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International Nuclear Fuel Cycle Fact Book

**I. W. Leigh
M. D. Patridge**

May 1991

**Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830**

**Pacific Northwest Laboratory
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by Battelle Memorial Institute**

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FUEL CYCLE FACT BOOK

I. W. Leigh
M. D. Patridge

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Pacific Northwest Laboratory
Richland, Washington 99352

PREFACE

As the U.S. Department of Energy (DOE) and DOE contractors have become increasingly involved with other nations in nuclear fuel cycle and waste management cooperative activities, a need has developed for a ready source of information concerning foreign fuel cycle programs, facilities, and personnel. This Fact Book was compiled to meet that need.

The information contained in the International Nuclear Fuel Cycle Fact Book has been obtained from many unclassified sources: nuclear trade journals and newsletters; reports of foreign visits and visitors; CEC, IAEA, and OECD/NEA activities reports; proceedings of conferences and workshops, etc. The data listed do not reflect any one single source but frequently represent a consolidation/combination of information.

The organizations and agencies listed in this publication often have a much wider range of activities and many more facilities or staff than described here. Lack of space, as well as the intent and purpose of the Fact Book, limit the information given to that pertaining to the nuclear fuel cycle and to data considered of primary interest or most helpful to the majority of users.

Every effort was made for all information to be as accurate and current as possible, incorporating updates as they became available until actual time of printing; however, the nature of the content makes it subject to frequent changes. If you have suggestions which would improve the usefulness of the book or if you can provide more current information, please let us know so these changes can be included in future editions.

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INTRODUCTION

INTRODUCTION

The International Nuclear Fuel Cycle Fact Book has been compiled in an effort to provide current data concerning fuel cycle and waste management facilities, R&D programs and key personnel.

The Fact Book is organized as follows:

- **National summaries**--a section for each country which summarizes nuclear policy, describes organizational relationships and provides addresses, names of key personnel, and facilities information.
- **International agencies**--a section for each of the international agencies which has significant fuel cycle involvement, and a listing of nuclear societies.

The national summaries, in addition to the data described above, feature a small map for each country as well as some general information. The latter is presented from the perspective of the Fact Book user in the United States. Please note the following:

DIRECT DIALING

For convenience in direct dialing from the United States to foreign countries, complete telephone numbers are listed, including country and city codes. Outside the United States, depending on the origin and destination of the call some of these codes may not be necessary. Instead, "0" may need to precede the local number. Since it is impossible to cover the various situations for calls originating outside the United States, accurate information concerning direct dial is best obtained from local sources (telephone company or hotel operator).

HOLIDAYS

The major holidays have been listed as they generally apply to the **entire** country, though no doubt some regional holiday may very well also be considered major in a particular area.

MAPS

Most of the major facility locations are shown on each country's map within a circle for easier identification. Where space permitted, the name of the organization or facility has been added. The major cities are also circled and some of the smaller towns are listed to assist as a reference when consulting a large-scale map.

PASSPORTS/VISA

Requirements listed are those applicable to United States citizens.

SOURCES

Electric Power Plant Capacity and Electric Power Production figures in Austria, Belgium, Canada, Finland, France, Federal Republic of Germany, Italy, Japan, Netherlands, Spain, Sweden, Switzerland, United Kingdom and United States are obtained from Energy Balances of OECD Countries 1987/1988 and Electricity, Nuclear Power and Fuel Cycle in OECD Countries, OECD/Nuclear Energy Agency, Paris, France, 1990.

Nuclear Power Plant Capacity figures are obtained from NUKEM Market Report on the Nuclear Fuel Cycle, 12/90, NUKEM GmbH, Hanau, Federal Republic of Germany.

Reactor Mix figures are obtained from "World List of Nuclear Power Plants," Nuclear News, 6/90.

TIME

The hours listed are the standard time difference between the country and Washington, DC. A specific reference is identified if more than one time zone exists in a given country. It should be noted that the variation in daylight saving time periods may influence the stated time differences.

VISITS TO U.S. DOE FACILITIES

Foreign visitors to U.S. DOE facilities must complete and submit a form IA-473 (OMB 1910-2100) "Request for Foreign National Unclassified Visit or Assignment" to DOE Office of International Affairs, Washington, DC 20585, at least 45 days before the proposed visit. The itinerary should be based on prior arrangement with appropriate DOE or DOE contractor staff concerning a suitable time for the visit.

INTRO-3

NATIONAL SUMMARIES

ARGENTINA



ARGENTINA

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year	June 20	Flag Day
Jan. 6	Epiphany	July 9	Independence Day
Feb. 11-13	Carnival	Aug. 15	Assumption
Mar. 28	Holy Thursday	Aug. 27	General San Martin
Mar. 29	Good Friday	Oct. 12	Columbus Day
May 1	Labor Day	Nov. 1	All Saints
May 25	Revolution Anniv.	Nov.	Bank Holiday
May 30	Corpus Christi	Dec. 8	Immac. Conception
June 10	Sovereignty	Dec. 25	Christmas

TIME

Standard Time Washington D.C.: + 2 hours
Standard Time Period: 03/03 - 10/20/91

PASSPORT/VISA

A passport is needed to depart and re-enter the United States. All business-related travel to Argentina currently requires a visa; however, it is recommended to consult a travel agency for up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 9450.00 Austral
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Argentina are complete as listed, after dialing international access code: 011. Country code is 54; listed local numbers include city code.

U.S. EMPASSY - BUENOS AIRES

American Embassy
4300 Colombia
1425 Buenos Aires
Argentina
Tel: 54-1-774-7611
Fax: 54-1-775-4205
Science Counselor Paul Maxwell

ENERGY

Population	1988	32 million
Electric Power Plant Capacity	1988	12.7 GWe 7% nuclear
Electric Power Production	1988	45.5 TWh ~47% hydro/geoth. 41% oil/coal 11.2% nuclear
	1990	16.9% nuclear

NUCLEAR POWER

Policy: High priority on CANDU-based nuclear power industry with indigenous fuel cycle; government ownership and operation of all nuclear power plants; develop nuclear plant and services export capability.

Nucl. Power Plant Capacity	1990	0.9 GWe
	1995	1.6 GWe
	2000	1.6 GWe
Reactor Mix	1990	HWR: 2 (1974/83) 1 (1994)

INDUSTRIAL FUEL CYCLE

Policy: Develop all phases of the CANDU-type PHWR fuel cycle, gaseous diffusion capability for U enrichment (Pilcaniyeu), and D₂O production; may export Pu to nations with breeder reactors. Interim AR and AFR storage of spent fuel.

Waste Management Strategy: Reprocess spent fuel eventually; vitrify HLW in French AVM process; dispose of HLW glass canisters in granite host-rock repository. Reduce volumes of LLW/ILW for disposal in shallow ground, or in mined cavity for ILW with long-lived radionuclides.

Cumulative Spent Fuel	1987	1,070 tU
Arising (HWR)	1990	1,900 tU
	2000	5,800 tU

AR-1

Demonstration/Production Activities

- D₂O production: delayed--250 t/a D₂O enrichment plant, supplied by a Swiss firm; developing domestic technology.
- Uranium mining and milling (t/a): 1987--150; 1985--680.
- Uranium enrichment (kg/a): 500 (≤20% enr. U).
- Conversion of yellowcake to UO₂: Fabrication of UO₂ fuel; 300 t/a.

Major Milestone

- HLW geologic repository (Patagonia, area of Gastre, Chubut province was previous target site; ruled out in 1989) 2010

INTERNATIONAL RELATIONSHIPS

Member of IAEA. Has not signed non-proliferation treaty (NPT), while the Treaty of Tlatelolco has been signed but not ratified.

ORGANIZATION

- CNEA (Comision Nacional de Energia Atomica)-- National Atomic Energy Commission, owns and operates all facilities.

CNEA (National Atomic Energy Commission)

Comision Nacional de
Energia Atomica (CNEA)
Avenida del Libertador 8250
1429 Buenos Aires
Argentina

Tel: 54-1-70-7711
Fax:
Tx: 21388 PREAT AR

President
Radioactive Waste Mgmt.
(Ezeiza Atomic Center)

Manuel A. Mondino
Dr. Jaime Pahissa Campá

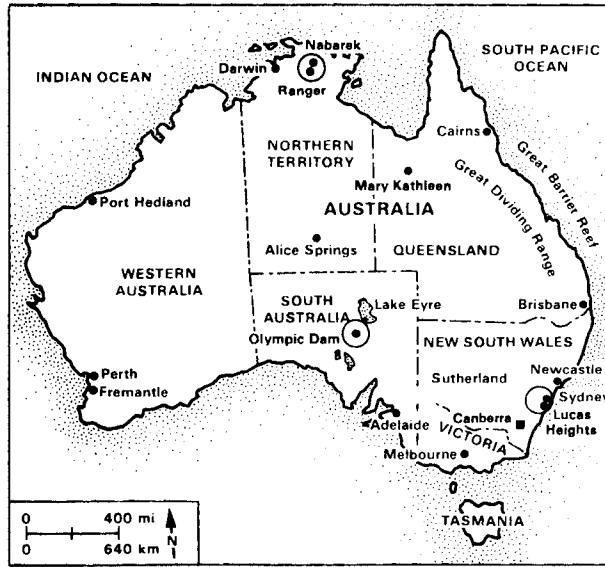
EZEIZA ATOMIC CENTRE

Location: 40 miles northwest of Buenos Aires, near airport.

Facilities

- Fuel fabrication: the first of three planned fabrication lines started up in 1982; second line 1985; produces 240 elements/yr for Atucha I and 5,360 elements/yr for Embalse; third line to produce Atucha II fuel elements.
- Fuel reprocessing: Ezeiza pilot plant, planned capacity of 20 kgU/d feed, 10-15 kgPu/a product; non-radioactive runs--1990; hot startup--1994. Potential expansion of pilot plant to commercial facility or new plant with 160 kg/d (40 MTU/yr) capacity (late 1990s). Reprocessing plant construction has been put on indefinite hold.

