and scientifically prestigious event providing rigorously controlled equal time to both sides throughout the week. Although not legally binding, the hearing established the basis for the Lower Saxony Prime Minister's conclusion that the complete center originally planned for Gorleben was politically infeasible.

Another political ploy used by the Prime Minister of Lower Saxony was to pass along the AFR siting decision to others. By transferring the decision to the local authorities, he effectively avoided the issue and at the same time bolstered his public image by showing appropriate sensitivity to the concerns of the local citizens.

In their search for an AFR design solution that would satisfy the very stiff Federal Republic of Germany safety criteria, the German utilities have, at the same time, come up with a unique approach to dealing with the AFR siting problem. A portable, virtually indestructable combination spent fuel transportation and storage device (CASTOR) which was developed and is now being licensed. Spent fuel stored in the CASTOR units would meet all safety requirements and would give relief to congestion in the AR basins, but, as they are kept at the reactor site, the problem of getting local approval for national or regional AFRs is avoided. Although more expensive than storage in multi-hundred ton national AFRs, this approach could be adaptable to countries whose siting problems were great enough to warrant the cost differential.

V. OBSERVATIONS/CONCLUSIONS

Considering the many problems that West Germany has faced in attempting to develop a waste management program, this country has made the most progress and gained invaluable experience in this area that other democracies cannot afford to ignore. In such a highly federated system, the rewards from the great deal of time and effort that have necessarily been expended in obtaining at least probable community acceptance of an AFR and a permanent repository as well as finding a state willing to accept a reprocessing plant may, in the long run, outweigh the frustrations encountered along the way. Since acceptance by a clear-cut majority of those to be impacted is sought, it is likely that such acceptance can be expected to remain firm into the future. Thus, in general, this patient, prudent, and thorough approach could prove to be a key factor in the successful development and implementation of a waste management program.

One of the specific lessons learned from the collapse of the plans for an integrated waste management center concerns the lack of early interaction between the federal, state and local officials. Because the people look primarily to their locally elected officials for guidance on such matters, it is imperative that these officials have a sufficient knowledge of the project to be able to understand and explain the need for it and counteract some of the more sensational news items picked up by the media. In addition, such interaction could provide the federal government valuable insight regarding the sociopolitical climate of the region so that the project can be better tailored to fit the needs and interests of the region. Consideration of these factors has led to the establishment of joint federal/state committees as well as federal/state/local communities to develop future waste management plans.

Finally, it becomes obvious that formal federal government preemptive authority is meaningless if it cannot be used. Instead,

as witnessed in the plight of West Germany, it is the practical politics of who has the courage to make a decision, coupled with the political support i.e., the confidence of the people and their elected representatives to make the decision hold. Public education programs and economic incentives can enhance the acceptability of a project, but without a basic trust in the present leadership, these measures alone are unlikely to produce the desired results.

VI. SYSTEM FOR OBTAINING ACCEPTANCE OF WASTE MANAGEMENT TECHNOLOGIES AND PRACTICES

Formal System

All waste facilities must be licensed under the Atomic Energy Law, thus, technologies and practices are subject to the approval of the licensing authorities in the Federal Ministry of Interior. Furthermore, the criteria established by the Reactor Safety Committee (RSK) and Radiation Protection Committee (SSK) must be considered. These two committees are the primary bodies within the Federal Ministry of Interior determining the technical acceptability of a project and making recommendations to the state licensing authority.

Technical criteria for repositories are established by the PTB. They examine the properties necessary to accommodate the HLW and evaluate accident scenarios, such as flooding of the repository mine. The PTB advises DWK in its development of a waste form technology, and will determine whether a particular waste form is acceptable. Thus, the PTB handles the standards and the regulatory requirements for waste management similar to the U.S. NRC. PTB also evaluates the technical criteria for AFRs.

At the state level, the state licensing authority commissions independent experts -- either nationally or internationally recognized scientists -- to assess the technical acceptability of the proposed methods and practices. The applicant or anyone directly effected has the right to challenge the state's decision in the local administrative court. The judge hears both sides of the story and in effect makes a pronouncement which may also be appealed.

Formal System for Routing

Storage casks must also be licensed under the Atomic Energy Law and are therefore subject to the supervisory authority of the Minister of Interior. Design criteria are based on IAEA regu-

lations and test standards. The PTB is also involved, because of its role in assuring that transport practices are completely safe. There has been no great division of opinion amongst the authorities regarding the technologies and practices in radioactive waste transport.

In general, two types of conflicts have resulted from this system for obtaining agreement on technologies and practices. The first involves the resolution of conflicts at the federal level over the choice of various competing waste form technologies developed by the prestigious laboratories in West Germany. The second involves the disagreements between federal and state authorities on the acceptability of certain technologies or practices. The former conflict has been resolved; however, the latter still menaces the decision-making process.

The uncompromising situation that existed between the various laboratories over selection of a waste form technology was inadvertently resolved by the enactment of West Germany's stipulation law. The federal government, urgently needing a "proven" technology for waste disposal, turned the matter over to DWK, who worked out the arrangements with the French to contract the AVM method. In spite of this, the Germans still desired continued development of their own national waste form. As a result, the competing forces were united in a common cause under the sponsorship of DWK. Thus, in assigning such responsibilities to a company rather than a government agency, the political pressure involved in government decision-making is relieved and a "proven" German waste form may end up being substituted for that of the French, at least in West Germany.

The basic system providing for technical review at both the state and federal levels is a good means of ensuring that a comprehensive assessment of a new technology or practice occurs. Unfortunately, the procedure for resolving a challenge, giving the

final decision-making authority to the courts, could be an invitation to serious problems. Although the court reviews all licensing documents and hears the opinion of independent experts, it is unlikely that he has the technical knowledge necessary to evaluate such information.

FRANCE

FRANCE

I. PROGRESS/STATUS REGARDING WASTE MANAGEMENT DECISION-MAKING

In spite of the events that have disrupted many nuclear power programs throughout the rest of the world, France's commitment to nuclear power remains undaunted. In fact, the program was accelerated in April, and again in November 1979, and plans for 1985 are to produce approximately 55 percent of France's electricity from nuclear power. There are currently 16 operating reactors producing about 19 percent of France's electricity, and another 32 under construction.

In addition to this ambitious reactor program, France is developing a strong reprocessing capability. The UP-1 plant, using the PUREX technology, started operating in Marcoule in 1958, for military purposes and was subsequently modified for civil graphite gas reactors during the 1960's. A second plant, UP-2, started operation at Cap de La Hague in 1967 for civil graphite gas reactors and then in the 1970's was modified to reprocess a capacity of about 400 tons/year of LWR spent fuel. Current plans include doubling the capacity of UP-2 to 800 tons/year by 1984 and the construction of two additional units (UP-3 A and B) of 800 tons/year capacity each -- one for French LWR spent fuel, the other initially for foreign fuels. Cogema, the operator of these reprocessing facilities, has negotiated a series of long-term contracts with several foreign governments to reprocess about 6,000 MTU of spent fuel. These foreign contracts are to provide much of the capital needed to expand the La Hague facilities. They also give Cogema the option to return the HLW to the respective countries.

The national waste management strategy for HLW in France begins with temporary, at reactor storage. No AFR storage is planned as HLW goes from AR storage directly to the reprocessing facility

where it is stored until reprocessed. After it is reprocessed, the HLW in liquid form is placed in shallow underground stainless steel tanks. Although plans are to solidify this waste as soon as possible after reprocessing, this type of confinement is considered safe for about 50 years.

The process for solidifying HLW on a production basis is a unique contribution of France to the field of waste management. The Atelier de Vitrifaction de Marcoule (AVM) has been operating successfully as a prototype since 1978, immobilizing HLW into borosilicate glass which is incorporated into stainless steel cylinders and stored at sub-surface level. Forced air cooling is used for the first few years until the material is cool enough to allow free convection cooling. Utilization of this surface storage could extend indefinitely, although research is underway on geological disposal.

LLW is stored initially where created, then sent to national centers where it is conditioned, and finally stored at the 12 hectare, open air Centre de Stockage de la Manche (CSM) in La Hague. The Agence Nationale Pour le Gestion des Dechets (ANDRA) oversees the management of the facility, while inspectors from industry and health ministries ensure that regulations and technical specifications are observed at the La Hague center.

Conditioning of LLW consists of volume reduction by evaporation, incineration and calcination. The process for immobilizing LLW in a chemically hardened resin (resine thermodurcissable) was developed by CEA research organizations in Grenoble and has been commercialized by the Society Ecopol now operating a plant at Chooz in Belgium. After the waste is conditioned, it is put into a block of cement, and most of it is stored at CSM in La Hague. Elements with longer half lives are surrounded by cement, but the majority are surrounded by clay.

At the present rate of stocks build-up, it is expected that the La Hague Center will be filled by 1985. ANDRA has initiated licensing procedures for a new center, CS-2, at Saint Priest de la Prugne, an abandoned uranium mine in central France. The public inquiry process necessary for such installations (see Section II, "Public Hearing Process" for description) has commenced and has attracted considerable opposition from the local inhabitants, the proposed site being in the French mineral water country -- as in Perrier. Efforts of the various prefets involved to educate the local mayors (les elus) on this subject were ineffective as these officials yielded to public pressure not to participate in such activities. For this reason, the official registers for public comment which are normally posted in the mayors' offices, were posted in the three neighboring prefectures and under-prefectures.

Transportation of radioactive materials within France has caused little concern. Shipments to La Hague from Japan, however, have been opposed by the organization Greenpeace, which in spite of a court order, attempted to block the unloading of the cargo at the Cherbourg harbor. The attempt was unsuccessful, the leaders arrested, and they will be summoned before a Maritime Court of Inquiry.

II. POLITICAL STRUCTURE AND ENVIRONMENT FOR WASTE MANAGEMENT DECISION-MAKING

Parliamentary Position

President Valery Giscard D' Estaing and Prime Minister Raymond Barre both strongly support the use of nuclear power. The ruling 2-party right-wing coalition also favors the nuclear power program. Of the two major opposition parties, the Communists support the use of nuclear power; however, the Socialists are divided on the issue. During the 1978 elections, under the leadership of Francois Mitterrand, the Socialists questioned the need for breeder reactors and called for a moratorium on construction of new plants, but the party was split and lost seats in Parliament. Antinuclear ecologists parties have had little, if any, influence on the national elections.

Preemption

The central government has preemption rights in siting decisions and has used this power in Normandy and Alsace as well as at the Creys-Malville site for the Superphenix, where local municipalities opposed the siting of nuclear power plants.

Local Officials

France is divided into 22 economic regions or provinces, which are further broken down into 95 localities or departments. At each of these levels, there is a Prefet who is appointed by the central government. The communes or towns elect town councils which then appoint a mayor.

Stipulation Law

There is no stipulation law in France.

Land Use Veto

There is a land use veto, but it can be overruled by the central government.

Referendum System

There is a national referendum system, but it has not been used for nuclear power. As a matter of interest, there have been local referenda on nuclear power which are not legally binding on the central government, and have not had a significant impact on national policy. Government officials report that only in one local referendum was a nuclear facility rejected, and in this case a compromise enabled the project to be continued as planned.

Public Hearing Process

Public hearings are not a part of the formal system for siting nuclear facilities or any industrial facility. There is, however, a formal public inquiry process allowing the local community to examine the detailed dossier of a project, ask questions and express opinions on it, but not to refuse the project.

National Waste Management Company

The Compagnie Generale des Matieres Nucleaires (Cogema) is the commercial fuel supply arm of the Commissariat a' l' Energie Atomique (CEA). Among its various responsibilities, Cogema acts as proprietor and operator of all reprocessing and HLW immobilization facilities and is therefore responsible for storage of HLW at La Hague and Marcoule.

Long-term waste management is the responsibility of the Agence Nationale Pour le Gestion des Dechets Radioactifs (ANDRA), under the CEA. ANDRA recently replaced the Office de Gestion des Dechets, also under the jurisdiction of CEA. ANDRA is responsible for the management aspects of waste storage; ensuring that the most up-to-date waste management techniques are used and that the producers are involved in waste management activities. Specifically, ANDRA is charged with the management of storage sites (which it may delegate to a third party), conducting studies, research, and obtaining new sites, obtaining regulatory authorizations, and coordinating the provisions for the conditioning of wastes.

III. FORMAL SYSTEM FOR OBTAINING LOCAL ACCEPTANCE ON SITING AND ROUTING FOR NUCLEAR WASTE ACTIVITIES

Formal System for Siting

Applications for construction of nuclear facilities are submitted to the Minister of Industry who is responsible for determining that the document is complete and then distributing the application to all concerned ministries at the national level. The Minister of Industry also gives the application to the Prefet of the department in which the facility is to be located. The Prefet, a central government appointee, is thus the central figure at the local level.

Proceedings at the local level begin with the Prefet's appointment of a Commission of Inquiry (Commission d' Enquete) to interact with the public. This Commission usually consists of three persons, but may be more or less as long as there are an odd number of people. The Commission is responsible for notification of the public inquiry (l'enquete locale) in newspaper announcements, official public notices, etc. The public inquiry is a process whereby all interested parties can examine the project application and record their observations, comments, and questions in an official register. They cannot, however, refuse the project. The Commission of Inquiry, after responding to all comments and questions, attaches the official register to the project application. The Commission then returns the entire application to the Prefet and advises him on the project. The Prefet reviews the material and submits it along with his opinion to the Ministry of Industry.

At the national level, a technical study is made on behalf of the Minister of Industry, by the specialized branches of the CEA. The Minister of Industry then forwards the file to the Inter-ministerial Committee for nuclear installations and then the Minister of Public Health. The Minister of Public Health must submit a favorable opinion if the project is to be authorized.

Otherwise, the project must be altered or abandoned. Upon approval, the Minister of Industry and the Prime Minister, having reviewed the comments of all parties involved, sign a decree authorizing the installation. The authorization defines the periphery and the characteristics of the installation, as well as the special provisions with which the operator will have to comply (e.g., safety, security, environment) in order to operate the facility.