AUSTRALIA



AUSTRALIA

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year	Apr. 25	ANZAC Day
Jan. 22	Australia Day	June 10	Queen's Birthday
Mar. 29	Good Friday	Oct. 7	Labor Day
Apr. 1	Easter Monday	Dec. 25-26	Christmas

TIME

Standard Time Washington D.C.: (New S. Wales) + 15 hours
Standard Time Period: 03/03 - 10/27/91

PASSPORT/VISA

A passport is needed to depart and re-enter the United States; in addition, a visa is currently required for a visit to Australia. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 1.27 Australian Dollar
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Australia are complete as listed, after dialing international access code: 011. Country code is 61; listed local numbers include city code.

U.S. EMBASSY - CANBERRA

American Embassy
Moonah Place, Yarralumla
Canberra
Australian Capital
Territory (A.C.T.) 2600

Tel: 61-6-270-5000
Fax: 61-6-270-5970

Scientific Attaché

Donald R. Cleveland

ENERGY

Population	1988	16.5 million
Electric Power Plant Capacity	1988	34.8 GWe
	1990	35.2 GWe
	1995	38.8 GWe
	2000	42.9 GWe
Electric Power Production	1988	139.8 TWh
		76% coal
		11% hydro/geoth.
		11% gas
		2% oil

NUCLEAR POWER

Policy: No nuclear power installed; none planned. Large uranium reserves; uranium currently produced for export. Government sponsors nuclear waste management R&D.

INTERNATIONAL RELATIONSHIPS

Member of IAEA and OECD/NEA.

Cooperative agreements for radioactive waste management R&D (including development of the SYNROC process) with Japan, Italy and the U.K..

Bilateral safeguards agreements (controlled use of Australian-derived uranium) with Japan, Republic of Korea, Philippines, United States, Canada, United Kingdom, France, Switzerland, Sweden, Finland, and Euratom (EC).

The ARAP (Alligator Rivers Analogue Project) is carried out jointly with Japan, Sweden, the U.K., and the U.S. Uranium ore deposit (Koongarra) is being studied to evaluate hydrologic and geochemical processes affecting radionuclide migration.

ORGANIZATION

- Department of Primary Industries and Energy
- Department of Industry, Technology and Commerce
- ANSTO--Australian Nuclear Science and Technology Organization and Lucas Heights Research Laboratory

ANSTO - LUCAS HEIGHTS

Australian Nuclear Science
and Technology Organization
New Illawarra Rd, Lucas Heights
Private Mail Bag 1
Menai NSW 2234
Australia

Tel: 61-2-543-3111
Fax: 61-2-543-5097

Located approx. 30 km southwest of Sidney. (Taxi from Kingsford Smith International Airport.)

Executive Director	Dr. Davidk
Chairman	Prof. Richard E. Collins
Deputy Chairman	Russell Fynmore
General Manager, Scientific	Des Davy
Advanced Materials	Dr. Adam Jostsons
Materials Technology	Dr. Ken U. Snowden
	Tel: 61-2-543-3265
	Fax: 61-2-543-7179
Advanced Ceramics/SYNROC	Dr. Keith D. Reeve
Operations	Alan Ridal
Materials Science	Dr. C. J. Ball
Engineering	Don. J. Mercer
Environmental Science	Dr. John Evans
Nuclear Technology (A)	Des Davy
Nuclear Services	Justin M. Silver

Function: Fuel cycle R&D--HLW immobilization (SYNROC process development and waste form properties), mill tailings treatment, actinide transport, surface hydrology, and radionuclide release.

ANSTO - LUCAS HEIGHTS (contd)

Facilities:

- **Non-radioactive SYNROC Demonstration Plant**
Mission: Engineering-scale tests of SYNROC process to provide data for a conceptual radioactive SYNROC plant design by mid-1991.
Design Basis: 10 kg/h SYNROC (40 cm); all operations compatible with remote handling; highly instrumented and partly automated.
History: Startup, 5/88 (integrated operation of all steps; three days of operation per month since), upgraded in 1990.
- **SYNROC Glove Box Line**
Mission: Produce SYNROC containing actinides/⁹⁹Tc.
Process Scale: Hundreds of grams (batch).
History: Startup, 1984.
- **Hot-Cell Processing Line for SYNROC**
Mission: Produce SYNROC containing beta/gamma-active fission products.
Process Scale: Hundreds of grams (batch).
History: Startup, 1984.
- **Semi-Dry Mixer/Rotary Calciner**
Mission: Detailed process improvements on mixing/calcining nitrate/powder.
Design Basis: 5 kg/h with in-mixer drying to reduce the size of the rotary calciner.
History: Startup, 1988.
- **Alkoxide Powder Preparation Facility**
Mission: Provide fine powders for mixing with nuclear waste slurry.
Design Basis: 100 kg/d.
History: Startup, 1987; upgraded, 1989.
- **Advanced Ceramics Fabrication Laboratory** - with full analytical and materials characterization capability. HIP/CIP.
- **Engineering Plant Design Team** - with 3-D finite element stress analysis, Apollo computers and CAD/CAM.

ANU

Australian National University
P.O. Box 4
Canberra 2600, Australia

Director, Research School
of Earth Sciences

Prof. A. E. Ringwood

Waste Management R&D: HLW immobilization (SYNROC
process).

GRIFFITH UNIVERSITY

Griffith University
Nathan, Queensland 4111
Australia

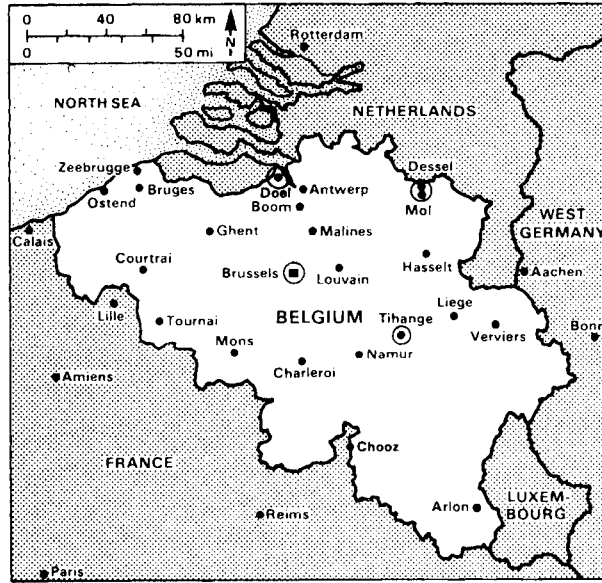
Tel: 61-7-275-7111
Fax:
Tlx: AA 40362

Chancellor

Sir Theodore Bray

Waste Management R&D: Characterization of SYNROC waste
forms.

BELGIUM



BELGIUM

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year	July 21	National Day
Mar. 31-		Aug. 15	Assumption
Apr. 1	Easter	Nov. 1	All Saints
May 1-2	Labor Day	Nov. 15	Dynasty Day
May 9	Ascension	Dec. 25-26	Christmas
May 20	Pentecost		

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time Period: 03/31 - 09/28/91

PASSPORT/VISA

A passport is needed to depart and re-enter the United States. A visa is currently not required for a visit to Belgium; however, it is recommended to consult a travel agency for up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 30.38 Franc
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Belgium are complete as listed, after dialing international access code: 011. Country code is 32; listed local numbers include city code.

U.S. EMBASSY - BRUSSELS

American Embassy
27 Boulevard du Regent
1000 Brussels
Belgium

Tel: 32-2-513-3830
Fax: 32-2-511-2725

Science Counselor Anthony Rock

ENERGY

Population	1988	9.5 million
Electric Power Plant Capacity	1988	14.0 GWe 39% nuclear
	1990	14.0 GWe 40% nuclear
	1995	14.0 GWe 39% nuclear
	2000	15.8 GWe 35% nuclear
	1988	58.6 TWh 66% nuclear 25% coal 4% gas 3% oil 2% hydro/geoth.
Electric Power Production	1990	62% nuclear
	1995	58% nuclear
	2000	51% nuclear

NUCLEAR POWER

Policy: Produce base load electricity by nuclear and coal power plants. Decided against addition of proposed eighth (1300 MWe) nuclear unit (at least during next few years).

Nuclear Power Plant Capacity	1990	5.5 GWe
	1995	5.5 GWe
	2000	5.5 GWe
Reactor Mix	1990	PWR: 7 (1975-85)

INDUSTRIAL FUEL CYCLE

Policy: Well-rounded capability--uranium enrichment (share in Eurodif); MOX and UO₂ fuel fabrication; purchase of foreign reprocessing services; decision made to dismantle former Eurochemic reprocessing plant.

Waste Management Strategy (responsibility of ONDRAF): Vitrify HLW and store 50 years (investigation of HLW, ILW and LLW disposal in clay formations underway); treat and immobilize other wastes; sea-dumping of LLW halted; shallow-ground disposal of LLW under investigation.

Cumulative Spent Fuel	1980	196 tU
Arisings (LWR)	1985	560 tU
	1990	1,290 tU
	2000	3,000 tU

Major Milestone

- Selection/characterization of site for LLW 1990-94
- Storage facility for waste from Belgian fuel reprocessed abroad 1993
- Safety assessment/feasibility report for demonstration of operations in proposed clay repository 1995
- Construction start of HLW repository 2025
- Disposal start of HLW 2030

INTERNATIONAL RELATIONSHIPS

DOE/SCK Agreement in the Field of Radioactive Waste Management

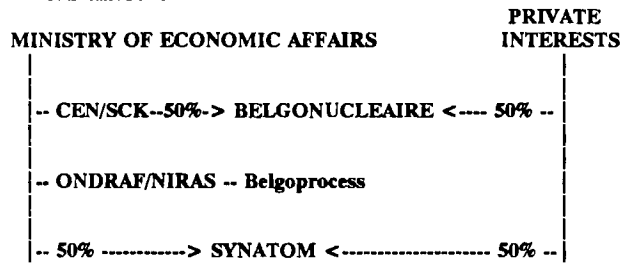
Term: 01-19-81 to 01-19-94.

Scope: Final disposal in geologic formations; retrievable storage; waste processing; environmental effects.

Emphasis: Technology information exchange.

Member of EC, IAEA, OECD/NEA. Partnership in Eurodif uranium enrichment plant (France). Belgian underground research laboratory at Mol is co-sponsored by CEC.

ORGANIZATION

**BELGONUCLEAIRE**

Belgonucleaire S.A.
Rue du Champ de Mars 25
1050 Brussels, Belgium

Tel: 32-2-513-9700
Fax: 32-2-511-0359

General Director

J. Van Dievoet
32-2-513-9690

Function: Provide engineering services for nuclear power plants, nuclear fuel cycle facilities, and waste treatment plants; fabricate MOX fuels.

Sponsor: CEN/SCK (50%), utilities/holding companies (50%).

Facility:

- **MOX Plant** (at Dessel, near Mol)
Mission: Produce MOX fuels for FBRs and LWRs.
Design Capacity: 30 t/a LWR or 10 t/a FBR fuel.
History: Startup, 1973.

BELGOPROCESS

Belgoprocess
Gravenstraat
2480 Dessel, Belgium

Tel: 32-14-24-41-11
Fax: 32-14-31-30-12

[Brussels National Airport (Zaventem); then by rental car or train (1-1/2 hours) to Mol.]

Managing Director	J. Claes
Operations	Paul Luyckx
Decommissioning	L. Teunckens
Safety	J. P. Minon

Activities: Maintenance/dismantling of ex-Eurochem facilities; medium-level waste conditioning; with WAK/FRG, joint operation of PAMELA pilot plant (Mol) which vitrifies liquid high-level radioactive waste; interim waste storage; operation of CEN/SCK waste treatment facility.

Owner: ONDRAF/NIRAS

Facilities:

- **Eurobitum** (bituminization plant)
Mission: Immobilize ILW.
Design Basis: Batch chemical pretreatment; screw extruder-evaporator (continuous); capacity, 650 m³/a ILW.
History: Startup, 1978; on-stream time, 87% through June 1983. Plant now operated as needed.
- **Eurowatt** (hot pilot plant-solvent treatment)
Mission: Treat PUREX (TBP-kerosene) solvent.
Design Basis: Extract TBP with concentrated H₃PO₄, pyrolyze H₃PO₄ fraction; capacity, 1 m³/d.
History: Startup, 1982; now dismantled.
- **PAMELA HLLW Vitrification Plant** [built by FRG (see under WAK in GE Section) and operated by WAK/Belgoprocess team]

BELGOPROCESS (contd)

- **Eurowetcomb** (hot pilot plant-acid digestion)
Mission: Wet combustion of combustible TRU wastes and Pu recovery.
Design Basis: Acid digestion with H_2SO_4 - HNO_3 .
History: Startup, 1982; now shut down.

CEN/SCK (Nuclear Energy Research Center)

Centre d'Étude de l'Énergie
Nucléaire/Studiecentrum
voor Kernenergie
Laboratory of the CEN/SCK
Boeretang 200
2400 Mol
Belgium

Tel: 32-14-31-18-01
Fax: 32-14-31-50-21

Chairman of the Board	I. Van Vaerenbergh
General Manager	Carl M. Malbrain
Geological Disposal Research	Arnold A. Bonne

Owner: Government--Ministry of Economic Affairs.

Waste Management R&D: FBR fuel reprocessing (head-end and off-gas treatment), incineration of TRU wastes, immobilization of cladding hulls, LLW treatment, geologic waste isolation in clay formations.

Facilities:

- **HERMES Pilot Plant** (Head-End Research facility on Mockup Engineering Scale)
Mission: Develop head-end treatment technology for LWR fuels.
Design Basis: Chop-leach; silver zeolite and cryogenic treatment of off gas.

CEN/SCK (contd)

Process Components: Double-pin chopper, critically safe dissolver, centrifugal filtration for solution clarification, fuel residue dissolver, "super dissolver" for cleanup of hulls, off-gas scrubbers, treatment of hulls by high-pressure compaction, encapsulation of compacted hulls.

Throughput: 10 kg irradiated fuel (20-30% PuO₂ in UO₂) per batch.

History: No longer in operation.

- **FLK Slagging Incinerator (radioactive)**
Mission: Volume reduction of combustible, and of selected noncombustible, low-activity TRU wastes.
Design Basis: High-temperature combustion (1200-1500°C); capacity, 50 kg/h; product, insoluble granular slag.
History: Startup, 1975; first tests with Pu-bearing wastes (tens of grams Pu in several tons of waste), 1983; shutdown, 1988.
- **CEN/SCK Waste Preparation Plant**
Mission: Immobilize Belgian LLW.
Design Basis: Stirred evaporator, batch process; capacity, 800 ℓ/h liquid LLW or 100 kg/h dried sludge.
History: Startup, 1964 (liquids), 1970 (solids).
- **HADES Underground Research Laboratory**
Mission: In-situ investigation in a deep clay formation to develop technology for disposal of ILW, TRU waste, and HLW.
Description: Access shaft to -230 m level, 2.65 m useful dia.; laboratory gallery, 3.5 m useful dia. by 30 m length; cast iron liner. Demo/test facility being added for tests with actual wastes.
Test Program: Geomechanical behavior of clay around underground structures, water-flow measurements, in-situ heater tests, clay stability studies, liner stresses, borehole atmospheres, corrosion; test emplacement of HLW and TRU incinerator residues.
History: Laboratory operational, late 1984.

FBFC (French-Belgian Fuel Fabrication Company)

Société Franco-Belge de
Fabrication de Combustibles
Europalaan 12
2480 Dessel
Belgium

Tel: 32-14-31-58-51
Fax: 32-14-31-58-45

Plant Manager

M. Huberlant

Function: Fabrication of fuel assemblies for LWR (capacity: 400 t/a). French owned.

FBFC Tour Manhattan-La Defense

6 Place de l'Iris
92400 Courbevoie, France

Tel: 33-1-4762-8800

MINISTRY OF ECONOMIC AFFAIRS

Ministry of Economic Affairs
Administration of Energy
Rue de Mot, 30
1040 Brussels
Belgium

Tel: 32-2-233-6636
Fax: 32-2-514-0635

MINISTRY OF PUBLIC HEALTH AND ENVIRONMENT

Ministère de la Santé Publique
et de l'Environnement
Quartier Vésale 2-3/32
1010 Brussels
Belgium

Tel: 32-2-210-4978
Fax: 32-2-210-4967

**ONDRAF/NIRAS (National Organization for Radioactive
Wastes and Fissile Materials)**

Organisme National des Déchets
Radioactifs et des Matières
Fissiles (ONDRAF/NIRAS)
Place Madou 1, B.P. 24/25
1030 Brussels
Belgium

Tel: 32-2-212-1011
Fax: 32-2-218-5165

ONDRAF/NIRAS (contd)

Chairman, Board of Directors	M. Frerotte
Chair., Perm. Tech. Committee	F. Deconinck
General Manager	E. Detilleux
Tech. Mgr./Deputy Gen. Mgr.	F. Decamps

Owner: Government.

Function: Define Belgian waste management policy and R&D requirements. Responsible for transportation of radioactive materials, waste treatment/conditioning and interim storage, spent fuel AFR storage, waste disposal; fissile material storage.

The organization is governed by a Board of Directors composed of a president, vice-president, and board members representing various national ministries and local government executives. The Board is advised by a Permanent Technical Committee.

SYNATOM

SYNATOM S.A.
Avenue Marnix, 13
1050 Brussels
Belgium

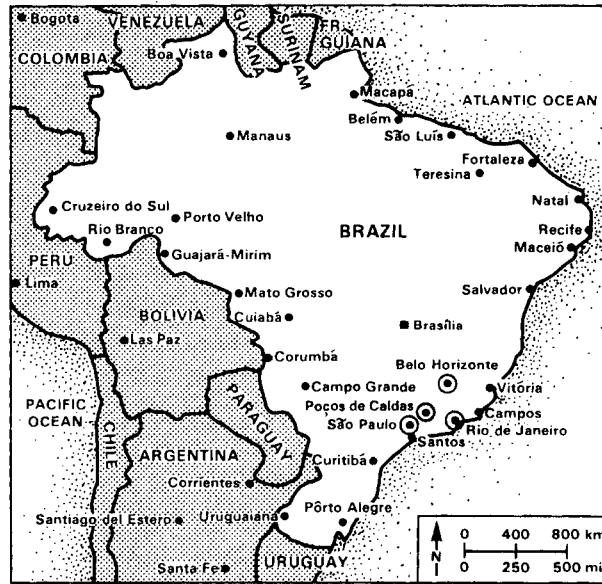
Tel: 32-2-518-66-66
Fax: 32-2-513-10-76

Chairman, Board of Directors	R. De Cort
Managing Director	R. Cayron
General Manager	Pierre Goldschmidt
Fuel Reprocessing Service	Jean Danguy

Function: Provide commercial fuel cycle services for the Belgian nuclear utilities.

Owners: Government/SNI (50%), INTERCOM (20%), EBES (20%), UNERG (10%).

BRAZIL



BRAZIL

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year	Sept. 7	Independence
Feb. 11-12	Carnival	Oct. 12	N.S. Aparecida
Mar. 29	Good Friday	Nov. 2	All Souls
Apr. 21	Labor Day	Nov. 15	Proclamation of the Republic
May 30	Corpus Christi	Dec. 25	Christmas

TIME

Standard Time Washington D.C.: (East/all coast) + 2 hours
Standard Time Period: 02/17 - 10/20/91

PASSPORT/VISA

A passport is needed to depart and re-enter the United States; in addition, a visa is currently required for a visit to Brazil. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 225.00 Cruzados (Cz\$)
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Brazil are complete as listed, after dialing international access code: 011. Country code is 55; listed local numbers include city code.