Formal System for Routing

To obtain authorization on transportation routes, the shipper must submit an application to the Minister of Transport. Information regarding the safety of the transport mechanisms, the time of transport, descriptions of the contents, loading and unloading procedures, and measures to be taken in case of an accident must be included in the application. The Minister of Transport considers the various regulations involved for each particular mode of transportation. If the Minister of Transport is satisfied that all regulations are met and approves the application, the shipper must then notify the National Service of Civil Protection at least three days prior to the shipment so that any necessary precautionary measures may be initiated. Under certain circumstances, (e.g., if the vehicle follows a predetermined route approved by previous requests) transport by road or rail carried out by or on behalf of the CEA is exempted from the procedure of notification with the National Service of Civil Protection. In this case, the Minister of Transport approves the shipment after consulting with the National Service. The formal system for transportation routes does not provide for public intervention.

IV. APPROACHES USED (INFORMAL SYSTEM) IN SUPPORT OF AND/OR IN ADDITION TO FORMAL SYSTEM

The French government sponsors several education programs emphasizing the need and safety of nuclear power. For example, the Commission for Information on Nuclear Power in France was established in 1978. Its publication, "Energie Nucleaire" is widely distributed amongst the general public and throughout the school systems. Within the CEA, under the direction of the Institut de Protection et de Surete Nucleaire (IPSN) is the Center of Documentation on Nuclear Safety (CDSN). This library located at the CEA's Centre d'Etudes Nucleaires de Fontenay-aux-Roses is open to the public and provides specialists from the IPSN to help answer additional questions.

In addition to the above organizations, the government utilizes the media to explain the need for and safety features of nuclear energy. For example, the nationalized television broadcasting system conducted a 3-week daily question-and-answer TV program in which government and industry officials responded to the public's questions. President d'Estaing also appeared on nationwide radio in January to explain why nuclear energy is crucial to the nation's energy needs. As efforts to discredit the nuclear program have been stepped up, particularly by the trade union, Confederation Francaise Democratique du Travail (CFDT), the government has used the media for explaining nuclear mishaps and reassuring the public, thus counteracting some of the more sensational reports found elsewhere.

France also makes use of economic incentives. Besides the tax advantages accrued from hosting any industrial facility, the government has recently initiated a program whereby communities within a 5-mile radius of a nuclear facility will pay up to 15 percent less on electricity bills. It is still too early to judge the effectiveness of this overt measure, and it is not yet clear how

this will apply to waste storage facilities. Similarly, the government has also provided financial support for infrastructure facilities such as roads, schools, etc. needed by communities accepting nuclear facilities; however, it is not yet known whether such incentives will be provided for permanent storage facilities.

V. OBSERVATIONS/CONCLUSIONS

Contributing to the success of the overall nuclear program, including waste management policies and plans, are many factors which are inherent in the French system itself. Indeed, the fact that waste disposal has not become a highly controversial issue in France as compared to the situation in many other countries, suggests that to date, waste management practices and approaches associated with this system have been highly compatible with the needs and interests of the majority of French people. In spite of the rather unique circumstances that comprise and dictate the French system, it is possible to characterize certain aspects which, by contrast, illuminate some of the constraints inherent in our own system. It is also beneficial to recognize that France, in addition to having the most favorable political system for handling nuclear matters, is not averse to using whatever informal approaches are needed to supplement and/or support the existing system.

Perhaps the most striking aspect of the French system is the degree of control enjoyed by the central government. The Prefets, by virtue of their appointed status, serve as agents of the central government. The strong position of the central government is thus sustained at the local level since the first two levels of local government are appointed by the central government and do not have to stand for elections.

The government's administrative apparatus is further bolstered by the role of the CEA. Although responsible for all civil and military nuclear activities, the CEA is sometimes equated to the former U.S. Atomic Energy Commission in that it is a highly centralized organization supervising the bulk of nuclear-related activities. In addition, there is only one nationalized electricity supplier, EDF responsible for the construction and operation of nuclear power plants, and one manufacturer for PWR nuclear equipment, Framat , with which the CEA deals. By concentrating authority for nuclear

activity into a few large organizations, all under the control of the central government, a working environment exists in which conflicts are minimized and decision-making is facilitated. The predictable nature of the licensing process and the constancy of France's pro-nuclear position throughout the central government appear to have contributed greatly to the success of this organizational framework.

Moreover, the government's strong promotional and educational activities, have caused the majority of the French people to understand the need for nuclear power. The advancement by France of their nuclear technology constitutes a source of pride as France is rapidly surpassing many of her competitors in the nuclear arena. France is also overtly utilizing economic incentives, however, it is too early to judge the overall effectiveness of these measures.

In spite of the above, a final observation concerning the efficacy of the French system needs to be addressed. Although France has been extremely successful in the development and deployment of such waste management activities as reprocessing and waste immobilization, the most formidable obstacle in the realization of any waste management program -- obtaining concurrence for siting of a permanent HLW repository -- has not yet been attempted. In this regard, the French system for managing their nuclear wastes has not been fully tested and thus its overall effectiveness and applicability in formulating U.S. policy is questionable. On the other hand, if taken in the context that the level of sensitivity revolving around this issue is currently at a peak and is likely to subside over time, then in the future, this French approach of purposely delaying the pushing of a detailed (site specific) plan for a permanent disposal facility may in the end be viewed enviously as the most prudent and successful of all.

VI. SYSTEM FOR OBTAINING ACCEPTANCE OF WASTE MANAGEMENT TECHNOLOGIES AND PRACTICES

The CEA develops standards for operation based on R&D performed in its own research centers, universities, and other institutions. The primary regulatory body, the Service Central de Surete des Installations Nucleaires (SCSIN) supervised by the Ministry of Industry, as well as the Institute de Protection et de Surete Nucleaire (IPSN) of the CEA, and the Service Central de Protection contre les Rayonnements Ionisants (SCPRI) within the Ministry of Health and Labor, develop and assure adherence to necessary design criteria, safety regulations etc. These bodies give advice and make recommendations on new technologies to the CEA's Haut Commissaire who then presents the information to the Comite Interministeriel de la Securite. This Comite Interministeriel, composed of the top officials from various concerned government agencies as well as top officials from the CEA and EDF, is chaired by the Prime Minister of France. The Comite Interministeriel considers the recommendations of the government/industry consultative committee, the PEON Committee, as to the size and scope of the nuclear program needed and therefore, the need for related technologies. The President endorses or rejects a new or different technology, based on the decisions and recommendations of the aforementioned groups.

Technologies and practices regarding transport containers must conform to "Cogema Cask Acceptance Criteria" which are based upon the IAEA standards for design, construction and testing. The supervisory authority is vested in the Minister of Transport who consults with the aforementioned regulatory bodies in determining the technical acceptability of transport equipment.

Conclusion

This highly centralized decision-making system, consisting of powerful government officials, has become a rather cohesive unit

capable of making definitive commitments and achieving established goals. Within this exclusive circle, there are enough resources that virtually no outside assistance is needed, thus technical challenges are rare. Consideration of peripheral viewpoints is therefore not a hindrance in the upper echelons, and there is no provision for extended public debates on new technologies and practices.

Regarding the permanent storage of wastes, French officials are so confident in the success of their current waste management practices that they perceive no urgent need to forge ahead and prematurely commit themselves to the details of a final repository. Instead, the foundations are being established for the future generations who could be better equipped to deal with the problem. Thus, the problem of specifying one ultimate repository technology over another is, for the time being, avoided.

JAPAN

JAPAN

I. PROGRESS/STATUS REGARDING WASTE MANAGEMENT DECISION-MAKING

Japan is the third largest consumer of energy in the world and, because of its 90% dependence on imported fuel, has embarked on one of the world's largest nuclear power programs. Japan has the second largest installed nuclear MWe in the world (after the U.S.) and plans to double it to 30,000 MWe by 1985. Japan is currently developing all segments of the nuclear fuel cycle, including a reprocessing capability.

Current Japanese spent fuel management policy is to reprocess discharged spent fuel as soon as practicable. Reprocessing contracts are active with BNFL and Cogema and a small (210 MTU) demonstration reprocessing plant is in operation at Tokai Mura. An 1,100 MTU commercial plant under private ownership is planned for the early 1990's.

Japan has no present plans to construct an in-Japan AFR, utilizing instead short-term pre-shipment storage at its reactors. It is examining, however, possibilities for participating in a Pacific basin spent fuel storage study.

During the 1980's, Japan intends to continue utilization of BNFL and Cogema. Under these arrangements, Japan must accept the return of recovered uranium and plutonium as well as the solidified waste. The reprocessing contracts with Europe may generate the return to Japan of 3,000 canisters (150-litre) of vitrified HLW and 20,000 asphalt drums (200-litre) of LLW. Study on the handling and storage of these returned wastes started only last year.

Japan and BNFL are engaged in joint venture to build a six-vessel fleet for carrying irradiated spent fuel from Japanese reactors to

British and French reprocessing plants. Under the terms of the contract, Pacific Nuclear Transport Ltd. will transport 1,600 tonnes of spent fuel to the European reprocessing plants over a nine-year period starting in 1982, in addition to the spent fuel already being handled. So far, over 200 tonnes have been transported to Europe from Japan since 1976.

Transportation issues have been the focus for most of the problems involving public acceptance of waste management matters in Japan. The main protestants have been fishermen who claim potential economic injury (see Section III).

To date, Japan has only formulated the basic principles for a comprehensive nuclear waste management program. The details regarding waste management technology and implementation of the program have yet to be decided. Japan's policy of shipping spent fuel to Europe for reprocessing has gained her additional time for waste management R&D, and possibly even more importantly, time for developing an approach dealing with problems of siting.

In October 1976, the Japan Atomic Energy Commission (JAEC) announced its basic policy on radioactive waste. According to this policy, LLW is to be stored on land or underground at plant sites or dumped in the ocean. LLW is presently stored at plant sites in warehouses and underground trenches after significant volume reduction and cement solidification.

After the JAEC announcement, the nuclear industries established the Nuclear Environment Coordinating Center as the organization for research on waste disposal and isolation under guidance of the government. Their main purpose is the development of an optimum radioactive waste management system with research and investigation centering on LLW and related environmental preservation. This R&D would include assessments of sea dumping and land isolation. The Center's assessment of sea dumping and land isolation will be done on a contract basis.

Japan's intention to evaluate the feasibility of ocean dumping prior to land isolation is because Japan does not permit the land burial of radioactive wastes at the present time. The sea dumping program is divided into two phases; the first phase is a two-year dumping experiment, and if that experiment is successful and acceptable the second would concentrate on routine operations.

The experimental program will commence in 1981 and will be jointly managed by the Nuclear Environment Coordination Center and the government Science and Technology Agency (STA). Simulation tests are being done by the Japan Atomic Energy Research Institute (JAERI) subjecting waste to simulated pressures of 5000m. depth. The test program involves sinking 10,000 drums containing about 500 curies of LLW. Before the experiments can begin, the Japanese Diet must ratify the London Ocean Dumping Treaty which Japan signed in 1973.

HLW disposal, though recognized as a very important issue, is only in the stage of discussion of general principles, with detailed plans and implementation to be decided after demonstration tests. HLW is considered a government responsibility with the JAERI and the Power Reactor and Nuclear Fuel Development Corporation (PNC) designated by the JAEC to promote and accelerate R&D.

In Japan, the basic concept for HLW disposal is as follows:

- storage of liquid wastes
- solidification of the waste solution
- engineered storage of solids
- long-term surface storage followed by permanent disposal

It is planned that high level liquid wastes from reprocessing operations are to be stored at the reprocessing plant in stainless steel tanks for about five years. Regarding solidification, the Japanese R&D activities include waste immobilization demonstration facility scheduled for 1986. Presently, the examination of alternate technologies is being undertaken by PNC and JAERI.

Additionally, PNC is developing technology and techniques for storage of solidified HLW. It is generally expected that returned HLW will be stored temporarily by the Japan Nuclear Fuel Service Co. (a private consortium) or at the second reprocessing plant. Under the guidelines of the JAEC, the Japanese reprocessor will be responsible for carrying out both treatment and engineered storage (but not for the ultimate disposal) of HLW based upon techniques verified by PNC and JAERI.

The government plans that it will be in charge of the long-term isolation and disposal of solidified HLW. The current emphasis is on geologic storage with additional research being undertaken for storage on or under the seabed. The specific principles regarding geologic disposal will be decided within 3-5 years and a demonstration test is targeted to begin around 1985.

The government Science and Technology Agency (STA) is sponsoring an extensive program to develop geologic disposal sites. PNC has begun the research for possible sites and JAERI is conducting safety studies. A preliminary study by Mitsubishi Metals, issued in 1977, identified crystalline rock formations as an attractive possibility. Fifteen sites are being evaluated for possible use. These are either at nuclear laboratories or nuclear power plant sites. There is presently no significant geologic exploration drilling underway.

The search for suitable geologic sites is particularly crucial in Japan given its narrow configuration, high population density, and the relatively brief length of time before the arrival of wastes from overseas. The latter point is salient because the final choice on waste form must be matched with an appropriate geology. There is, therefore, considerable interest in the geologic disposal programs of other countries, seabed disposal and the remote island disposal concept.

II. POLITICAL STRUCTURE AND ENVIRONMENT FOR WASTE MANAGEMENT DECISION-MAKING

Parliamentary Position

The Liberal Democrat party, which has governed Japan for thirty years, recently retained their majority in elections following a stunning no-confidence vote. Despite the current crises, four of the five parliamentary parties are pro-nuclear, though they differ somewhat in emphasis. Nuclear matters have not been important electoral issues. It is to be expected that the new Prime Minister will reflect the pro-nuclear position of the majority of the diet.

Preemption

Under Japanese law, as in most other countries, the central government may override a local veto on siting. In practice, however, the Japanese prefer accomodation and concurrence to the exercizing of pre-emptive powers.

Local Officials

Local governors, mayors, village chiefs and councilmen are all elected officials.