U.S. EMBASSY - BRASILIA

American Embassy
Avenida das Nações, Lote 3
CEP 70403, Brasilia
Brazil

Tel: 55-61-321-7272
Fax: 55-61-225-9136

Science Counselor

Barbara J. Tobias

ENERGY

Population	1988	147 million
Electric Power Plant Capacity	1988	49 GWe 1% nuclear
Electric Power Production	1988	200.0 TWh ~92% hydro ~ 7% thermal 0.3% nuclear

NUCLEAR POWER

Policy: Ambitious program to develop complete nuclear industry with closed fuel cycle, based upon technology transfer from FRG and other countries.

Nuclear Power Plant Capacity	1990	0.6 GWe
	1995	1.9 GWe
	2000	3.1 GWe
Reactor Mix	1990	PWR: 1 (1984) 2 (1994/97)

Reactor Development: Low power PWR; Research/isotope production reactor (light water/ low enrichment); FBR (experimental).

INDUSTRIAL FUEL CYCLE

Policy: To develop full commercial capability for closed fuel cycle --conversion of U_3O_8 to UF_6 ; enrichment; UO_2 fuel fabrication; fuel reprocessing.

Waste Management Strategy: Not yet defined.

Cumulative Spent Fuel Arisings (LWR)	1989	32 tU
	1990	48 tU
	1995	162 tU
	2000	~412 tU

Demonstration/Production Activities

- Uranium mining and milling: 300 tU₃O₈/a--in operation.
- UF₆ production: (1984) 90 tU/a; planned expansion delayed indefinitely.
- Uranium enrichment (gas centrifuge): small experimental demonstration (1987).
- Uranium enrichment (Becker nozzle process), at Resende:
 - First Cascade, 24 stages; 6 kSWU/a (1985).
 - Second Cascade, 64 kSWU/a (1988).
- Fuel fabrication: 100 tU/a (1982); design capacity--400 tU/a.
- Spent fuel reprocessing: 10 kg/d pilot plant (1986 startup originally scheduled, currently delayed indefinitely).

INTERNATIONAL RELATIONSHIPS**Joint Natural Analog Studies - Pocos de Caldas Project**

Joint study by Sweden, Switzerland, United Kingdom, and United States of migration of radionuclides from ore deposits in Brazil. (Work completed in 1990.)

Member of IAEA (has not signed NPT); dependence on nuclear technology transfer from other nations, principally from FRG.

ORGANIZATION

- Federal Republic--President (Executive), Bicameral National Congress (Legislative), and Supreme Federal Tribunal (Judiciary).
- **Federal Ministry of Mines and Energy**--planning, execution and control of nuclear power program.
 - **Eletrobrás (Centrais Eletricas Brasileiras)**--Planning/ supervision of power plant construction, and operation of transmission/distribution system. Established 1961 to coordinate activities of state, municipal and private utilities. Operates through regional subsidiaries, i.e., FURNAS. Also responsible for appropriate R&D.

ORGANIZATION (contd)

- CSPN (Superior Council for Nuclear Policy)--sets guidelines for nuclear industry and controls CNEN through non-military board.
- CNEN (National Nuclear Energy Commission)--regulatory/R&D. Research Institutes: CDTN, IEN, IPEN, IRD.
 - INB (Brazilian Nuclear Industries)--commercial nuclear fuel cycle activities, uranium mining and processing.
 - Urânio do Brasil, S.A.
 - Ownership: 51% government (CNEN); 49% private.

CDTN (Center for the Development of Nuclear Technology)

Centro de Desenvolvimento de Tecnologia
Nuclear de Nuclebras (CDTN)
Rua Gonçalves Dias No. 1054 Tel: 55-31-441-5422
Belo Horizonte, MG, Brazil Fax:

Director V. Mattos Andrade Silva

Function: Applied research and industrial development of uses for atomic energy. Triga reactor (research/isotope production); laboratory scale enrichment nozzle process.

CNEN (National Nuclear Energy Commission)

Comissão Nacional de Energia Nuclear (CNEN)
Rua General Severiano 90
Botafogo ZC-82, CEP 22290 Tel: 55-21-295-2232
Rio de Janeiro, RJ, Brazil Fax: 55-21-295-6098

President Rex Nazare Alves
Director, Nuclear Safety Luiz Arrieta
Head, Waste Disposal H. R. Franzen

Function: Regulation, financing and licensing of nuclear reactors, fuel cycle facilities and radiation-emitting installations. Promotion of nuclear technology R&D--technology transfer to private industry. Promotion/training of personnel. Controls four research institutes: CDTN, IEN, IPEN, and IRD.

IEN (Nuclear Engineering Institute)

Instituto de Engenharia Nuclear
Cidade Universitária
Ilha do Fundão
Caixa Postal 2186
CEP 20001, Rio de Janeiro, RJ Tel: 55-21-280-3113
Brazil Fax: 55-21-590-2692

Director Alcyr Mauricio

Activities: Nuclear reactor physics; cyclotron radioisotope production; reactor engineering; research reactor operation; metallurgy; nuclear/applied chemistry; nuclear instrumentation (development/production); health physics; mathematics/computation and sodium technology; reactor development.

Facilities:

- Laboratories for Nuclear Chemistry, Metallurgy and Engineering
- Argonaut type reactor - 10 kW
- Sodium loop - 300 kW
- Cyclotron

IPEN (Energy and Nuclear Research Institute)

Instituto de Pesquisas Energeticas e Nucleares
Cidade Universitária
Caixa Postal 11.049 Tel: 55-11-211-6011
Pinheiros Fax:
CEP 01000, São Paulo, Brazil Tlx: 11-23592 IPEN

Superintendent Claudio Rodrigues

Nuclear Activities: Nuclear physics; nuclear medicine; radiobiology; radiation health/safety; engineering/reactor technology/instrumentation; nuclear materials chemistry; isotope and radiation applications/production; nuclear waste disposal; nuclear metallurgy; radiochemistry.

IPEN (contd)**Facilities:**

- 90 tU/a UF₆ conversion plant at Iperó
- Laboratory for spent fuel reprocessing
- Small experimental gas centrifuge uranium enrichment
- Low-power PWR reactor development
- Swimming pool 10 MW reactor (isotope production)

IRD (Health Physics and Dosimetry Institute)

Instituto de Radioproteção e Dosimetria
Avenida das Américas Km 11,5
Barra Da Tijuca
CEP 22700, Rio de Janeiro, RJ
Brazil

Tel: 55-21-5252
Fax:
Tlx: 21-31624 IRD

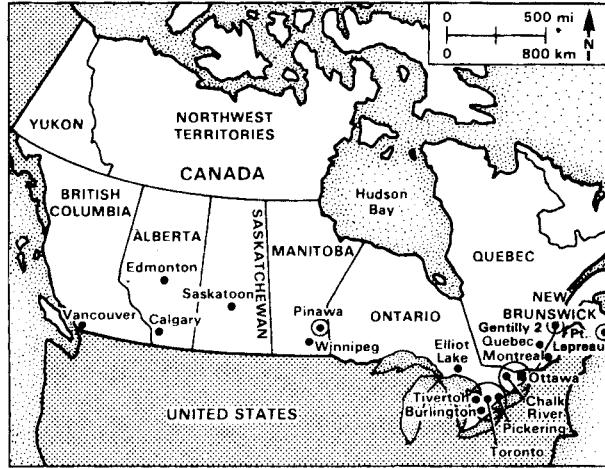
Director Anamelia Habib de Mendonça

Activities: Personal dosimetry control, calibration of radiation detectors, reactor environment control; nuclear medicine and X-ray equipment control, radiobiology, background evaluation, dosimetry research.

Facility

- Brazilian Secondary Standards Dosimetry Laboratory

CANADA



CANADA

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year	July 1	Canada Day
Mar. 29	Good Friday	Sept. 2	Labor Day
Mar. 31-		Oct. 14	Thanksgiving
Apr. 1	Easter	Nov. 11	Remembrance Day
May 20	Victoria Day	Dec. 25-26	Christmas

TIME

Time zones correspond to those in the United States.

Daylight Saving Time period: 04/30 - 10/26/91

PASSPORT/VISA

In lieu of passport, proof of U.S. citizenship such as birth certificate (but not driver's license) is sufficient for a visit to Canada. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 1.16 Canadian Dollar
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Canada are complete as listed. Dial long distance access code: 1, followed by 3-digit area code + 7-digit local number.

U.S. EMBASSY - OTTAWA

American Embassy
100 Wellington Street
Ottawa K1P 5T1
Canada

Tel: 613-238-5335
Fax: 613-238-8750

Science Counselor

Thomas J. Wadja

ENERGY

Population	1988	26.1 million
Electric Power Plant Capacity	1988	97.6 GWe 12% nuclear
	1990	103.9 GWe 13% nuclear
	1995	124.8 GWe 12% nuclear
	2000	145.2 GWe 11% nuclear
Electric Power Production	1988	504.3 TWh 61% hydro/geoth. 19% coal 16% nuclear 2% oil 2% gas
	1990	16% nuclear
	1995	18% nuclear
	2000	16% nuclear

NUCLEAR POWER

Policy: Strong support for domestic use and export of the CANDU reactor system.

Nuclear Power Plant Capacity	1990	13.6 GWe
	1995	15.4 GWe
	2000	15.4 GWe
Reactor Mix	1990	PHWR: 19 (1971-90) 3 (1991-92)

INDUSTRIAL FUEL CYCLE

Policy: Retrievable storage of used fuel for decades, pending assessment of a concept for geologic disposal of nuclear fuel waste.

Waste Management Strategy: Geologic disposal of "nuclear fuel waste," either used CANDU fuel or immobilized HLW, in a crystalline rock repository. Disposal of LLW in engineered, shallow ground facility.

Cumulative Used Fuel	1980	3,650 tU
Arisings (PHWR)	1985	9,000 tU
	1989	14,100 tU
	2000	27,000 tU

Major Milestone

- Start of Federal Government Assessment Review of Nuclear Fuel Waste Management Disposal Concept 1990

INTERNATIONAL RELATIONSHIPS**DOE/AECL Agreement for Cooperation in Radioactive Waste Management**

Term: 09-08-76 to 08-25-92.

Scope: Waste treatment; storage; geological disposal; transportation requirements; operational considerations; environment and safety; public acceptance issues.

Emphasis: Information exchange in radioactive waste management, geological disposal, waste form characterization, waste/used fuel storage, and intercomparison of performance assessment computer models and codes.

Member of IAEA and OECD/NEA. Exchange agreements with the following agencies and countries: DOE/U.S.; CEC Euratom; BMFT/Germany; SKB/Sweden; UKAEA/United Kingdom; PNC, JAERI/Japan; KAERI/Korea; TVO, IVO/Finland; ANDRA/France; and ENRESA/Spain.

ORGANIZATION

- **AECB (Atomic Energy Control Board)**--health and safety regulation, licensing.
- **AECL (Atomic Energy of Canada Limited)**--a Crown Corporation owned by the federal government. Nuclear R&D; design, engineering and sale of CANDU, SLOWPOKE, and research reactors; proprietary rights on CANDU Nuclear Steam Supply Systems; Waste Management R&D at Whiteshell and Chalk River laboratories.
- **OH (Ontario Hydro)**--provincial public utility. Owns/operates 18 CANDU nuclear power plants, totally almost 13,000 MWe and has two more, totalling 1,800 MWe under construction; waste management R&D.
- **HQ (Hydro Quebec)**--provincial public utility. Owns/operates Gentilly 2, a 600 MWe CANDU station.
- **NBEPC (New Brunswick Electric Power Commission)**--provincial public utility. Owns/operates Point Lepreau Nuclear Generating Station, a 600 MWe CANDU.

**FEDERAL GOVERNMENT RESPONSIBILITIES--FUEL
CYCLE/WASTE MANAGEMENT****Ministry of Energy, Mines and Resources (EMR)**

- **Atomic Energy Control Board (AECB)**
 - **Regulations, Licensing**
- **Atomic Energy of Canada, Limited (AECL)**
 - **CANDU Operations**
 - **Reactor Design, Engineering, Export, proprietary rights on CANDU Nuclear Steam Supply Systems**
 - **AECL Research (see CA-5)**
- **Department of Energy, Mines and Resources (EMR)**
 - **Geological Survey of Canada**
 - **Information/Services Branch**
 - **Minerals/Continental Geoscience Branch**
 - **Sedimentary/Cordilleran Geoscience Branch**
 - **Geophysics/Marine Science Branch**
 - **Canadian Centre for Mineral and Energy Technology (CANMET)**
 - **Mining Research Laboratories**
 - **Sudbury Laboratory**
 - **Elliot Lake Laboratory**
 - **Canadian Mining Technology Laboratory**
 - **Mineral Sciences Laboratories**
 - **Radionuclide Recovery from Thorium Mill Tailings**
 - **Metal Technology Laboratories**

**ATOMIC ENERGY OF CANADA LIMITED --
WASTE MANAGEMENT ORGANIZATION**

AECL RESEARCH

- Whiteshell Laboratories (WL)**
 - Environmental Sciences/Waste Management Program**
 - Disposal Technology**
 - Environmental Technology**
- Chalk River Laboratories (CRL)**
 - Waste Management Systems**
 - Health Sciences**
- Research Company Head Office, Ottawa**
 - Low-Level Radioactive Waste Management Office**

AECB

Atomic Energy Control Board
 P.O. Box 1046
 270 Albert Street
 Ottawa, Ontario K1P 5S9
 Canada

Tel: 613-995-5894
 Fax: 613-995-5086

President
 Fuel Cycle/Materials Regulations
 Waste Management
 Fuel/Heavy Water Plant
 Regulatory Research
 Safety/Safeguards Research
 Safeguards/Security

Dr. Rene J. A. Levesque
 W. D. Smythe
 G. C. Jack
 J. P. Didyk
 J. W. Beale
 J. R. Coady
 D. B. Sinden

AECL

Atomic Energy of Canada Ltd.
 344 Slater Street
 Ottawa, Ontario K1A 0S4
 Canada

Tel: 613-237-3270
 Fax: 613-563-9499

Chairman
 President
 President/AECL Research
 Dir./Low-Level Waste Mgmt.

Robert A. Ferchat
 Dr. Stanley R. Hatcher
 Dr. Terry E. Rummery
 Dr. Robert Pollock

Facilities:

- Harbour Test Cell Facility - field test facility for removing contaminated sediments from Port Hope harbour. Sediment dredging/chemical testing take place within a 5-m² enclosure formed by sheet steel pilings driven down to the bedrock. History: Startup, 1987; currently decommissioned.

AECL-CRL

AECL Research

Chalk River Laboratories

Chalk River, Ontario KOJ 1JO
Canada

Tel: 613-584-3311

Fax: 613-589-4024

Health Sciences

Dr. R. V. Osborne

Radiation Biology

Dr. N. E. Gentner

Waste Management Systems

Dr. D. J. Cameron

Facilities

- **WTC (Waste Treatment Center)**
Mission: Development and operation of processes for the treatment of low- and intermediate-level wastes using incineration, compaction, micro-filtration/reverse osmosis, evaporation, ion exchange, pyrohydrolysis, and solidification in bitumen.
- **IRUS (Intrusion Resistant Underground Structure)**
Mission: LL- and ILW repository consisting of three concrete vault "prototype units." Each unit, with a capacity of 2,000 m³ radwaste in drums or bales, will be covered with backfill, roofed with concrete and mounded with earth. Waste can be retrieved from the IRUS module until concrete cap is poured over the vault.
Milestone: Construction start, 1992.
- **IST (Improved Sand Trench)**
Mission: An enhanced shallow-ground concept for the lowest class of low-level waste. It is currently in the conceptual design stage.

AECL-WL

AECL Research
Whiteshell Laboratories
Pinawa, Manitoba ROE 1L0
Canada

Tel: 204-753-2311
Fax: 204-753-8404
Verif: 204-753-2311 ext. 3162

Environmental Sciences and
Waste Management, V.P.
Disposal Technology
Environmental Technology

Dr. Collin J. Allan
Dr. K. W. Dormuth
Dr. K. Nuttal

Facilities:

- **WIPE (Waste Immobilization Process Experiment) - Cold pilot plant vitrification.**
Mission: Develop HLW conditioning process for the CANDU-Thorium fuel cycle.
Design Basis: 10 kg/h glass - rotospray calciner/ceramic melter.
History: Startup, 1983.
- **HPPR (Hot Pilot Plant Reprocessing)**
Mission: Develop CANDU-Thorium fuel cycle technology; provide HLW for studies.
Design Basis: Thorex process, mixer-settlers; capacity, 0.3 kg/d.
- **BITF (Borehole Instrumentation Test Facility)**
Mission: Test and calibrate geotechnical borehole instruments under pressure, temperature, and chemical conditions that could exist in exploration boreholes to depths of 1200 m below ground surface in granitic rock.
Design Basis: Stainless steel vertical test chamber to simulate a 10 m long borehole section, 76 mm inside diameter. Temperature, pressure, flow rates, and water chemistry can be precisely controlled and monitored.
History: Startup, 1983.

AECL-WL (contd)

- **URL (Underground Research Laboratory)**, located about 20 km northeast of WL in the Lac du Bonnet granite batholith.
Mission: Provide a facility in a representative geological environment for in situ experiments and demonstrations to develop and assess the tools and methods for designing, constructing, and operating nuclear fuel waste disposal facilities.
Design Basis: Vertical shaft with shaft stations at 130 m, 240 m, 300 m, and 420 m depths. Licensed radioactive sources and tracers may be used, but no radioactive wastes can be employed. A series of nine experiments are in progress on the 240- and 420-m levels and in the surrounding rock mass.
History: Underground access development complete in 1990; major experiments began in 1988.
- **HTF (Hydrostatic Test Facility)**
Mission: Test the performance of containers made of different metals under temperature and pressure conditions that could exist in an underground disposal vault.
Design Basis: Carbon steel pressure chamber with a test cavity 1.5 m in diameter and 3 m in depth contained in a 4 m x 4 m x 4.6 m deep concrete-lined pit. Temperature/pressure can be adjusted and controlled over long periods of time. Available test pressure and temperature - 10 MPa at 150° C.
History: Startup, 1984.
- **IFTF (Immobilized Fuel Test Facility)**
Mission: Test the effects of water, heat and pressure on waste forms, containers, buffer, and rock in the presence of a radiation field. Waste forms include used fuel and fuel recycle glass or glass-ceramics.
Design Basis: A high-level radiation source used in concrete canisters to measure corrosion of metals; "warm cells" for experiments involving moderate levels of radiation. Three Laboratories: Analytical, Low Activity Examination, and Alpha.
History: First canister loaded, August 1984.

AECL-WL (contd)

- LBRMF (Large Block Radionuclide Migration Facility)**
Mission: Study the migration of non-reactive and reactive contaminants, including radionuclides, over a distance up to 1 m through natural fractures in quarried intact rock. Determine the spatial distribution of sorbed radionuclides on fracture surfaces and in the rock matrix at the end of the migration experiments.
Design Basis: The facility consists of an experimental section, equipped with moveable active fume hoods to hold quarried rock, and an analysis section, equipped with a 2-D gamma scanner, active fume hoods, and equipment to handle blocks of rock up to 2000 kg.
History: Joint migration experiment with U.S. DOE, using uranine, ^{131}I , and ^{137}Cs , has been completed and results published. Second experiment, using uranine, ^3H , ^{85}Sr , $^{85\text{m}}\text{Tc}$, ^{137}Cs , and ^{144}Ce has been completed. Third experiment, using ^{85}Sr , ^{131}I , ^{137}Cs , ^{144}Ce , ^{152}Eu , ^{237}Np , ^{238}Pu , is being carried out for PNC. Colloid migration experiments are planned.