Stipulation Law

With the license application, the reactor owner (utility) must prove that it has specified means to have the spent fuel re-processed -- in Japan or abroad. The government also requires that the applicant specify how the extracted plutonium will be used.

Importantly, there are no legal requirements linking the final disposition of waste to reactor licensing.

Land Use Veto

Although land ownership is well protected, there are provisions for eminent domain. This law is scarcely invoked, however, since

the Japanese have a tradition of amicable resolution of such difficulties which often involve financial settlements.

Referendum System

There is no legal basis for referenda nor have any referenda been carried out in Japan.

Public Hearing Process

There is no requirement for or history of public hearings regarding any aspect of nuclear waste management. Since January 1979, public hearings have, however, become a part of the legal requirements for nuclear plant siting. There are hearings related to environmental/safety matters as well as hearings regarding local interests. These hearings are utilized as a forum for local approval although an issue has not been made as to whether the hearings are binding or not.

National Waste Management Company

There is presently no national waste management company although the formation of a private corporation for this purpose is under consideration.

III. FORMAL SYSTEM FOR OBTAINING LOCAL ACCEPTANCE ON SITING AND ROUTING FOR NUCLEAR WASTE ACTIVITIES

Formal System for Siting

There are no designated land storage facilities (other than at-reactor basins) within Japan, and the Japanese public approvals system for waste management siting and routing decisions is presently undecided. It is envisioned, however, that such an approvals process would be similar to the system utilized for the siting of nuclear power plants. Even this latter process is a relatively new one, established in January 1979, and not yet fully formalized in terms of its practice and application.

Prior to nuclear plant construction there are two public hearings. The first requires the utility or utilities to brief local residents about the proposed project. These hearings are informative in character and may even be quite informal, held with various groups, perhaps even in citizen's homes. The second hearing is more formalized, focusing on environmental and safety issues. It is conducted by the Nuclear Safety Commission (NSC) and requires the utility to apprise the public of the safety issues at hand.

Experience so far indicates that these hearings are a forum for local approval, solicitation of opinion, and "selling" of the planned project although no voting actually takes place. Criticisms have been made as to the pro-nuclear character of these hearings despite the fact that the Nuclear Safety Commission is considered neutral. Final decisions regarding sites are made by STA for fuel cycle facilities, MITI for power reactors, and the NSC for both.

Formal System for Routing

The approval of routes for radioactive waste transportation is made at the national level with little input from localities. Public opposition to overland transport of radioactive material is

minimal. No waste has been transported within Japan except for wastes from hospitals, research facilities, and reactors whose properties were adjacent to one another and did not require public roads.

The cognizant authorities with whom the transporter must deal are the Ministry of Transport (MOT), who deals with mode of transport; the STA, who is responsible for waste packaging; the prefectural public safety commission, who oversees regional police activities and is responsible for directions on routing and dates.

Public consent is not required for transportation of wastes but there are formal and informal practices which allow for some public input. The transporter and utility notify the local police authorities and they, in turn, contact the government of the prefect. The governor wields considerable power and can influence in either direction the outcome of the transport license application. In practice, any administrative decisions of the central government are almost always accommodated. The applicant briefs the prefectural government and any local officials through which the cargo will pass. Very often prefectural or city representatives attend the departure and arrival of the cargo.

Local leaders may also submit their opinions on the proposed route to the MOT who can accept or reject any modifications. Conversely, the MOT can, if it wishes, informally solicit prefectural or other local opinion.

IV. APPROACHES USED (INFORMAL SYSTEM) IN SUPPORT OF AND/OR IN ADDITION TO FORMAL SYSTEM

Despite Japan's narrow size, her dependence on the sea and a high degree of sensitivity towards nuclear power due to the Hiroshima-Nagasaki bombings, Japan has built the second largest installed nuclear capacity in the world. Japan has managed to accomplish this without a massive public information campaign or the exercise of its pre-emptive powers over land use. Instead, the government and the electric utilities have made liberal use of a generous system of subsidies and direct compensation.

Traditionally, nuclear facilities have had problems with fishermen for both facility siting and agreement to spent fuel transporting ships entering or leaving ports. This opposition is understood as having basically economic motivations such as the potential reduction of fish catches or loss of markets due to fear of radioactive contamination.

There is a well established right to anticipatory compensation i.e., money paid prior to evidence of damage for potential and undefined problems. These problems are not limited to nuclear sites, and many industrial facilities along the coasts have had the same experience.

Siting and sea transport issues have been resolved through an elaborate payments scheme to localities and fishing co-operatives. Localities receive an automatic subsidy from MITI generated as a result of a tax on the utilities for electrical generation in the case of power plants. A fraction of this subsidy is allocated to improve local roads, schools, town halls, and public projects. Additional funds are disbursed to surrounding villages near the nuclear facility. The utilities also routinely pay multi-million dollar sums directly to fishing co-operatives as compensation in

both siting and transportation matters. The extent of these payments can be considerable; in one case, compensation amounted to 10% of the entire plant construction costs.

Often additional "donations" are made to local treasuries and sometimes even to the mayors themselves. MITI officials make the distinction between the subsidy fund they administer and the compensatory payments that the utilities pay to the fishermen. In practice, however, the two are negotiated together by MITI and the power companies.

Additionally, nuclear facilities are usually built in remote, under-developed, coastal locations. Their presence usually results in increased employment, improved transportation and more money available from taxes on industry and utility donations. So far, local reactions have been quite favorable.

In transportation matters, other approaches have been used in addition to those described above. All but one of the nuclear power plants in Japan are located by the sea and have their own port loading/unloading capabilities. Since practically all spent fuel is transported by sea from dedicated port to dedicated port, (thereby minimizing the use of highways) the transport does not attract much public attention.

V. OBSERVATIONS/CONCLUSIONS

Attaining local acceptance for siting and routing is especially important in Japan. Like most democracies, the central government is also unwilling to use its preemptive power to force a siting or routing decision against the will of the local people. Additionally, Japan does not seem to need outsiders (e.g., Greenpeace) to get their locals aroused, and when they are they can be more violent -- as in the case of the new airport -- than in most Western democracies. Also the Japanese, possibly because of their crowded conditions, have some unique environmental laws, such as rights to sunshine and preservation of view, which give locals wide latitude for objection. On the other hand, reaching accommodation with the locals appears to be more feasible than in many countries. The people (as a whole) are inclined to be more flexible, pragmatic, and conformist than in most Western democracies.

The Japanese strategy has been to couple remote siting of nuclear facilities on the coasts with substantial compensatory payments, the latter being deeply rooted in Japanese tradition. This strategy has facilitated public acceptance of nuclear siting and transportation matters, and although Japan has not yet had to deal with local acceptance of a permanent repository, or even an AFR, the relative smoothness with which the remote, on-the-coast, well-compensated-for approach has worked so far would seem to indicate it could also work for the waste management siting problems of the future.

Though the local siting problem is an important one, it is interesting that there has not been a concerted Government effort at public education. Existing public information functions have been assumed by the nuclear industry and they provide films, texts, and conduct public relations campaigns where appropriate.

The possible need for a comprehensive public information program could be seen in the results of a public poll taken by the Asahi Shimbun in 1979. The 10 most prevalent factors listed by those concerned about nuclear power, in order of importance, were:

- inability to see its economic advantages or other merits;
- worry over the risks in relation to the benefits;
- disruption of the economic and social orders;
- local community feels left out of the decision-making process and therefore...
- feels that consensus has neither been sought for nor reached;
- there is a lag in the development of safety technology;
- it is difficult to understand nuclear technology;
- there are no channels for supplying information that the public wants;
- hasty development and empty promise;
- no common agreement through the discussion with the public.

As can be seen from this survey, the Japanese public is concerned less with the safety aspects of nuclear power than with the way the government and other authorities handle the preliminaries of the project. It appears that several of the problems identified above could be resolved by an improved educational program, by more effective and relevant information at the public hearings stage, and by developing more of a sense of participation on the part of the public.

In Japan, reprocessing and radioactive waste are not major political issues even among nuclear opponents. This is due, in part, to the low profile accorded transportation matters and to minimal public awareness about waste management R&D. A major waste management event which could have generated public concern was the start-up of the Tokai Mura reprocessing plant. This, however, became a matter of national pride in the fact that Japan could successfully start the plant.

The delicacy of the siting issue and the success of strategies employed by Japan will be evident in the siting of the second planned reprocessing plant: While the exact location is not yet (publically) known, there is speculation that the private consortium will obtain land on a sparsely populated island between Kyushu and Okinawa. The survey of candidate sites and procurement of the required land is anticipated to take at least three years.

VI. SYSTEM FOR OBTAINING ACCEPTANCE OF WASTE MANAGEMENT TECHNOLOGIES AND PRACTICES

Three major government agencies are responsible for establishing criteria for waste and transportation technology and practices: Nuclear Safety Commission (NSC), the Ministry of Transportation (MOT), and the Science and Technology Agency (STA).

The Nuclear Safety Commission was formed in 1979 to supplant the JAEC in the following areas:

- regulation of the safe use of atomic energy;
- safety aspects of nuclear fuel and reactors;
- protection against hazards occurring from the use of atomic energy;
- protection against hazards of radioactive fallout;
- any other matters of importance in the regulation of the safe use of atomic energy.

The Commission consists of five members who are appointed by the Prime Minister with the consent of both houses of the Diet.

Transport

Japan follows IAEA criteria for the transport of nuclear waste. Criteria for waste transportation are formulated by three committees. The STA works in close contact with the Special Committee on Safe Transportation of Radioactive Material which is under the NSC. MOT has a Special Council on Transportation of Radioactive Material. STA concentrates on safeguards; MOT on packaging and mode of transport; NSC on overall safety. Since most of the membership overlap in the three committees, there is in fact little disagreement on views, regarding the criteria.

These committees are responsible for all procedural and safety aspects of transportation. Certain bureaus within these agencies

may handle specialized aspects of the transport, i.e., the Marine Inspection and Certification Association for safety of sea transport. The STA confirms the actual transportation and also licenses the spent fuel casks every three years.

Waste Form

There has been no formal decision made on waste form yet, though there is a consensus on the acceptability of borosilicate glass. It is the government's view that this is a subject for private negotiation between the various national companies involved namely, BNFL, Cogema, and the Japan Nuclear Fuel Service Company. The final decision will be made in consultation with the STA and NSC.

Geology

No formal organizational structure exists for the establishment of practices and criteria related to the selection of geological media. It is presently thought that the NSC will be instrumental in the ultimate selection of the medium and for related environmental analysis. The NSC will also draw heavily on the expertise of government research laboratories, the Geological Service, the Natural Disease Prevention Center and the Japan Civil Engineering Laboratory.

Waste Practices

Criteria for waste disposal are considered by the Experts Committee on Technical Safety of Radioactive Waste, which is under the NSC and the Experts Committee on Radioactive Waste under the JAEC.

Ratification of the London Convention and domestic legislation for ocean dumping are now being debated in the National Diet. Its passage will obligate Japan to follow the IAEA guidelines for LLW ocean dumping as well as place her under the NEA surveillance mechanism.

Observations/Conclusions

The organizational structure for radioactive waste management is not yet well developed in Japan. As the program crystallizes, more definitive organizational roles will also evolve. At this time it appears that the Nuclear Safety Commission will play a key regulatory role in the selection of a geologic medium, the establishment of waste form criteria, and the decision on waste form.

SWEDEN

SWEDEN

I. PROGRESS/STATUS REGARDING WASTE MANAGEMENT DECISION-MAKING

As a result of the March referendum, Sweden is now prepared to accept a nuclear power program based on 12 operating reactors which will generate approximately 45-50% of Sweden's electricity by 1990. Presently, there are six operating reactors providing about 25% of Sweden's electricity and another four were scheduled for operation sometime this year although one of them may be delayed. Work on the final two reactors, which up until the referendum was progressing slowly, has been resumed at a normal pace. Thus, some of the uncertainty surrounding Sweden's nuclear power program has been resolved.

In addition to the approval of the 12-reactor program, the referendum results have also been interpreted by the government as an indication of public acceptance of the utilities' proposed waste management programs, KBS-I and KBS-II. These programs, developed in 1977 and 1978, follow the earlier work of the AKA Committee, which was established by the government in December 1972 to investigate the problems related to the disposal of HLW from nuclear power plants. One of the AKA recommendations led to the creation of the National Council for Radioactive Waste Management (PRAV) in 1975, the government agency responsible for coordinating radioactive waste handling, storage, and disposal activities. Other recommendations included the use of glass or ceramic material for HLW solidification, the use of bedrock for final storage of solidified HLW, the creation of a central and intermediate storage facility within Sweden for the storage of spent fuel, and a comprehensive program of research and development including detailed geological studies of sites suitable for the management of spent nuclear fuel and radioactive wastes. Reactions to the AKA's final

report issued in April 1976 were positive for the most part, although many parties warned against a hasty commitment to a particular method for the handling of spent fuel and final storage.

Of particular significance in the evolution of Sweden's waste management program was the September 1976 Parliamentary election in which the Social Democrat party did not receive the majority of the votes for the first time in 44 years. Nuclear power had become a major campaign issue with each party adopting a formal position (Social Democrats -- strongly in favor; Center party -- strongly opposed; Liberals -- supporting a modest program; Conservatives -- strongly in favor; and Communists -- strongly opposed). Therefore, many attributed the Social Democrats' loss of power and the Center party's gain to the nuclear issue. Following this election, the Center party, the Conservative party and Liberal party formed a coalition government headed by Center party leader Thorbjorn Falldin.

Although this coalition collapsed in October 1978 because the parties could not agree upon the degree of curtailment of nuclear power, that government did succeed in passing the Stipulation Act in April 1977, linking the commissioning of nuclear power plants to a demonstration of an "absolutely safe and final" method for disposing of radioactive wastes.

Obligated to develop plans that could meet the requirements of the Stipulation Act, the four Swedish utilities initiated the Nuclear Fuel Safety Project or KBS Study as an independent project within the utility-owned Swedish Nuclear Fuel Supply Company (SKBF). The KBS I Report was issued in December 1977 and circulated for thorough evaluation to 20 Swedish reference bodies and an equal number of foreign persons and organizations. After lengthy deliberation, the Swedish government decided in October 1978 that the report did not satisfy the requirements of the Stipulation Act because it did not determine the existence of a rocky mass with the required properties large enough to host the proposed repository

in Sweden. The decision implied that the basic concept was acceptable, and that the KBS scheme would satisfy the Stipulation Act if an actual area in Sweden with the assumed rock characteristics were found to exist. Thus, a supplementary drilling plan was submitted to the Government early in 1979. In June, this plan was accepted and two reactors (Forsmark I and Ringhals 3) were given permission to operate, pending the outcome of the above-mentioned 1980 nuclear referendum. The power companies also agreed to:

continue the work on the final storage of high-level waste obtained from reprocessing or of unprocessed spent nuclear fuel, either within the company or within a special project group, in order to gather further knowledge concerning the final storage of these types of radioactive material.

In addition to the KBS I Report, reprocessing contracts with Cogema for 620 MTU of spent fuel and with BNFL for 140 MTU of spent fuel were also used as evidence of complying with the Stipulation Law. Although no spent fuel has yet been shipped there, the Swedish State Power Board/Sydkraft contract with Cogema provides for spent fuel to be reprocessed in a new plant at La Hague during the 1980s. This contract gives Cogema the option to return the resultant HLW to Sweden. Now that INFCE is completed, Sweden is negotiating with the United States for permission to proceed per the above agreement with Cogema. Sweden had previously obtained United States approval for reprocessing at BNFL, and as of November 1979, three shipments for a total of 33 tons of spent fuel had been transported to Windscale. Although this earlier contract does not call for return of the HLW to Sweden, future ones will.

In spite of these two contracts, Sweden has not yet made a final decision on continued reprocessing. The KBS II Report completed early in 1978, deals with the alternate approach of final storage of unprocessed spent fuel. This report has been reviewed by various national and international entities and will be used to help the Swedish Government develop and promulgate a definitive strategy for waste management. The decision on whether or not to reprocess spent fuel is expected in the early 1980s. Sweden currently has no plans to build its own reprocessing plant.

In the meantime, since at reactor (pool) storage will be exhausted in about two to three more years, work is now underway on a Central Temporary Storage Facility for Spent Fuel (CLAB). This SKBF facility, located on OKG property, obtained all the necessary licensing approvals by August 1979, but had to await the outcome of the referendum before construction could begin. Utilizing storage pools housed in a cavern to be excavated under approximately 25m of solid bedrock, the CLAB will provide a storage capacity of 3,000 MTU. SKBF feels that it can have one-half of the facility in operation within 55 months (from May 1, 1980) and that the entire plant should be fully operational around 1985.

As presently envisioned, the Swedish permanent HLW disposal plan is based on a multi-barrier concept with each barrier constituting a level of protection against the release and dispersal of radioactive material. Furthermore, each barrier acts to reinforce and complement one another.

The geological barrier called for by the KBS I Report and still under investigation is granite. KBS drilling and measurement activities are continuing at the Sterno and Finnsjo areas and a Swedish-sponsored international R&D program is being conducted in the abandoned Stripa iron ore mine. Experimental drilling activities have so far been done only on government or utility-owned property. Attempts to get permission on privately-owned land have so far been unsuccessful.

Low level and intermediate level wastes (LLW and ILW) are currently being stored at reactor sites either above ground or in shallow caverns below ground. For compaction purposes, LLW is sometimes burned and put in metal containers. ILW is often put in concrete or a bitumen/asphalt substance. Although LLW and ILW are not considered a technical or political problem, they do constitute a volume problem. This has required expanded at reactor storage, and additional research in this area. SKBF's owners decided that studies should be conducted within the KBS project in order to

obtain the information required to design the handling equipment and final waste storage facilities for ILW and LLW. A centrally located facility for ILW and LLW called ALMA is planned. This work began in early 1979 in close cooperation with work being done in this area by the National Council for Radioactive Waste (PRAV).

SKBF is also in the midst of developing a sea transport system as all power reactors as well as the CLAB facility are located along the coast. A special ship is being designed for this purpose and this program is to be completed in 1982. The cognizant government agency is the Swedish Nuclear Inspectorate (SKI) who must approve transport casks and issue transport permits. A limited number of shipments have been made within Sweden by railroad, and to BNFL by commercial vessels not specifically designed for this purpose. IAEA approved casks were supplied by BNFL, although Sweden will eventually purchase their own casks. No major problems have yet been encountered in the transportation of radioactive materials in Sweden.

II. POLITICAL STRUCTURE AND ENVIRONMENT FOR WASTE MANAGEMENT DECISION-MAKING

Parliamentary Position

Sweden's present Prime Minister, Thorbjorn Falldin is opposed to the use of nuclear power. Although obligated by a pledge to support the results of the referendum and thus the 12-reactor program, he and many others have also claimed that as a result of the referendum, all parties agree that nuclear power must eventually be replaced as soon as alternatives are found.

As discussed previously, the non-Social Democrat coalition formed as a result of the 1976 Parliamentary election, again formed the ruling majority after the September 1979 election; however, the Conservative party instead of the Center party is now the largest non-Social Democrat party in the coalition. Moreover, this coalition now has only a one seat advantage over the Social Democrats. The party positions adopted in 1976 still hold, and the disunity that forced this government to resign in 1978 still appears evident.

Preemption

The Swedish government does not have preemptive authority because of the local land use veto. Although Parliament has given some consideration to passing a preemption law similar to those in effect for railroads and government buildings, such a law is not likely to be enacted in the near future.

Local Officials

There are 24 counties in Sweden, each administered by a governor who is appointed by the central government and a council elected by the people. Mayors and town councils are locally elected.

Stipulation Law

According to the Stipulation Law passed in April 1977, no new reactor can be charged with fuel without special permission of the

government. Such permission may be granted only if the reactor owner has fulfilled one of the following two alternatives:

- Produced an agreement which adequately satisfies the requirements for the reprocessing of spent nuclear fuel, and has demonstrated how and where HLW obtained from the reprocessing can be permanently and safely stored;
- Has demonstrated how and where an absolutely safe final storage of spent, unprocessed nuclear fuel can be effected.

Land Use Veto

As representatives of the people, the county council has the right to veto all land use proposals for large industrial complexes with an environment impact.

Referendum System

The referendum system in Sweden serves only to guide Parliament in making decisions. Sweden has used this only three times prior to the recent referendum on nuclear power: on prohibition; driving on the right-hand side of the road; and on a state pension program. The nuclear power referendum of March 23 resulted in a 58%-38% vote for completing the already-planned 12 reactor program.

Public Hearing Process

Sweden has no public hearing process, and a government decision cannot be challenged in the courts. The central government bases its decisions on information obtained from specially-commissioned reports that have been circulated for review and comment amongst the involved government agencies, known experts in the field, and other interested parties.

National Waste Management Company

The Swedish Nuclear Fuel Supply Company (SKBF) was established by four nuclear power utilities to meet the requirements of the Stipulation Act which pertain to the handling and final storage of spent nuclear fuel of high level waste. SKBF is therefore

responsible for such matters as negotiating reprocessing contracts, building and operating the CLAB, as well as making the arrangements for the permanent repository. SKBF is owned 50% by the Swedish State Power Board, 25% by Sydkraft, and 25% by Oskarshamn; however, its chairman is appointed by the central government. It was within this organization that the KBS projects were established to demonstrate how and where HLW or spent fuel could be safely and permanently isolated from the biosphere; however, the work was conducted in consultation and collaboration with other organizations, corporations, and institutions active within the field of radioactive waste handling and/or other technically related fields.

III. FORMAL SYSTEM FOR OBTAINING LOCAL ACCEPTANCE ON SITING AND ROUTING FOR NUCLEAR WASTE ACTIVITIES

Formal System For Siting

The formal licensing procedure requires the applicant, SKBF, to obtain a series of permits according to the various laws related to the siting of commercial facilities and to nuclear facilities in particular. First of all, SKBF must obtain approval from the county administration for a site permit under the Building Act. If the county approves this permit, it is granted by the central government and cannot be challenged by any interested parties. If the county does not approve this permit, in effect vetoing the use of the land, neither SKBF nor the central government have any recourse and the project must be abandoned, postponed, or relocated.

Assuming that the site permit has been obtained, SKBF applies to the Swedish Nuclear Inspectorate (SKI) for a permit under the Nuclear Energy Act. SKI evaluates the safety of the design of the proposed facility ensuring adherence to the standards promulgated by such authorities as the National Institute of Radiation Protection.

According to the Environmental Protection Act, SKBF must also apply for a permit from the National Franchise Board for Environmental Protection. In the end, all permits are reviewed by the central government, who then issues the final decision. If approved, a detailed timetable for commencement of construction and a manpower forecast is submitted to the County Employment Board who will issue a building permit or require certain modifications so that the building permit may be issued.

Formal System For Routing

The transport regulations of the IAEA govern the transport of spent fuel and other radioactive material. There are also various Swedish and international rules governing transports via different

means, e.g., Inter-Governmental Maritime Consultative Organization (IMCO). Every planned transport must be preregistered with SKI, including a description of the type of packaging, the contents and a preliminary timetable for the transport. After examining the transport application, SKI prepares a statement either approving or disapproving the application and submits it to the government for final decision. Since government decisions cannot be challenged in court, the local authorities cannot legally and so far have not attempted to prohibit the transport of radioactive materials.

IV. APPROACHES USED (INFORMAL SYSTEM) IN SUPPORT OF AND/OR IN ADDITION TO FORMAL SYSTEM

A well-developed energy education program, one of the most extensive found anywhere, has been used effectively in Sweden to supplement the formal system and enhance public receptiveness to nuclear energy-related projects. Indirectly supported by the central and local governments, programs such as evening energy classes and public forums have been conducted to discuss and explain the need for nuclear power, the safety of reactor operations and waste disposal, the economic advantages of using nuclear power, and economic benefits that are introduced to the community as a result of accepting the industry. In addition, the Ministry of Industry has appointed special committees to conduct inquiries in areas of importance for Swedish nuclear power producers. A significant example is a report completed in November 1979, presenting the consequences of phasing out nuclear power in Sweden. Particular attention was given to the potential effects on local areas that have nuclear stations, on employment, and on the balance of trade and international competitiveness. The report appears to have had a considerable impact on the subsequent referendum, as the voting districts with the highest "yes" scores were often those with nuclear plants.

Although a formal alternative to help the government reach a decision, the use of a referendum with all its widespread discussion serves the additional purpose of forcing the public to confront the issue in the light of a well-informed consideration of the available alternatives. This broadened understanding of the availability and economics of alternatives has led, as the experience of many other companies going through the same process suggests, to a resigned acceptance of nuclear power.

Regarding the choice of a site for waste management activities, Sweden has found that the public is less likely to oppose such a project if the chosen site is on government or utility-owned property and especially if a nuclear installation is already located

there. Furthermore, the larger and/or longer the installation has been there the better. This has been clearly indicated in the siting of the CLAB, which was licensed with relatively little difficulty. Because the local people exhibited strong opposition to drilling activities for repository exploration on private property, only government and utility-owned sites have been explored, and direct confrontation with private landowners has thus far been avoided.

V. OBSERVATIONS/CONCLUSIONS

As a result of the referendum, Sweden, as a whole, is now prepared to accept the use of nuclear power, at least for the time being, and go ahead with the 12-reactor program. Importantly, both the nuclear advocates and the opponents were pleased with the results: the former because the six operating reactors will not be dismantled and six more will be brought on line; and the latter because a ceiling has been put on nuclear power at 12 reactors.

Another important result that the Swedish government inferred from the outcome of the referendum, is that the majority of the nation acknowledged their acceptance of the KBS waste management plan. Although waste management was not a question on the referendum ballot, the public was well aware that the 12-reactor program would involve the philosophy of engineered barriers proposed by the KBS. Thus, in approving the 12-reactor program, the public indirectly gave its vote of confidence to the proposed KBS solution. Central to this acceptance were the educational-type activities used to stimulate public interest and increase overall understanding of the issues at hand.

Sweden is especially significant because it is the first country to fully license an AFR. The fact that three communities were actually competing to be selected as the site of the new AFR suggests that the Swedish approach to the initial selection of potential sites, and the program for then selling the benefits to the local community, merit consideration by other democracies.

In particular, three factors seem to have played an integral role in obtaining public acceptance over and above the initial requirement of having a sound plan for the facility in question. First of all, the educational activities enabled the people to conclude that the facility would be safe, and that the economic benefits to be realized were worth the few risks if any. Secondly, a nuclear facility already existed at this site so that there was a basic

comfort level in living with nuclear power. Finally, the fact that this facility will be used only as a *central stopping ground for spent fuel on its way elsewhere, did not carry the stigma of the permanent dumping ground. Thus, the combination of these three elements in addition to a soundly planned venture greatly aided the local acceptance of, and indeed the creation of competition for the siting of this waste facility.

In contrast to the highly successful program to obtain local approval in siting an AFR, the prospects for siting the two remaining facilities, an *intermediate storage facility and a permanent repository would appear to be extremely difficult at this time. The siting approaches used for the AFR, can also be employed, but with varying degrees of difficulty relative to each facility. Treated separately, the intermediate facility should not encounter as much difficulty as the permanent facility. The economic attractiveness with a favorable risk/reward ratio would still apply and the site could also be at an established nuclear facility. Although this intermediate storage facility, because it involves 2 or 3 decades of storage compared to the AFRs 2 or 3 years, could meet with an increased level of public concern, it does not appear that this aspect would be insurmountable. If handled prudently, the same approaches used in gaining local acceptance for the AFR would appear to be applicable for the intermediate storage facility.