CAMECO

Canadian Mining & Energy Corporation
 2121 11th Street West
 Saskatoon, Saskatchewan
 S7M 1J3, Canada

Tel: 306-956-6200
 Fax: 306-956-6201

Chairman
 President/COO

William A. Gatenby
 Bernard Michel

Commercial mining and energy operation jointly owned by the governments of Canada and Saskatchewan.

EMR

Energy, Mines and Resources Canada
 Science and Technology
 580 Booth Street
 Ottawa, Ontario K1A 0E4
 Canada

Tel: 613-995-3065
 Fax: 613-996-6424

Dir. Gen., Electricity Branch
 Dir., Radioactive Waste Mgmt.

Dr. R. W. Morrison
 Peter Brown

EMR-CANMET

EMR-Canada Centre for Mineral
and Energy Technology

555 Booth Street
Ottawa, Ontario K1A 0G1
Canada

Tel: 613-995-3065
Fax: 613-996-9673

Dir.Gen., Policy Plng./Serv.
Dir.Gen., Mineral Tech. Branch
Rock Mechanics
Waste Mgmt., Elliot Lake

J. Ferron
Dr. J. T. Udd
G. E. Larocque
R. Tervo

Laboratories:

Mineral Sciences
Canadian Mining Technology
Mining Research Laboratories
Elliot Lake, Ontario P5A 1T6, Canada

EMR-GSC

EMR-Geological Survey of Canada

601 Booth Street
Ottawa, Ontario K1A 0E8
Canada

Tel: 613-992-5910
Fax: 613-995-3082

Assistant Deputy Minister
Chief Scientist

Dr. E. A. Babcock
Dr. Robin Riddihough

OH

Ontario Hydro
700 University Avenue
Toronto, Ontario M5G 1X6
Canada

Tel: 416-592-5111
Fax: 416-592-4485

Director, Design/Development
Nuclear Materials Management
Radioactive Mtls. Management
Radioactive Mtls. Storage
Fuel Cycle, Isotope

H. S. Irvine
D. W. Souther
P. Stevens-Guille
P. J. Armstrong
R. A. McEachran

OH (contd)**RWOS (Radioactive Waste Operations Site)**

Bruce Nuclear Power Development

Box 1540

Tiverton, Ontario, NOG 2T0

Canada

Tel: 519-368-7031 ext. 3383

Fax: 519-368-7031 ext. 4345

Contact:

Brian Vaughan

Function: Process/store low- and intermediate-level radioactive waste from Ontario Hydro CANDU reactors and research/maintenance facilities.

Facilities:

- **WVRF (Waste Volume Reduction Facility)**
Processing Equipment: Two-chamber pyrolysis incinerator with a capacity of 30 kg/h; baler with a compaction force of 1100 kPa and low force drum crusher.
History: Startup, 1977.

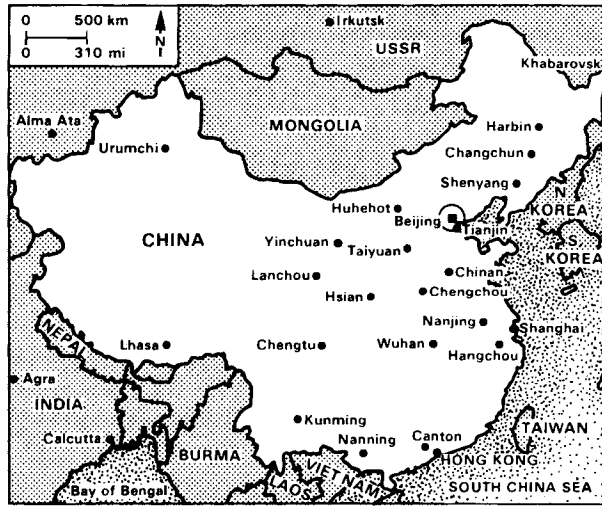
- **Low-Level Waste Storage:**
5 above-ground warehouse-type buildings; waste with a radiation field of <1R/h at 30 cm is stored in stackable containers with a storage capacity of 8000 m³.

15 trenches; reinforced concrete structures ~3 m below ground; designed for waste with radiation fields >1R/h but <15 R/h. Storage capacity ranges from 360 to 680 m³ each.

15 quadricells; above-ground, reinforced concrete structures; sufficient shielding for storage of waste with radiation fields of >15 R/h, e.g., ion exchange resins, filters and reactor core components. Storage capacity is 24 m³ each.

296 in-ground containers; welded steel liners concreted into augered holes; designed for storage of waste with radiation fields >15 R/h, e.g., ion exchange resins, filters and reactor core components. Storage capacity ranges from 1 to 18 m³.

CHINA
(People's Republic of China)



CHINA
(People's Republic of China)

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year
Feb. 15-16	Spring Festival
Mar. 6	Women's Day
May 1	Labor Day
June 1	Children's Day
Aug. 1	Army Day
Oct. 1-2	National Liberation

TIME

Standard Time Washington D.C.:	+ 13 hours
Daylight Saving Time Period:	04/14 - 09/14/91

PASSPORT/VISA

A passport is needed to depart and re-enter the United States; in addition, a visa is currently required for a visit to the People's Republic of China. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 5.23 Yuan
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

U.S. EMBASSY - BEIJING

American Embassy	
Xiu Shui Bei Jie 3	
Beijing 100600	Tel: 86-1-532-3831
People's Republic of China	Fax: 86-1-532-3178
Science Attaché	Andres Onate

ENERGY

Population	1988	1.09 billion
Electric Power Plant Capacity	1988	114 GWe
Electric Power Production	1988	545 TWh ~70% coal ~24% oil ~ 6% hydro/geoth.

NUCLEAR POWER

Policy: Develop nuclear power as one of three major sources of energy to solve problems caused by uneven distribution of resources; be self-sufficient, but introduce foreign advanced technology.

Nuclear Power Plant Capacity	1991	0.3 GWe
	1995	2.1 GWe
	2000	2.1 GWe
Reactor Mix	1990	PWR: 3 (1991-93)
Reactor Development		BWR, HTR, FBR

INDUSTRIAL FUEL CYCLE

Policy: Retrievable storage of spent fuel for 5-8 years, followed by reprocessing and vitrification; final disposal in deep geologic formation. Activities include uranium mining, milling, and diffusion enrichment; isotope separation, fuel fabrication, future spent fuel reprocessing.

Waste Management Strategy: Interim storage of spent fuel in pools if <1,000 tU, in transport/storage casks if >1,000 tU. Interim storage, reprocessing, vitrification, and fuel disposal all to be at one site, to be selected in the Gobi Desert. Plan for a small pilot reprocessing plant, followed by a commercial-sized facility, about 500 tU/a.

INTERNATIONAL RELATIONSHIPS

Member of IAEA. Cooperative agreements have been signed with Argentina, Canada, France, Germany, Italy, Japan and the U.S.

ORGANIZATION

- CNNC (China National Nuclear Corporation) -- fuel cycle development
 - IAE (Institute of Atomic Energy)
 - INET (Institute of Nuclear Energy Technology)
 - CNEC (China Nuclear Engineering Corporation)
 - handles import and export.
 - China Zhongyuan Engineering Corporation
 - provides technical services and engineering work, contracts building projects.
- NNSA (National Nuclear Safety Administration) -- responsible for standards/regulations, construction permits/operating licenses, monitoring plant operations; conducts joint safety research with other nations.
- Southwest Institute of Physics -- nuclear R&D.

CNEC

China Nuclear Engineering
Corporation
P.O. Box 840
Beijing
People's Republic of China

Tel: 86-1-89-4794
Fax:
Tlx: 22240 CNEC-CN

Manager
Deputy Manager
Contact

Jia Dexian
Wu Fuxin
Song Ruo

CNEIC

Chinese Nuclear Energy
Industry Corporation

Expected to construct two final LLW/ILW disposal facilities; one in Zhejiang Province (eastern China) for waste from Qinshan and Daya Bay reactors; the other in the District of Taishan (northwest).

CNNC

China National Nuclear Corporation
c/o Ministry of Energy Resources
P.O. Box 2102
Beijing
People's Republic of China

Tel: 86-1-86-7784
Fax:
Tlx: 222315 FACNC CN

General Manager
Science/Tech.Com., V.Chairman
Nuclear Fuel Department

Jiang Xingxiang
Lu Rong'Guang
Wang Xiaoli

General Machinery Research Institute

General Machinery Research
Institute
Shu Shan Road
Hefei City, Province Anhui
People's Republic of China

Tel: 86-3-1337
Fax:

Contact

Schou Gang

IAE

Institute of Atomic Energy
Academia Sinica
P.O. Box 275 (4)
Beijing, People's Republic of China

Tel:
Fax:

Director
Honorary Director

Sun Zuxun
Dai Cuanzheng

Waste Management R&D: HLW vitrification, waste form characterization; pilot plants to be built.

INET

Institute of Nuclear Energy Technology
Qinghua University
P.O. Box 1021
Beijing, People's Republic of China

Tel:
Fax:

Director Prof. Wang Dazhong
Dep. Dir., Radiochem. Technology Prof. Zhu Yong-jun

Designed/built low-temperature reactor (5 MWth), located in
Changping Suburb, which provides central heating in Beijing.