On the other hand, the repository is likely to encounter severe local acceptance problems. In spite of the many economic benefits that would accompany the undertaking of such a large project, the risks related to the project's permanence could, in the minds of the people, outweigh the benefits. On government or utility-owned

* According to the KBS I plan, the AFR storage facility is called a central storage facility used prior to reprocessing. An intermediate facility will be used for cooling the returned reprocessed material prior to emplacement in a repository.

property, the project might be easier to accept; however, this depends on where the large crackfree mass of granite is located. In view of all circumstances involved, the Swedish government has decided that there is no urgent need to start building a repository in the immediate future. The availability of a central storage facility, coupled with the possibility of reprocessing and subsequent intermediate storage of the returned HLW will provide Sweden enough time to proceed slowly and methodically in order to reach the level of acceptability for a permanent repository that was achieved for the central storage facility.

VI. SYSTEM FOR OBTAINING ACCEPTANCE OF WASTE MANAGEMENT TECHNOLOGIES AND PRACTICES

Although formal regulations for waste management facilities are not yet established, the general safety criteria for nuclear power plants are applicable. Design standards that have been established in the U.S. and in West Germany have been taken into consideration for current endeavors and will provide a framework in which Sweden can develop and formalize its own systematic process for assessing the technical criteria of waste management facilities. A committee has been appointed by the Ministry of Industry to review nuclear energy legislation, especially legislation concerning the technology to be used in the management of nuclear wastes, the results of which are to be issued in mid-1981.

The supervisory authority designated by the Swedish Atomic Energy Act, the Swedish Nuclear Power Inspectorate (SKI), currently examines the design of safety systems for all nuclear related facilities. SKI ensures that the technologies used adhere to National Radiation Protection Institute's criteria governing radiation protection. In addition, the fundamental principles developed by international organizations such as the International Commission on Radiological Protection (ICRP), International Atomic Energy Agency (IAEA), the World Health Organization (WHO), and the OECD's Nuclear Energy Agency (NEA) also apply.

Ultimate authority for new technologies or practices comes from the Parliament who either accepts or rejects proposals which are usually contained in studies, similar to that of the KBS. Parliament takes into consideration SKI recommendations on new concepts as well as the comments received from various government agencies, national and international experts etc. The public's opinion may also be weighted as evidenced in the recent referendum in which the people by voting for the 12-reactor program accepted the use of nuclear technology.

Transport containers comply with the rules issued by the IAEA for design, construction, and testing. The containers must also conform to the "Cogema Cask Acceptance Criteria" issued in November 1978. Again, the Swedish Nuclear Power Inspectorate is the supervisory authority ensuring satisfactory compliance with all safety design criteria with a positive recommendation to the central government.

Observations/Conclusions

Perhaps the most striking achievement regarding the system for obtaining agreement on technologies and practices in Sweden, is that when called upon, the utilities via the KBS study were able to develop a waste management plan within two years that received SKI, and parliamentary approval within 1 year. This accomplishment allows Sweden to proceed cautiously and devote ample time to permanent waste management -- factors which have proved to be so effective in earning and retaining public credibility in and acceptance of past government decisions.

An important factor leading to the acceptance of the KBS plan appears to have been the broad participation, in its development, by the various Swedish entities concerned with waste management. By involving these organizations in the generation of the initial plan, and many others in the evaluation and review of the plan, once it was approved the probability of broad acceptance and endorsement was greatly enhanced.

SWITZERLAND

SWITZERLAND

I. PROGRESS/STATUS REGARDING WASTE MANAGEMENT DECISION-MAKING

Although there are strong anti-nuclear elements in Switzerland, other options for meeting electricity growth needs are so limited, expensive, or undependable that the nuclear option, having recently survived two referenda, has come to be accepted as necessary, if not completely desirable. Currently, over 26% of electricity is generated by nuclear plants, and Switzerland plans on increasing its installed nuclear capacity by a factor of two by 1985.

The siting of nuclear power plants and waste management activities figured prominently in the above nuclear power referenda. Overall, nuclear siting has become a very sensitive political issue in this small, crowded, highly democratic country.

Impact of the Federal Order of 1978 and the Referenda of 1979. Two national referenda have been held in the last year as well as several cantonal referenda. Anti-nuclear groups are initiating additional referenda, centering on the cancellation of newly planned reactors.

The 1959 Atomic Energy Act was the skeleton law centralizing the authority to control and regulate nuclear energy activities within the jurisdiction of the federal government. The discussions on siting of new power and especially the debates following the site occupation at Kaiseraugst proved that a revision of the old law was necessary. A Federal Commission of legal experts was then established to study the overall revision of the Act. The Federal Order of 1978 revised the 1959 Atomic Energy Act and contained provisions which limit the growth of nuclear power unless absolutely necessary and place nuclear power under more public control.

Specifically:

- licenses will be granted by the Federal Council and approved by both houses of parliament;
- a license for a nuclear power station will be granted only if the safe disposal of the station's wastes can be guaranteed (repository project drawn up, geological situation explored by drillings and a safety assessment drafted by the regulatory body made available);
- waste disposal facilities are considered to be atomic installations; the Federal Government can give support to the preparatory work for disposal facilities by expropriation, if necessary;
- the licensee has to demonstrate that the plant is absolutely necessary for the national energy supply;
- the licensee has to work out a decommissioning plan.

Before the law (already passed by parliament) could go into effect, two referenda were held. The first referendum, a popular constitutional initiative, was an extremely restrictive one which declared that 1) a nuclear plant would have to require the approval of a majority of all registered voters within 30 kilometers of the site; 2) imposed unlimited liability for nuclear accidents over a 90-year period; and 3) mandated a shutdown if the public or the environment were effected. The referendum was narrowly defeated by 51.7% to 48.3% in February 1979.

In May 1979, anti-nuclear groups, encouraged by the close vote of the first referendum, organized against the planned referendum on the parliamentary revision of the Atomic Act. The revision was passed decisively by 70% - 30%. The outcome of the referendum was interpreted as a tougher stance by the government on nuclear development. Nonetheless, pro-nuclear groups and utilities were heartened by the outcome.

The results of the two referenda and the Federal Order of 1978 have been to clarify many of the legal problems surrounding the nuclear siting issues and waste management.

Switzerland's four operational reactors discharge approximately 81 MTUs of spent fuel annually and have at-reactor (AR) storage capacities of over 800 MTUs among them. Expansion of existing AR capacity by re-racking is planned; this will allow an 8-9 year storage capacity. New reactors will have a 10 year AR storage capacity. Utility plans for a 600 MTU AFR to be located in the caves of the decommissioned research reactor at Lucens have met with strong public opposition.

A domestic reprocessing capability is deemed as too uneconomic. As waste is considered a responsibility of the utilities, most have contracts with reprocessors abroad. For contracts executed before 1980, BNFL and Cogema have agreed to keep the reprocessing waste in their care; they have the option of returning the waste on contracts signed from 1980-90. The first HLW returns are expected to arrive in Switzerland around 1992-93.

Switzerland has transported 145 t of spent fuel abroad. Transport is made by rail, truck and ship.

Both the utilities and the government bring LLW to the federally-owned Institute for Reactor Research in Wurenlingen, run by the Department of Interior, where it is incinerated and temporarily stored prior to annual ocean dumping. Since 1969 the Swiss have already dumped 4000 tons of concrete containing low level waste under the prescriptions and supervision of the NEA (Nuclear Energy Agency) in joint actions with the United Kingdom, the Netherlands, and Belgium. E.g., in 1980, 300 tons were dumped. The Swiss are a party to the London Sea Dumping Convention. As Switzerland has no shallow land burial sites, LLW which cannot be left in the reprocessor country or dumped at sea will be disposed of in underground repositories.

In view of the large quantities of LLW and MLW that United Reprocessors (URG) will have after reprocessing Swiss spent fuel, there are presently negotiations underway which propose that Cogema keep the LLW and MLW generated in return for Switzerland's

accepting an equivalent additional currie level in the HLW to be returned. This would relieve Switzerland of the burden of storing large volumes of LLW in exchange for their accepting HLW of greater radioactive content.

The ultimate form of the reprocessed waste is also subject to negotiation between Switzerland and United Reprocessors. URG will propose the ultimate waste form -- expected to be some type of borosilicate glass -- and Switzerland has until 1984 to accept or reject it. Switzerland has, in fact, incorporated a "wait and see" attitude into her planning on ultimate disposal, watching the actions of other nations before committing herself full-force to a given approach. The Swiss utilities are currently studying variations of engineered storage and expects to have either a surface storage facility or ultimate repository available in the 1990s.

Status of Test Drilling

Currently, the emphasis in Swiss waste management is on geological exploration; and it has been the center of great controversy. The Swiss sites include granite areas in the northern lowlands of Switzerland. This is a tectonically inactive area where the granite is buried under much sediment. NAGRA (the national waste corporation) has so far selected 12 candidate drilling sites though it has not yet received permission to drill at any of them.

Despite the Federal Order of 1978 and the two referenda of 1979, development of an ultimate nuclear waste repository in Switzerland has been impeded because of the refusal of local authorities to allow test drilling. Local resistance to drilling touched off the whole question of the acceptance and control of nuclear energy in Switzerland. In 1974, the newspapers reported test drilling by NAGRA without the permission of local authorities. At the time, the Atomic Energy Act of 1959 was in effect, which meant that the Federal Council was only responsible for site licenses and permits once the site had been selected. The Federal Council decided that since these were only exploratory drillings, they were governed by

the normal mining or oil drilling laws which are under cantonal jurisdiction. To date, out of the twelve communities concerned, six communities have raised objections to the applications, either by popular votes or by opposition of the local community council. In an informal vote, one application was defeated by a margin of 400 to 4 votes. The remaining six communities, however, have taken an understanding view with regard to the drillings.

NAGRA has asserted that test drilling is an integral part of the facilities themselves, falling under federal, not cantonal, jurisdiction. Accordingly, NAGRA put in applications for test borings with the Federal Energy Office. The revision of the Atomic Energy Act, as described above, has alleviated the legal complexities somewhat:

- test borings are considered preparatory measures for nuclear facilities;
- federal authorities may transfer the right of expropriation of land to NAGRA, if need be;
- distinction is made between "preparatory measures" versus site selection or approval of a nuclear installation. Therefore, approval for test drilling will not force a locality into accepting a permanent repository.

Despite these improvements, the situation remains problematical, because from 1990, the reprocessing wastes can be given back to Switzerland (according to the contracts with Cogema and BNFL) and because a LLW repository is needed anyway at this time.

Since under the current Federal legislation, cantons and communities still have to issue their construction licenses related to test drillings, it may take too much time until the drillings can be performed at sites with suitable geology. NAGRA officials are optimistic, however, that at least half of their twelve drilling applications will even be favorably accepted by local authorities.

II. POLITICAL STRUCTURE AND ENVIRONMENT FOR WASTE MANAGEMENT DECISION-MAKING

Parliamentary Position

The Swiss Assembly is currently composed of a Grand Coalition of all three major parties: Socialist, Liberals, and Christian Democrats. The seven-member Federal Council (Bundesrat), the executive body of government, reflects this coalition with each party holding two seats; the seventh is held by a member of a party representing agrarian interests. The nuclear issue cuts across party lines, no one party being strongly pro or anti-nuclear. On the whole, though, parliament generally supports the need for nuclear power.

Preemption

Federal authority in the field of siting of waste management activities is mandated by the 1978 revision of the Atomic Energy Act. Proposed federal pre-emption of cantons was removed from the Federal Order of 1978. However, the revision did state that test borings for waste repositories can be forced through by expropriation. The federal government is also seeking responsibility to judge if cantons are arbitrarily changing laws to block nuclear facilities.

Local Officials

Local officials are elected.

Stipulation Law

Without an approved disposal plan by 1985, reactor licenses will be withdrawn or not renewed. Similarly, proof of safe disposal of radioactive waste must be shown for new reactor licenses.

Land Use Veto

Cantons have a land use veto over water use, zoning (including rezoning) and construction permits. Deliberate rezoning, may not be exercised merely to block a nuclear installation. The commune (local) level also has a veto regarding zoning and construction permits. None of these laws were originally intended to apply to waste management activities though they could be used to block test drilling, although they have not been used to date. The Federal Tribunal resolves conflicts of law between the cantons and the federal government.

Referendum System

Switzerland, as one of the world's oldest democracies, has a highly developed and widely used referendum system. It is the primary vehicle for establishing and revising law. Referenda are held at the communal, cantonal, and federal levels and are legally binding if they do not circumvent "higher" law. They may, therefore, be overturned by a tribunal if found to be in conflict with federal law (see above).

Public Hearing Process

Switzerland holds public hearings as an integral part of its nuclear policy and facility siting process. The public hearing involves briefings and discussions on the proposed facility. While voting takes place, it is not binding and seen only as advisory.

National Waste Management Company

NAGRA (Swiss National Corporation for the Disposal of Radioactive Wastes) is a private organization established by the utilities. It is involved in waste conditioning and treatment, contracts research in the development of repository concepts and conducts geological studies. NAGRA is to provide, ultimately, a solution for waste disposal and assist utilities' applications to the government. NAGRA also manages waste from government research laboratories and hospitals. It is also a member of Konsortium Untertagsspeicher (KUS) which coordinates underground storage of materials including oil and gas.

III. FORMAL SYSTEM FOR OBTAINING LOCAL ACCEPTANCE ON SITING AND ROUTING FOR NUCLEAR WASTE ACTIVITIES

Formal System for Siting

Before the revision of the Atomic Energy Act, as described in Section I, test drilling for a nuclear waste repository was considered as totally subject to local mining laws and, therefore, under sole jurisdiction of the canton. Localities were able to veto drilling applications and thereby stymie the drilling program.

Since May 1979, however, the test borings are considered as preparatory actions for an atomic installation and now are under federal jurisdiction (The Ordinance on Preparatory Measures, Oct. 24, 1979). The process for local approval follows.

NAGRA must submit an application to drill to the Department of Transport, Communication and Energy which contains an explanation of the research program; a geological report; a report on the effects of the drilling; a topographic map of the area; detailed plans of the operation. The Department publishes the request in the Federal Notebook and also in designated public places in the appropriate canton(s). Within the Department, the Federal Energy Office deals with the application.

Concurrently, there would be thorough briefings by members of NAGRA and sometimes by members of the parliament or government. The purpose of the meetings is to explain the drilling plan and its effects.

Upon publication of the request, the Department of Transport, Communication and Energy invites land owners and other persons who will be affected by the drilling to register their objection. At the same time, the Department informs the canton(s) affected by the drilling as well as other appropriate federal offices (e.g., military, water, public health authorities). All are allowed "fair delay" to record any objections.

At the expiration of the delay, the applicant is also given "fair delay" to modify the application, if need be.

The Department transmits to the Federal Council the application, objections, the advice of experts who have examined environmental and safety aspects of the drilling, and a preliminary decision. The Federal Council may accept or reject the application and, if granted, fixes the duration of the authorization to drill.

While the revised Atomic Law gives the Federal authorities the right of expropriation, it does not specify that Federal decisions regarding drilling take precedence over local/cantonal law. Conflicts of this nature may be settled by an independent Federal Tribunal located in Lausanne (corresponding to the U.S. Supreme Court).

The construction of a nuclear waste facility must be authorized under the conditions stipulated in both the 1959 Atomic Energy Act and the Federal Order of 1978.

A written request for construction is presented to the Federal Council containing the project plans and other necessary documents. The Federal Council then publishes the request in the Federal Notebook and in other public places. Ninety days is allotted for anyone to submit their written objections and their reasons for doing so.

The Federal Council then asks specified government agencies (examples given above) and the cantons for their advice and they are given time to do so. The cantons also consult with local communities and include those opinions in their response. The experts are consulted as to safeguards, safety, need (considered proven in the case of a waste facility), the objections already presented and, in the case of reactors, the ability to dispose of the waste generated.

The advice from the experts is again published in the Federal Notebook and in public places for this purpose. Another 90 days is given for objection to the conclusions formulated by the experts. The cantons and communes concerned also register their objections. The Federal Council again invites cantons, government agencies and the experts to answer these objections in due course.

After examining the request, the advice of the experts, and the objections presented, the Federal Council makes a decision. If the application for construction is granted, it is published in the Federal Notebook with any special conditions or requirements indicated. The authorization, along with an explanatory report, is sent to the Federal Assembly for approval.

While not part of the national system, another aspect is that a few cantons have laws which require them to oppose "by all possible political and legal means" nuclear plants or waste disposal site plans. This is indicative of the difficulties in gaining acceptance of waste management sites and institutionalizes opposition to nuclear power by forcing the federal authorities into a legal battle in which they might have to exercise their right of expropriation.

The Federal Order of 1978 reduced the veto rights of the cantons in siting matters to those of consultation. The cantons, in turn, will deal with communities in voicing their objections to the federal government. The revision has given the federal government preemptive rights if NAGRA fails to "sell" its program and the system fails. The intent of the Swiss siting system is to employ expropriation only as a last resort.

Formal System for Routing

Routing decisions are made entirely at the federal level and no public approval is required. Public demonstrations in Switzerland have tended to revolve around siting issues rather than waste transportation. The Federal Energy Office issues the transpor-

tation license; the only local authorities involved in transportation are cantonal police who must be notified since police escorts are required along the route.

IV. APPROACHES USED (INFORMAL SYSTEM) IN SUPPORT OF AND/OR IN ADDITION TO FORMAL SYSTEM

Swiss Federal authorities are presently reluctant to force the legal issue in siting matters and are hoping for a compromise. They have not, however, employed economic incentives or engaged in a public information campaign.

While economic incentives are often effective in siting issues and have been used in other countries, they have not yet been used in Switzerland for siting of waste management activities. The possibility of economic incentives has been raised during public meetings regarding drilling requests but so far the government has not been inclined to utilize this approach merely for test borings. Tax rebates have been used for siting reactors and could eventually be used in siting waste management activities. NAGRA is setting up a commission to study the possibilities of economic incentives for localities.

V. OBSERVATIONS/CONCLUSIONS

No country better illustrates the national versus local government conflict than Switzerland. The inability to progress even with exploratory drilling is the effect of a long history of local political autonomy in Switzerland. The lack of progress in the waste management program is therefore unsurprising, given the highly decentralized political structure.

Switzerland's lack of indigenous resources for fuel has prompted its choice of the nuclear option and it is presently struggling with the problems of local acceptance. While Switzerland has experience with reactor siting, it has little with regard to waste management activities.

More positively, Switzerland has finally untangled many of the legal complexities related to waste management, particularly regarding jurisdiction over test drilling activities. Lines of authority in waste management siting are now more clearly defined: although federal authorities must consult with cantons, who in turn deal with communities, federal law clearly is viewed as pre-eminent (though this has yet to be upheld in the courts) and may be forced through by expropriation. Additionally, Switzerland has not yet tapped the potential of a wide-reaching public education program or of economic incentives for increasing local acceptance of waste management activities. The optimism of NAGRA -- that 6 of their 12 test drilling sites will be accepted -- may therefore be well founded.

VI. SYSTEM FOR OBTAINING ACCEPTANCE OF WASTE MANAGEMENT TECHNOLOGIES AND PRACTICES

The Federal Energy Office (within the Department of Transport, Communication and Energy) is responsible for setting criteria for waste management practices, issues transportation licenses and will set criteria for geologic disposal in conjunction with groups of expert geologists. The Federal Council is advised by a Working Group for Waste Management with representatives from various environmental, regulatory and energyrelated agencies. The group tries, though it is not mandatory to do so, to form a consensus before presentation of advice to the council.

Technical practices and procedures are developed by NAGRA, who often works in conjunction with the Institute for Reactor Research. For example, current radiation safety criteria stipulate a level of not greater than 10 millirems per person per year. This criteria is at present only a proposal and limits will be affected by the actions of other countries regarding similar criteria. In any case, the Federal Energy Office judges NAGRA's proposal to meet these criteria; the actual design is up to NAGRA, but they must prove its efficacy. In case of disagreement over waste management practices and criteria, the Federal Council and even the Swiss Federal Assembly may make the ultimate decision(s).

Geology

The Federal Energy Office will contract research on safety aspects of geologic disposal to geological institutes and experts. The results will be evaluated by the Federal Energy Office who will ultimately establish the appropriate criteria. NAGRA, will undertake test drilling and waste management and is responsible for meeting these criteria.

Waste Form

The Federal Energy Office will judge and approve the various waste forms.

Transportation

Switzerland abides by IAEA criteria in the shipment of spent nuclear fuel. The Federal Energy Office issues the licenses required for transporting spent fuel outside of Switzerland. According to Swiss law, the Federal Office of Energy will review the transport application against the criteria mandated by the Non-proliferation Treaty and by participation in the Nuclear Suppliers Group. These factors are all considered within a broad "interests of Switzerland" statutory test.

The procedure also requires that the Federal Ministry of Foreign Affairs and the Trade Division of the Federal Ministry of Economy agree to the granting of transport licenses. The only local authorities involved in transportation are cantonal police who must be notified since police escorts are required along the route.

Switzerland uses Transnuclear casks, which are licensed in Switzerland. The casks are passed through a special, instructed customs during transportation.

Observations/Conclusions

The Federal Energy Office is the primary regulatory body for waste management practices and criteria. Switzerland is unique, along with U.K., in that criteria are sometimes set by the parliament and Federal Council.

UNITED KINGDOM

UNITED KINGDOM

I. PROGRESS/STATUS REGARDING WASTE MANAGEMENT DECISION-MAKING

Britain, the first nation to deploy commercial nuclear power plants, has a long-standing commitment to nuclear power. The U.K. nuclear programs involve broad areas of overlap between civilian and military nuclear activities. Currently, 12% of Britain's electrical capacity is nuclear powered and the country plans to increase installed nuclear MWe by 15 GW over 10 years from 1982. Britain's power reactors are currently all of their own gas-cooled design, but they have recently announced plans subject to safety evaluation to license and build a Westinghouse PWR as well. A decision on the fast reactor is under review. The U.K. government has said it will hold a public inquiry on both the PWR and the breeder reactor.

The U.K. has no plans for the direct disposal of spent fuel elements or for centralized storage. Spent fuel is initially stored at reactor sites and subsequently sent by train to British Nuclear Fuels Ltd. (BNFL), Windscale for reprocessing. The U.K., as a nation with nuclear weapons capability, has been reprocessing fuel elements for over 20 years. Its power reactor fuel elements are reprocessed in the same facility as its military reactor fuel and the wastes are stored in the same tanks. Over 800m³ of liquid HLW has accumulated so far.

BNFL has moved to upgrade its reprocessing and storage capacity at Windscale so as to take advantage of the burgeoning world market for reprocessing services and to help relieve current congestion in storage ponds at Windscale. A Thermal Oxide Reprocessing Plant (THORP) with a nominal capacity of 1200 MTU/year, planned since 1975, is now scheduled to be operational in 1987. It will be able to process both AGR and LWR fuel. In the meantime, new arisings of Magnox fuel are occurring at about 1100 MTU/year while the storage

capacity of the present Windscale Magnox fuel ponds is only 1000 tonnes. These ponds are already almost all full, with some of the stored fuel badly corroded.

The continuing build-up of Magnox fuel at BNFL will be met by making fuller use of storage capacity at power stations. Fresh pool capacity at Windscale will be available around 1981 when a 1300 MTU LWR fuel pool will come on-line. Three new 1,000 MTU pools will be available in 1984 or 1985 as part of the THORP plant. They will be capable of handling LWR and/or AGR fuel; a new 600 MTU pool for AGR fuel will also be ready next year. Additionally, BNFL is stepping up its reprocessing activities to work off the backlog of Magnox fuel and is now negotiating reprocessing contracts with new customers. An additional 150m³ liquid HLW tank is being built each year to keep pace with reprocessing. The program of new pond and tank construction will keep storage capacity way ahead of new arisings. The backlog of stockpiled fuel will be gradually reduced, thereby increasing the capability to handle new arisings and fuel from foreign sources.

The report of the Royal Commission on the Environment (known as the Flowers Report) and the Windscale Inquiry were two major developments in the mid-1970's that influenced the course of radioactive waste management in the U.K. The proposal to locate a chemical reprocessing plant at Windscale was the subject of a public inquiry during which the need for U.K. reprocessing capabilities, the nuclear waste disposal policy and technologies, and the appropriateness of the site were addressed following referral to the Secretary of State for the Environment of the planning application to build the plant. The outcome reconfirmed the U.K. intention to continue with reprocessing at Windscale. The constitution, conduct and outcome of the inquiry was regarded world-wide as a landmark in the nuclear decision-making process.

The Flowers Report issued in September 1976, addressed many of the environmental issues pertaining to waste management. Regarding nuclear wastes, the report states:

"... there should be no commitment to a large program 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. These wastes already exist in substantial quantity and a safe method for their long-term disposal is in any case, required whatever is decided about nuclear development in the future. We are clear that such a demonstration will require a substantial program of research."

The Flowers Report recommended principles to separate organizational responsibility for framing environmental regulations and monitoring the environment. It also suggested the establishment of a national waste disposal company as well as a high-level advisory committee to the Department of Environment (DOE) for all aspects of waste disposal. Some of Flowers' recommendations were accepted by the government in a White Paper in 1977. Others are still in the process of being implemented.

Present U.K. government policy favors research on three final disposal options for solidified HLW: disposal in deep geological strata, on the sea bed, or under the sea bed. The program is funded by the Department of the Environment whose political head, the Secretary of State, is now responsible with his Scottish and Welsh colleagues for radioactive waste management policy. Work on geologic disposal is furthest advanced of the three.

It is planned that five years of detailed geological studies will need to be conducted before an appropriate geological formation can be identified and a site selected for disposal of low heat generating wastes and perhaps ten years for the higher heat generating HLW.

Pilot disposal would be possible in the mid-1990s but full-scale disposal is not planned for this century. The U.K. has been appraising 13 regions where the necessary geological field work could be conducted. Applications for test drilling, initiated by the U.K. Atomic Energy Authority (AEA), have been sought in four hard rock areas and planning permission granted in only one. One local public inquiry has been held and another is planned this fall at

desired drilling sites. The test drilling program is currently meeting with stiff resistance at practically all target locations.

The U.K. strategy for disposal had vacillated in the past between a preference for solid and liquid waste forms. In the mid-60s research on waste solidification was suspended because of the then good record of storing high-level liquid waste in stainless steel tanks and the economics of changing from liquid to glass storage. In the 1970s, problems with tank storage and increasing inventories of liquid HLW as a result of reprocessing, coupled with the new political emphasis on closing the fuel cycle in the safest possible manner, lead to the rekindling of research efforts on waste form. BNFL began work on the HARVEST process which was an extension of previous work done by the AEA at Harwell.

Present policy planning is to immobilize the HLW in borosilicate glass. By 1988, BNFL plans to build a full scale vitrification plant using either their HARVEST process or the French AVM at Windscale.

The U.K. is waiting until the end of the century to pick a technical solution for ultimate disposal. The proper mix between waste form and disposal media is dependent upon the government research on geologic and seabed disposal and a final decision on waste form. Britain intends a systems approach, optimizing the combination of surface cooling period, engineered barriers and disposal medium. Surface storage periods of 50 years or more are under consideration.

Regarding LLW, small amounts of solid LLW are authorized for disposal with ordinary refuse, so-called "dustbin disposal". Higher level LLW is packaged and stored on-site or disposed of at the Drigg site, a fenced area of some 300 acres 4 miles from Windscale. Drigg is operated by BNFL who buries the waste in trenches and covers it with 1m of soil. The trenches are drained into a tidal stream which is regularly monitored. The site has the capacity to continue to receive considerable additional LLW, though a second site may be required in the next century.