NNSA

National Nuclear Safety
Administration
54 San Lihe Rd.
Beijing
People's Republic of China

Tel: 86-1-86-8361
Fax:

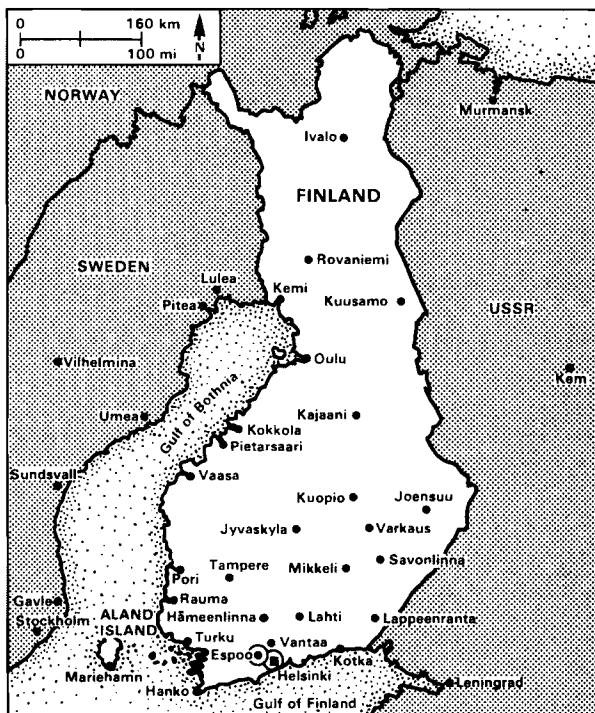
Director General Zhou Pin
Chief Engineer Lin Chengge
Dep. Chief Engineer Dong Bonian
Dep. Div. Chief Xu Wanjin
Dep. Div. Chief Li Zhiyu

YIBIN

Yibin Nuclear Fuel Fabrication
Sichuan

Plant produces fuel for the 300 MWe PWR being built at
Qinshan (near Shanghai) and is to upgrade its facility to supply
the two 900 MWe PWRs under construction at Daya Bay (near
Hong Kong).

FINLAND



FINLAND

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year
Mar. 29	Good Friday
Mar. 31-Apr. 1	Easter
May 1	May Day
June 21	Midsummer Eve
Dec. 6	Independence Day
Dec. 24-26	Christmas

TIME

Standard Time Washington D.C.: + 7 hours
Daylight Saving Time Period: 03/31 - 09/28/91

PASSPORT/VISA

A passport is needed to depart and re-enter the United States. A visa is currently not required for a visit to Finland; however, it is recommended to consult a travel agency for up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 3.57 Markka (FIM)
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Finland are complete as listed, after dialing international access code: 011. Country code is 358; listed local numbers include city code.

U.S. EMBASSY - HELSINKI

American Embassy
Itainen Puistotie 14A
00140 Helsinki
Finland

Tel: 358-0-17-1931
Fax: 358-0-17-4681

ENERGY

Population	1988	5.0 million
Electric Power Plant Capacity	1988	11.9 GWe 19% nuclear
	1990	12.6 GWe 18% nuclear
	1995	13.6 GWe 17% nuclear
	2000	15.1 GWe 15% nuclear
	Electric Power Production	1988
	1990	30% nuclear
	1995	27% nuclear
	2000	25% nuclear

NUCLEAR POWER

Nuclear Power Plant Capacity	1990	2.3 GWe
	1995	2.3 GWe
	2000	2.3 GWe
Reactor Mix	1990	PWR: 2 (1977/81) BWR: 2 (1979/82)

INDUSTRIAL FUEL CYCLE

Policy: Purchase fuel and fuel cycle services from other countries (spent fuel from Soviet-built reactors is returned to USSR).

Waste Management Strategy: According to current plans, spent fuels (non-Soviet fuels) will be stored for 40 years, then placed in granitic bedrock; reactor wastes are conditioned and stored above ground at the nuclear power station sites. Reactor and decommissioning wastes will be disposed of in granitic bedrock.

Cumulative Spent Fuel Arisings (LWR), tU		<u>TVO</u>	<u>IVO</u>
	1980	22	46
	1985	228	140
	1990	450	270
	2000	880	500

Major Milestones

- Complete LLW/ILW repository (TVO) 1992
- Complete LLW/ILW repository (IVO) ~1997
- Complete repository site selection (spent fuel, TVO) 2000
- Complete repository (spent fuel, TVO) 2020

INTERNATIONAL RELATIONSHIPS

Member of IAEA and OECD/NEA. Collaboration with Sweden, Canada, Denmark, Norway, and Switzerland in waste management studies. Purchases of fuel cycle services: disposal of spent fuel, from USSR for IVO; uranium, conversion/enrichment, fuel element fabrication from various foreign countries, including the USSR and China for TVO.

ORGANIZATION

- **Nuclear Energy Commission**--advisory organization for matters connected with the use of nuclear energy.
- **Advisory Committee on Nuclear Safety**--advisory organization.
- **IVO** (government-owned power company)--operates two Soviet-built PWR reactors.
- **TVO** (power company, jointly owned by IVO and several industrial companies)--operates two Swedish-built BWR reactors.
- **VTT** (Technical Research Center)--nuclear research, including waste management R&D.
- **STUK** (Finnish Centre for Radiation and Nuclear Safety)--regulatory authority which also conducts research, in particular, related to transport of radionuclides in biosphere.
- **Geological Survey of Finland**--bedrock-related research.
- **University of Helsinki**--basic research on radiochemistry.

ADVISORY COMMITTEE ON NUCLEAR SAFETY

Advisory Committee on Nuclear Safety
Ydinturvallisuusneuvottelukunta
Säteilyturvallisuuskeskus
Kumpulantie 7
00520 Helsinki
Finland

Tel: 358-0-708-21
Fax: 358-0-708-2392

Chairman
Secretary-General

Prof. Jarl Forstén
Hannu H. Koponen

Function: Advisory organization for safety matters connected with the use of nuclear energy. Coordinated by the Finnish Centre for Radiation and Nuclear Safety (STUK).

GEOLOGICAL SURVEY OF FINLAND

Geological Survey of Finland
Betonimiehenkuja 4
02150 Espoo
Finland

Tel: 358-0-469-31
Fax: 358-0-462-205

Director
Nuclear Waste Disposal

Prof. K. Korpela
Paavo Vuorela

IVO (National Power Company)

Imatran Voima Oy (IVO)
Rajatorpantie 8
01600 Vantaa
Finland

Tel: 358-0-5081
Fax: 358-0-563-6823

Nuclear Waste

Jussi-Pekka Palmu

Function: Operate two nuclear power plants (Soviet built) at Loviisa, southeastern Finland.

Owner: Government.

NUCLEAR ENERGY COMMISSION

Nuclear Energy Commission
Ydinenergianeuvottelukunta
Kauppa- ja teollisuusministeriö
Pohjoinen Makasiinikatu 6
00130 Helsinki
Finland

Tel: 358-0-160-5229
Fax: 358-0-160-2695

Chairman
Secretary-General

Prof. Jorma Routti
Sakari Immonen

Function: Advisory organization for general matters connected with the use of nuclear energy. Coordinated by the Ministry of Trade and Industry.

STUK (Finnish Centre for Radiation and Nuclear Safety)

Finnish Centre for Radiation
and Nuclear Safety
P.O. Box 268
Kumpulantie 7
00520 Helsinki
Finland

Tel: 358-0-7082-1
Fax: 358-0-7082-392

Director
Nuclear Fuel Cycle
Nuclear Waste

Prof. Antti Vuorinen
Hannu H. Koponen
Esko Ruokola

Function: Regulatory enforcement and inspection authority. Also, research related to transport of radionuclides in biosphere.

TVO (Industrial Power Company)

Teollisuuden Voima Oy (TVO)
Fredrikinkatu 51-53 B
00100 Helsinki, Finland

Tel: 358-0-605-022
Fax: 358-0-605-135

Nuclear Waste

Veijo Ryhänen

Function: Operate two nuclear power plants (Swedish BWRs) at Olkiluoto in Eurajoki, southwestern Finland.

Owners: Government 43%; private 57%.

TVO (contd)**Facilities:**

- **KPA-STORE** (Interim storage facility for spent nuclear fuel) located at reactor site. First stage, construction of three pools (capacity of 600-900 tU, depending on choice of storage racks) completed November 1987. Expansion of capacity to 1,200-1,800 tU planned in second stage.
- **VLJ Repository** located at reactor site. Low- and intermediate-level wastes packaged in metal drums/containers will be buried in two silos 70-100 m deep. ILW silo has reinforced 0.6 m concrete liner. Construction start 4/88; completion 1992.

VTT (Technical Research Center of Finland)**VTT Nuclear Engineering Laboratory**

P.O. Box 169

00181 Helsinki

Finland

Tel: 358-0-648-931

Fax: 358-0-603-626

Director

Nuclear Waste Management

Dr. Lasse Mattila

Dr. Seppo Vuori

R&D Activities: Safety analysis/performance assessment, geologic disposal.

VTT Reactor Laboratory

Otakaari 3A

02150 Espoo

Finland

Tel: 358-0-4561

Fax: 358-0-4610-85

Director

Nuclear Waste Management

Prof. Pekka Hiismaki

Arto Muurinen

R&D Activities: Leaching and dissolution of spent fuel under repository conditions; properties of barrier materials; near-field chemistry in repositories and long-term stability of ILW forms; decommissioning of nuclear power plants.

VTT (contd)**VTT Metals Laboratory**

Kemistintie 3
02150 Espoo
Finland

Tel: 358-0-4561
Fax: 358-0-4356-7002

Director
Nuc. Fuel Mtl. Research

Dr. Jari Forsten
Esa Vitikainen

R&D Activities: Corrosion of encapsulation materials in repository conditions; nuclear fuel studies.