Britain also disposes of some 300 tonnes (net) of LLW annually to the bed of the deep ocean. This waste is solidified to NEA specifications and disposed at an IAEA-approved deep ocean site 500 miles off the coast of England, in an area 60 miles by 20 miles.

The British policies on disposal and storage of nuclear waste, as described above, were recently deemed "satisfactory" by the U.K.'s Radioactive Waste Management Advisory Committee (RWMAC). This committee, whose establishment was recommended by the Flowers Report, was set-up in May 1978 to advise Britain's Secretaries of State for the Environment, Scotland and Wales on waste management.

The first annual report of the Committee, issued in May 1980, generally endorsed the current waste management program and, especially, the expansion of the geological and oceanographic research programs and advised an increase of effort in those areas for the next few years. It underlined an "urgent need" to proceed with the development of treatment and disposal options after storage of HLW in liquid form. The RWMAC also thought that ocean dumping of LLW be somewhat increased.

The committee deferred for the present recommending the formation of a nuclear waste disposal corporation until the disposal options for stored waste are more clearly identified.

The RWMAC is chaired by Sir Denys Wilkinson, Vice-Chancellor of Sussex University. It comprises eleven independent scientists, four nuclear and electric utility representatives and three labor union representatives. The committee has a statutory duty to report annually to the Environment Secretaries of State. It will have a key role in determining U.K. waste management technologies and practices (see Section IV on Approval of Technology and Practices).

II. POLITICAL STRUCTURE & ENVIRONMENT FOR WASTE MANAGEMENT DECISION-MAKING

Parliamentary Position

The Conservative Party has a majority in the Parliament. Both Conservative and Labour parties support the nuclear power program. The Conservatives are advocating an expansion of the program, and the Labour Party was in power during both the formation of BNFL and during the Windscale hearings. Nuclear power is not presently a party political issue.

Preemption

The central government has the legal authority to override local siting vetoes. No U.K. local government authority can have a complete siting veto as appeals are heard at the ministerial level and may also be directed to Parliament. In transportation matters, the Department of Transportation has primary decision making powers and can override local vetoes. Environment Secretaries of State can also "call-in" controversial planning applications for their own decision.

Local Officials

Borough, County and District officials are elected. The responsibility for waste management in Scotland, Wales, and Northern Ireland rests with the three Secretaries of State for those areas who are cabinet members.

Stipulation Law

There is no stipulation law linking reactor construction to waste management plans. However, the Flowers Report has recommended:

"...there should be no commitment to a large program 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. These wastes already exist in substantial quantity and a safe method for their long-term disposal is in any case, required whatever is decided about nuclear development in the future. We are clear that such a demonstration will require a substantial program of research."

Nuclear power stations must show a minimum at-reactor core discharge capability to receive a license.

Land Use Veto

There is no absolute land use veto. A locality may turn down a nuclear facility siting request, but it can be overruled by the central government after a public hearing.

Referendum System

Referenda have not been used in Britain except on the issue of British entry into the EEC.

Public Hearing Process

Site specific local hearings are held by local authorities, according to the Town and Country Planning Act, who may grant or reject a drilling or construction application. If the project is rejected at the local level, provisions exist for a planning inquiry to be held at the national level (see Windscale Hearings). The Parliament is also the focal point for debate on nuclear matters and can overrule any ministerial decision.

National Waste Management Company

The Flowers Report recommended a national organization to handle waste disposal, but present feeling as enunciated by the Radioactive Waste Management Advisory Committee, is to delay its establishment until the technical approaches are settled.

III. FORMAL SYSTEM FOR OBTAINING LOCAL ACCEPTANCE ON SITING AND ROUTING FOR NUCLEAR WASTE ACTIVITIES

Any proposal to extend an existing nuclear site or create a new one must be sent to the relevant local planning authority (borough or county) under the Town and Country Planning Acts.

This first step involves consideration of the case by locally-elected representatives who can take into account any objections or representations made in writing by members of the public. Local authorities may grant or refuse permission or in certain cases may refer the case to the county authority for its decision. If either the local council or county council refuse permission the applicant may appeal to the Secretary of State who can set up a public local inquiry to help him in determining the case. In the case of nuclear power station this power is exercised jointly by the Secretary of State for Energy and the appropriate Environment Secretary of State. In addition, the Secretaries of State can themselves "call-in" an application which they consider to be a national matter and appoint inspectors to conduct a public inquiry.

Two recent cases illustrate both the flexibility and the limits of the British planning inquiry system. The first case was the Windscale Inquiry in which BNFL applied to Copeland Borough Council for planning permission to build the THORP reprocessing plant on the Windscale site. The Borough Council referred the case to the Cumbria County Council but the Environmental Secretary "called in" the submission and appointed an inspector and two assessors to conduct a public inquiry. The course of the resulting so-called Windscale Inquiry was unique (given the nature of the surrounding factors as described in Section I): as a device to enable the issue to be debated in Parliament, the inspector's recommendation for approval of the facility was refused by Environment Secretary Peter Shore who then referred the matter to Parliament. Two debates took place and the decision in favor of BNFL was taken by a vote of 224-80 in the House of Commons.

The second illustration of the planning inquiry process in Britain has been with regard to the strong local opposition to exploratory drillings (described in Section I). Three of four applications to drill by the AEA have been rejected so far. A public inquiry was held at Mullwarchar in Scotland and the Secretary of State for Scotland will rule on the appeal. The AEA faces a similar inquiry this autumn into proposals to test drill in Northumberland. The County Council for that area is already being briefed by planning authorities from Mullwarchar on resisting the drilling. With 24 sites under consideration, there is the possibility of an appeal and public inquiry at each site. AEA officials have stated that rejection of their appeal would "clearly be a serious setback".

The issue is further complicated by an apparent conflict of interest within the various departments responsible for the environment. The drilling program has been transferred from AEA to the Institute for Geological Sciences which works under contract for the Department of the Environment; the Institute would also appeal to DOE in the event of a drilling application being refused. Thus, DOE finds itself playing the role both of judge and, indirectly, applicant. This conflict has hardened resistance to the drilling program. The RWMAC has meanwhile underscored the importance of the test drillings to final selection of an appropriate geologic medium.

If, during the next phase of the geological research program, planning permission is granted by either a local or national authority for a demonstration disposal repository, the applicant may then apply for a construction license. The legal framework for construction and operation of nuclear facilities is the Nuclear Installations Act of 1965 (which does not apply to AEA or defense facilities). Authorization -- called a nuclear site license -- approves the design for the site specified.

Normally the applicant (e.g., the Central Electricity Generation Board, BNFL) consults the Nuclear Installations Inspectorate (NII) as to information to be submitted and procedural details to be

followed regarding the license. NII informally assesses the safety of the proposed facility and the suitability of the site. If this assessment is satisfactory, and he is advised that there are no safety objections to the granting of the license, the applicant may make a formal application to the Health and Safety Executive (HSE).

The HSE may then direct the applicant to notify local authorities, (river boards, local fisheries committees, and other similar bodies) of his plans. The HSE then receive opinions and comments from these bodies regarding the license application. The HSE, on the basis of the comments and opinions received, decides whether or not -- and on what conditions -- a construction license should be granted. This cannot occur less than three months from the time notice was served on the local bodies.

Usually, only a construction authorization is received. Control over construction is exercised by the NII by means of conditions attached to the authorization. Construction cannot begin until the NII is satisfied with the design work on the facility.

A second license is not required for operation as opposed to construction of the facility, but safety assessments of the design and proposed operating procedures are submitted to the HSE. On the basis of this information, the HSE will replace the previous conditions on the license related to construction with detailed conditions appropriate to the operation of the installation. These conditions are tailored to the particular facility.

All proposals for the discharge of radioactive wastes from a nuclear site must be approved jointly by the appropriate Environment and Agriculture, Fisheries and Food Ministers under the Radioactive Substances Act, 1960. Local authorities, water authorities and sea fisheries committees are consulted about the proposals and in certain cases there is provision for a public hearing (this provision has not yet been used). In coming to a decision on the terms of an authorization, Ministers are guided by advice from their own technical advisers.

Formal System for Routing of Irradiated Fuel Flasks

Routes are set by the Department of Transport in consultation with the Department of Health and Department of Environment. Local approval is unnecessary although local police and councils are notified for reasons of safety, emergency preparedness and sometimes for police escorts. Almost all spent fuel transportation is by rail though foreign spent fuel is first sent by dedicated ship to Barrow and then by rail to Windscale. Shipments are occasionally challenged, but the Secretary of State for Transport has so far overridden any objections.

IV. APPROACHES USED (INFORMAL SYSTEM) IN SUPPORT OF AND/OR IN ADDITION TO FORMAL SYSTEM

The British government routinely relies mainly on two of the most commonly used approaches to help the formal system work: education and the siting of waste management activities at already-established nuclear sites. On the one occasion when the government thought the issue too complex and important for local determination they went beyond the regular system eventually taking the matter directly to the Parliament (see III above) for its decision.

In the education approach, British authorities are actively seeking to increase public acceptance of nuclear programs. The interest in public education was recently stated by AEA chief Sir John Hill:

"We have a uniquely difficult problem in communication. The public at large is at much greater risk from many other hazards...but they can form their own judgements about them... We must regard public understanding as important as our science, our technology, and our engineering, and devote sufficient of our resources and time and thought and energy to this purpose."

An Expert Group, reporting to the Radioactive Waste Management Committee (not to be confused with RWMAC) which is composed of representatives of the relevant Government Departments, the nuclear and electricity industries, and regulatory agencies, reviewed the existing structure for the control of radioactive waste in the U.K. It also addressed the importance of the test borings and stressed that every opportunity should be taken by the AEA and other departmental authorities to assist this research through a public education program. Such a program would emphasize the exploratory nature of the research, the advantages of safe disposal compared with indefinite storage, the succession of barriers which would be placed between the waste and the environment.

Since that time the British have begun a public information effort including large-scale government-sponsored exhibits in London. The nuclear establishment has also formed the Nuclear Power Information

Group (NPIG) comprised of the CEGB, SEGB, the British Nuclear Fuels Committee, and the AEA. NPIG publishes a series of booklets, sends speakers to public groups and engages in other public information activities. They are playing a key role in the public acceptance of nuclear power.

The central government has not, as France has, made direct use of the government-owned television or radio to promote nuclear power. Concerned agencies such as the AEA and CEGB do form teams to appear at meetings and brief journalists and the public.

Additionally, public awareness regarding nuclear power has increased as the debate has widened. Open inquiries such as Windscale have raised public interest and also provided a role similar to that of an information program. Royal Commissions and Expert Groups further stimulate interest and encourage flow of information, though their effect on public acceptance as such is difficult to judge.

Britain does not use economic incentives in siting matters or to encourage test drilling. Officials are examining the possibility of locating waste sites in areas that already have some other nuclear facility (i.e., Dounreay) and that have received general economic spin-offs from the siting of these establishments. These areas already have a decidedly pro-nuclear bias. It is significant that the only drilling permission received so far has been at Caithness, near the Dounreay.

Britain has used publicized scientific testing, some of it redundant, to convince the public of the safety of its waste practices. Two years ago, problems with a proposed radioactive discharge into the sea from the Capenhurst diffusion plant resulted in protests by a local pressure group. BNFL agreed to make exhaustive tests on shellfish and seaweed for technetium. The tests results showed insignificant traces, and local public opinion appears reassured as continued testing shows no increase in radioactivity.

Recent publicity, including requests for a public inquiry about the shipment of spent fuel through London, may result in the conducting of tests on cask transportation by CEGB. The conditions of transport already surpass IAEA requirements.

Britain has not resorted as yet to the offering of direct economic incentives.

V. OBSERVATIONS/CONCLUSIONS

There appears to be in Britain a broad consensus on the need for and acceptance of nuclear power. Despite this generally positive climate there have been, as described, debates at both the national and local levels. The Windscale Inquiry, with its pro-nuclear outcome, also served to heighten public interest in learning more about nuclear power. Intervenors maintain, however, that these inquiries are not sufficient substitutes for on-going public involvement in nuclear (or even broader scientific) policy decisions. Neither government nor anti-nuclear groups have suggested an appropriate forum for on-going public participation. Both groups, however, maintain that the U.S. model of "advocacy politics" is inappropriate for the U.K.

The planning inquiry system formally does not allow for the degree of discussion and Parliamentary debate that assures local and national public acceptance for a nuclear project. The planning inquiry process contains, however, a large degree of flexibility. The appropriate minister can (and has in the case of Windscale Inquiry) broaden the inquiry process to include the general public as well as parliamentary debate.

The problems in the test drilling program may, in their extreme, culminate in 6 to 24 separate inquiries being held throughout the U.K. Therefore, in matters of major national interest, such as waste management or the upcoming decisions on commercialization of breeder reactors and acceptance of the PWR, a special wide-ranging procedure may be necessary which, like the Windscale Inquiry, goes well beyond local considerations and involves Parliament. In this way, there can be a proper balance maintained between local and national interests.

The U.K. is an example of what can be done if the central government has the will to exercise its preemptive powers. There is a great deal of local support for the continuance and extension of reprocessing at Windscale; most of the opposition comes from pressure

groups geographically distant and economically independent of it. By allowing Parliament to make the decision, the Windscale plan was approved despite the various objections.

VI. SYSTEM FOR OBTAINING ACCEPTANCE OF WASTE MANAGEMENT TECHNOLOGIES AND PRACTICES

Waste Management Technical Criteria

In the U.K. technical inputs are solicited and considered from many scientific bodies but especially the IAEA, ICRP, EEC, NEA, and WHO. Nationally, the Secretary of State for the Environment has the responsibility for satisfying himself that "adequate" technology and practices are being developed. When a national waste corporation is established it will be responsible for carrying out and overseeing disposal.

Britain also extensively utilizes Royal Commissions, appointed by the Crown, and other Expert Groups to assist and establish technical criteria and waste management practices. The Royal Commission which published the Flowers Report was instrumental in initiating the organizational structure and control arrangements for waste management in the U.K. The RWMAC, itself established as a result of the Flowers Report, serves in an advisory capacity and is considered a national authority on the acceptability of current and future waste management policy and technical practices.

Other Royal Commissions or inquiries headed by ministerial appointees may serve in the future as a forum for discussion on waste management practices and technology. One such inquiry was recently held regarding water pollution by the Windscale plant; two others will be held regarding adoption of the PWR and the commercialization of breeder technology. There is also the possibility that a commission or inquiry on nuclear waste management will be held at the end of the decade. Parliamentary debate on these questions is also very possible.

Basic standards for the control of radiation exposure originate with the International Commission on Radiological Protection (ICRP). The U.K. also conforms to EEC regulations pertaining to radiological protection. The National Radiological Protection Board (NRPB) is

the U.K. authority on radiological matters and also conducts research.

Licenses are issued by the Health and Safety Executive (HSE) for all nuclear facilities. The Nuclear Installations Inspectorate (NII) under HSE conducts field investigations and is also a monitoring body. NII licenses sites, assesses specific safety designs, and grants authorizations for construction.

The Department of Environment (DOE) and Ministry of Agriculture, Fisheries, and Food (MAFF) are jointly responsible for authorizing the disposal of LLW into the environment. Responsibility for radioactive waste management policy lies with the Secretary of State for the Environment together with his colleagues in Scotland and Wales, as called for in the Flowers Report. The government is presently considering whether the Secretaries need further statutory powers to help carry out their responsibilities.

Geology

Geological criteria for the selection of sites for HLW repositories in the U.K. have been drawn up by the Institute of Geological Sciences, who also carry out and supervise the geological field work along with the AEA. This work is funded by the DOE. DOE will be assisted by the Radioactive Waste Management Advisory Committee who will examine the results of the test borings and have a significant impact on the choice of a final disposal option.

Transportation

The Department of Transport (DTp) have a regulatory function in the control of transport of radioactive materials within, to and from the U.K. The regulations for transport are in accordance with IAEA criteria. The Transport Radiological Advisor of the DOT assesses the safety of the cask design and, if satisfied that the regulations are met, issues an approval certificate (to BNFL, for example) for that design of package with specified contents.

Waste Form

A final decision on waste form will be made sometime this year or next by BNFL in consultation with the DOE.

Observations/Conclusions

Since the publication of the Flowers Report in 1977, the British government has established and begun to seriously implement a system for determining waste management practices and technologies. These include high level advisory committees to augment ministerial decisions regarding waste management practices as well as the usual inter-departmental consultation.

The British seem to be headed in a direction which will broaden the process of acceptance of technical decisions. These will include, as described, public inquiries on breeder commercialization, adoption of the PWR, and possibly on waste management. To date, there have been no major challenges to the government's decisions on waste management technologies and/or practices.

APPENDICES

APPENDIX "A"

APPENDIX "A"

INTERNATIONAL
ENERGY
ASSOCIATES
LIMITED

S A M P L E
L E T T E R

April 15, 1980

Mr. Stanley R. Hatcher
Whiteshell Research Establishment
Pinawa, Manitoba
Canada

Dear Mr. Hatcher:

Thank you for your willingness to take the time to assist me in the survey for our Department of Energy of national practices for dealing with local authorities in connection with nuclear waste programs and projects.

A short summary of the objectives and approach for this study is contained in the following text from a telex recently sent by DOE to some of those offering to assist:

"USDOE is gathering background information for formulating an acceptable national procedure for obtaining state and local acceptance in nuclear power related siting and transportation matters. As part of this effort, we are hoping it would be possible to discuss with non-U.S. democracies various approaches being developed and employed by them in dealing with this situation. Of specific interest, are waste management aspects of reprocessing plants, and repositories for spent fuel, high and low level waste. In addition to acceptance problems associated with siting and transportation, it would also be helpful to discuss national procedures for obtaining acceptance on technologies and practices to be employed in management of radioactive waste and spent fuel; including developing national consensus on:

Mr. Stanley R. Hatcher
April 15, 1980
Page 2

- Waste Form
- Geological Disposal Media
- Role of Waste form vs Geology in maintaining isolation
- Criteria for safe transportation (other than routing)

In support of this effort, DOE has contracted with International Energy Associates Limited (IEAL) of Washington, D.C., for the services of Hilliard W. Paige, Director and Principal Consultant. Mr. Paige's activities in this area on behalf of the Department over the past three years have included several previous visits to Europe and the Far East for discussions on various aspects of waste management with authorities there."

One purpose of this letter is to confirm our luncheon appointment at 12:00 in Ottawa on May 5th.

The other purpose of this letter is to give you an advance indication of the method we are planning to use in structuring the study so that we can make most effective use of the time you have so kindly agreed to give me.

The method will be for us to identify before our visit as many as possible of the different approaches being used in the various countries to obtain public acceptance of national decisions on the above nuclear waste management related issues. The broad list will then be reviewed with each country to determine which specific approaches are being used or planned in that particular country.

The various approaches identified to date are set forth below. Those for siting and routing issues tend to deal with the resolution of (in U.S. terminology) federal vs states rights issues, i.e., obtaining local political acceptance, whereas approaches for resolving decisions on technologies and practices tend to involve the federal government in quite a different role -- that of obtaining a consensus among the differing viewpoints in the national technical community. Although some specific approaches are applicable to both types of acceptance, they are basically different problems in the U.S., and are generally being approached here with different strategies.

Approaches aimed at obtaining acceptance of technologies and practices include:

1. Establishment of a Waste Management Technology (or Safety) Committee of the National Academy of Science or equivalent. Usually at initiative of and submitting reports directly to head of government.
2. Establishment, by Prime Minister or equivalent, of an interagency review group within the national government reporting directly to the Prime Minister.
3. Establishment by the Prime Minister of a commission representing a broad cross-section of interests. Chaired and well represented by scientific community, but with enough others to constitute a "Citizens' Committee" e.g., Kemeny Commission on TMI.
4. Establishment by Environmental Protection Agency (or equivalent) of acceptable (safe) criteria; licensing by NRC (or equivalent) of facility or design indicates federal governments assurance to the nation that above criteria have been met.
5. Contract technical/safety reviews to a prestigious university or highly regarded contract research organization.
6. Require nuclear utilities to prepare, present, and defend a "safe" plan, drawing on all appropriate national and international expertise.
7. Exhaustive multi-year, government-funded R&D program pinning down "all" safety uncertainties of proposed national technical solution approaches. See 8. below under approaches for obtaining siting approvals.

Approaches aimed at obtaining local political acceptance of siting and routing issues include:

1. Establishing that the federal government has (or creating for it) broad pre-emptive powers over the states in all nuclear matters. In addition to clearing up the lines of authority, this also allows state and local officials to pass distasteful siting decisions up the line and not have to be held accountable for them.

2. A federally appointed council of state officials. Usually including governors of states deriving most benefit from nuclear power. Turns the problem back to the states to make the site selections; with the implied threat that if they cannot agree, the federal government will be forced to decide. Federal government supplies technical data to the Council, and all work toward "consultation and concurrence". (Latest U.S. approach)
3. A variation of 2) above. Divide nation up into regions, allowing each region to pick its own sites. Usually structured around regions that both generate and use nuclear power. Has political advantage of multiple sites so that no one locale becomes the national nuclear "garbage dump".
4. On routing issues, federal government, after appropriate hearings, determines acceptable routes. State and local authorities can require notification, but cannot deny or reroute.
5. Broad national public educational programs. Factual, non-biased education of public of risks, rewards, and available alternatives.
6. Wide program of open public forums and debates. Give everyone opportunity to be listened to and have an opportunity to participate in the decision.
7. Delay as a conscious strategy. Structure decision making process so that siting decisions will not be faced for several decades. Puts decision well beyond tenure of those now in office. Added appeal: the cooler the waste, the safer/cheaper/easier to dispose of.
8. Federal government conducts elaborate, thorough, sound, lengthy, well-publicized program; finally concludes that a (or some) technical solution(s) is "officially safe". Public has sufficient confidence in government to accept decision.
9. Federal government makes siting arrangement sufficiently economically attractive that local populace is willing to accept perceived risks.
10. Gradual approach. Put limited waste in situ on a trial basis. If technical results and public reaction so warrant, this could be followed by a more definitive program.

Mr. Stanley R. Hatcher
April 15, 1980
Page 5

11. Conduct intensive and well-publicized technology program while avoiding concrete projects which would raise a siting issue.
12. Ocean disposal.
13. Space disposal.

I hope that this description of the purpose and methodology of our study will be of some help to you, and, once again, I express my appreciation for your willingness to assist me. I look forward to seeing you soon.

Sincerely yours,

Hilliard W. Paige

HWP/wen

APPENDIX "B"

APPENDIX "B"

- I. HOW IS AGREEMENT REACHED ON THE TECHNOLOGIES AND PRACTICES TO BE USED IN MANAGEMENT OF RADIOACTIVE WASTE AND SPENT FUEL?

INCLUDING:

WASTE FORM

GEOLOGICAL DISPOSAL MEDIA

ROLE OF WASTE FORM VS GEOLOGY

CRITERIA FOR SAFE TRANSPORTATION

- II. HOW IS AGREEMENT REACHED ON SITING AND ROUTING ISSUES?

REGARDING:

HLW (INTERIM AND ULTIMATE)

LLW

1. IS THERE A NATIONAL PROCEDURE FOR REACHING AGREEMENT ON THESE ISSUES? IS IT ESTABLISHED? IS IT UNDER CONSIDERATION?
2. WHAT IS IT?
3. IS IT USED? IS IT EFFECTIVE?
IF SO, BASIS FOR SUCCESS.
IF NOT, WHY?
4. IF THERE IS NO ESTABLISHED OR PLANNED NATIONAL PROCEDURE, WHAT APPROACHES ARE BEING USED/CONSIDERED? TIMING? (SEE LETTER)
5. PROGNOSIS FOR SUCCESS OF ABOVE APPROACHES.
6. BREADTH OF INPUTS BEING CONSIDERED?
IAEA, NEA, ECC, WHO, ICSU, CHURCH ORGANIZATIONS,
OTHER COUNTRIES? ICRP, OECD'S ENVIRONMENTAL COMMITTEE?

APPENDIX "C"

APPENDIX "C"

1. United States

- Mr. Alex F. Perge, Office of Nuclear Waste Management,
Department of Energy
- Dr. Kent M. Harmon, Manager, International Programs
Support Office, Nuclear Waste Technology Program
Office, Battelle Pacific Northwest Laboratory

2. Belgium

- Mr. Jean Danguy, Chef du Service Retraitement Combustible,
Synatom, S.A.
- Dr. Pierre Erkes, Director, Synatom, S.A.
- Mr. Maurice Potemans, Directeur, EBES
- Mr. Earl M. Shank, Engineering Manager Nuclear,
Comprimo Belgie, n.v.
- Belgian Embassy - Washington, D.C.
Dr. Louis Groven

3. Canada

- Mr. Joseph Howieson, Adviser, Nuclear Waste Management,
Energy, Mines and Resources Canada
- Dr. John Jennekens, President, Atomic Energy Control
Board
- Mr. Stanley R. Hatcher, Vice President and General
Manager, Atomic Energy of Canada Research Company
- Canadian Embassy - Washington D.C.
Dr. John Harrison

4. Federal Republic of Germany

- Dr. Rolf-Peter Randl, BMFT
- Dr. Reinhard Proske, DWK Abt. Entwicklung
- Dr. Franz-Peter Oesterle, Physikalisch - Technische Bundesanstalt
- Dr. Klaus Einfeld, DWK Projektdirektion
- Dr. Alois Ziegler, Ministerialrat, BMFT
- Dr. Felix Oboussier, Geschäftsführendes Vorstandsmitglied
- Mr. Reinhold Ollig, BMFT
- Mr. Wilhelm Kulke, Leiter der Informationsstelle des Bundes Nukleare Entsorgung
- Dr. Rer. Nat. Jens Dieter Becker-Platen, Gemeinsame Informationsstelle zur Nuklearen Entsorgung
- German Embassy - Washington D.C.
Dr. Stephen F. von Welck

5. France

- Mr. Andre Finkelstein, Adjoint au Delege Central Securite, CEA
- Mr. Jean-Marie Lavie, Directeur, ANDRA, CEA
- Mr. Yves Sousellier, IPSN/CSDR, Centre d'Etudes Nucleaires
- Dr. Abraham S. Friedman, Scientific and Technological Affairs, American Embassy, Paris
- French Embassy - Washington D.C.
Mr. Pierre Zaleski

6. Japan

- Dr. Ryukichi Imai, General Manager of the Engineering Department, The Japan Atomic Power Co., Inc.
- Japanese Embassy - Washington, D.C.
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7. Sweden

- Mr. Olle G. Gimstedt, President, OKG
- Mr. Alf Larsson, Statens Karnkraftinspektion
- Mr. Lars B. Nilssen, Director, KBS Project, SKBF
- Mr. Goran Schultz, Swedish Nuclear Fuel Supply Co.
- Mr. Bo Gustafsson, Engineer, Swedish Nuclear Fuel Supply Co.
- Per-Eric Ahlstrom, Chief Engineer, Swedish State Power Board
- Tonis Papp, Safety Analysis, Swedish Nuclear Fuel Supply Company
- Swedish Embassy - Washington D.C.
Dr. Lars Larrson

8. Switzerland

- Dr. Christian Favre, Sous-Directeur de L'Office Federal de L'Energie
- Dr. Rudolf Rometsch, President, NAGRA
- Swiss Embassy - Washington D.C.
Mr. Riccardo Mueller

9. United Kingdom

- Dr. D. G. Avery, Deputy Managing Director, British Nuclear Fuels Limited
- Dr. Frank L. Feates, Director, Nuclear Waste Management Division, Department of the Environment
- Ms. Dinah Nichols, Assistant Secretary, Radioactive Waste Administration Division, Department of the Environment
- British Embassy - Washington D.C.
Mr. John Gaunt
Mr. James Hooper

RECEIVED BY TIC JAN 12 1981