VTT Geotechnical Laboratory

Betonimiehenkuja 1
02150 Espoo
Finland

Tel: 358-0-4561
Fax: 358-0-467-927

Director
Rock Mechanics

Dr. Markku Tamminne
Dr. Kari Saari

UNIVERSITY OF HELSINKI

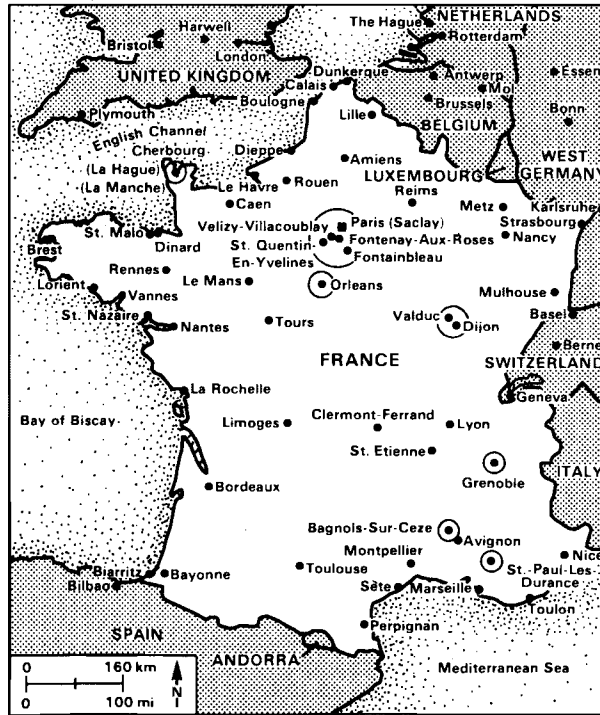
University of Helsinki
Department of Radiochemistry
Unioninkatu 35
00170 Helsinki
Finland

Tel: 358-0-1911
Fax: 358-0-6565-91

Director

Prof. T. Jaakkola

FRANCE



FRANCE

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year	July 14	Bastille Day
Mar. 31-		Aug. 15	Assumption
Apr. 1	Easter	Nov. 1	All Saints
May 1	Labor Day	Nov. 11	Remembrance Day
May 9	Ascension		
May 19-20	Pentecost	Dec. 25	Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time Period: 03/31 - 09/28/91

PASSPORT/VISA

A passport is needed to depart and re-enter the United States; in addition, a visa is currently required for travel to France, unless a personal passport is used for the visit. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 5.01 Franc
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to France are complete as listed, after dialing international access code: 011. Country code is 33; listed local numbers include city code.

U.S. EMBASSY - PARIS

American Embassy
2 Avenue Gabriel
75382 Paris
France

Tel: 33-1-42-96-12-02
Fax: 33-1-42-61-80-75

Science Counselor

Michael A. Michaud

ENERGY

Population	1988	55.5 million
Electric Power Plant Capacity	1988	101.0 GWe 52% nuclear
	1990	102.8 GWe 54% nuclear
	1995	106.7 GWe 58% nuclear
	2000	106.7 GWe 59% nuclear
Electric Power Production	1988	391.9 TWh 70% nuclear 20% hydro/geoth. 7% coal 2% oil 1% gas
	1990	76% nuclear
	1995	76% nuclear
	2000	78% nuclear

NUCLEAR POWER

Policy: Vigorous nuclear power program, scaled down recently to construction of less than one new reactor per year; commercialization of the breeder reactor; export of nuclear plants and services.

Nuclear Power Plant Capacity	1990	55.7 GWe
	1995	61.2 GWe
	2000	64.1 GWe
Reactor Mix	1990	GCR: 2 (1971/72)
		PWR: 52 (1967-90)
		4 (1992/93)
		LMFBR: 1 (1974)
		1 (*)

*Initial criticality in 1985, commercial start pending completion of remedial work.

INDUSTRIAL FUEL CYCLE

Policy: Maintain full domestic fuel cycle capability; aggressive export of fuel cycle plants, equipment and services (including uranium enrichment and spent fuel reprocessing).

Waste Management Strategy: HLW--vitrify and store in engineered storage facility for indefinite period, then emplace in geologic repository (granite, salt, clay or schist). LLW--immobilize in bitumen, concrete or resin and dispose in engineered surface facility.

Cumulative (PWR) Spent Fuel Arisings, tU	<u>1980</u>	<u>1985</u>	<u>1990</u>	<u>2000</u>
	248	2,900	7,300	20,000
Cumulative Waste Arisings, m ³		<u>1983</u>	<u>1990</u>	<u>2000</u>
vitrified HLW		250	750	3,000
packaged TRU waste		10,000	20,000	60,000
packaged LLW/ILW		250,000	450,000	800,000

Industrial-Scale Activities

- Uranium mining and milling (tU/a): 3,920 (1988)
- Uranium enrichment (kSWU/a)
 - Pierrelatte, gaseous diffusion: 600
 - Eurodif, gaseous diffusion: 10,800
- Fuel fabrication (tHM/a)
 - UO₂: 1,400
 - MOX: 50 (LWR fuels)
- Spent fuel reprocessing (t/a)
 - Marcoule: 400 (U metal fuels)
 - La Hague: 1,200 (UO₂, LWR fuels)

Major Milestones

- LLW disposal facility (Centre de l'Aube) 1991
- T7 vitrification plant (La Hague) 1992
- UP2-800 reprocessing plant (La Hague) 1992
- Melox (MOX fuel fabrication plant-Marcoule) 1993
- Underground Research Laboratory
(Completion date uncertain)

INTERNATIONAL RELATIONSHIPS**DOE/CEA Umbrella Agreement for Cooperative Radioactive Waste Management Technology Exchange**

Term: 07-26-83 to 07-26-93.

Scope: Préparation/packaging; D&D; waste/spent fuel storage; geologic disposal; transportation requirements.

Emphasis: Technical workshops in the areas of LLW and TRU waste management; exchange of waste repository site characterization technology and data for granite and salt host rocks.

Member of EC, IAEA and OECD/NEA. Major role in Eurodif uranium enrichment consortium (COGEMA). Partnership with German and British companies in United Reprocessors GmbH (COGEMA) and in Nuclear Transport, Ltd. (Transnucléaire).

ORGANIZATION

- **CEA (Atomic Energy Commission)**--controls practically all nuclear R&D; controls long-term waste management, disposal included (ANDRA)
 - Nuclear Research Centers:** Cadarache, Fontenay-aux-Roses, Grenoble, Valrho, Saclay
- **CEA INDUSTRY:** Industrial group concerned with all industrial fuel cycle activities in France
 - **COGEMA (CEA 100%):** mining, reprocessing
 - **COMURHEX (COGEMA 49%):** uranium conversion
 - **EURODIF (COGEMA 51.5%):** commercial enrichment
 - **SICN (100%), FRAGEMMA (50%), FBFC (50%), COMMOX (50%) - COGEMA subsidiaries:** fuel fabrication
 - **SGN, USSI (COGEMA part subsidiary)**
 - **TECHNICATOME (90% CEA):** design, construction, operation of fuel cycle and/or waste facilities
 - **STMI (60% CEA):** waste management, decontamination, dismantling services
 - **TRANSNUCLÉAIRE:** transport
- **EdF (Electricité de France, 100% government)**-- public power generation; owns and operates all nuclear plants except Phenix (50% EdF, 50% CEA) and SuperPhenix (NERSA: 51% EdF, 33% ENEL, 16% RWE)

CEA STRUCTURE

Minister of Industry, Telecommunication and Tourism

- CEA CHAIRMAN - Philippe Rouvillois**
- HIGH COMMISSIONER - Jean Teillac**

OPERATIONS UNITS

- DAM - Military Applications - Roger Baleras**
- IPSN - Institute for Nuclear Safety - Jean Rastoin**
- Direction des Sc.de la Matière - Robert Ayma**
- Direction des Sc.du Vivant - Michel Suscillon**
- Direction des Reacteurs Nucleaires - Jacques Bouchard**
- Direction des Cycles du Combustible - Jean-Yves Barre**
- Direction des Techniques Avancées - Yannick Escatha**
- ANDRA - National Agency for Waste Management -
Henri-Edme Wallard**

RESEARCH CENTERS

- CEN (see Page FR-6)**

COGEMA

- La Hague Center
 - Reprocessing (LWR)
 - AVH - Vitrification
- Marcoule Center
 - AVM - Vitrification
 - Melox - MOX Fuel Fabrication

CEA

RESEARCH CENTERS (CEN)

- Cadarache - Georges Vial, Director
 - MOX Fuel
 - TRU Waste and LLW/ILW
 - Environmental
- Fontenay-aux-Roses - Georges Devic, Director
 - Disposal R&D
 - MOX Fuel
 - TRU Waste and LLW/ILW
 - Engineered Barriers
 - Safety and Health Protection
- Grenoble - Francis DeCool, Director
- Saclay - Jean Bazin, Director
 - MOX Fuel Fabrication
 - TRU Waste and LLW/ILW Treatment
 - Engineered Barriers
- Valrho - Albert Teboul, Director
 - APM - Reprocessing (Metal)
 - FBR Fuel Cycle
 - Reprocessing
 - ILLW
 - TRU Waste and LLW/ILW R&D

ANDRA (National Agency for Radioactive Waste Management)

Agence Nationale pour la Gestion
des Déchets Radioactifs
Commissariat à l'Energie Atomique
Route Du Panorama Robert Schumann
B.P. 38

92266 Fontenay-aux-

Roses Cedex

France

Tel: 33-1-46-54-7080

Fax: 33-1-46-54-9925

Director
Deputy Director
Deputy Director

Henri-Edme Wallard
M. Faussat
Yves Marque

Function: Design, construct and manage long-term waste disposal centers; establish radioactive waste packaging/disposal specifications; contribute to R&D programs related to long-term waste disposal.

Facilities:

- **Centre de la Manche**
B.P. 71
50140 Beaumont-Hague

Mission: Disposal of ILW and LLW; capacity: 480,000 m³ (1988: 350,000 m³ in place; to be full and shut down in early 1990s).

- **Two new centers** planned; one site approved (1987): Soulaïnes (Aube), to be commissioned in 1991; will accommodate 1,000,000 m³ of IL/LLW over a period of 30 years.
- **Four possible sites** (in clay, granite, schist and salt) selected for characterization of underground HLW disposal. Site characterization 1-year moratorium during 1990/91; HOW disposal program under reevaluation; disposal facility --2000/TRU; 2010/HLW glass.

BRGM (Bureau of Geological and Mineral Research)

Bureau de Recherches Géologiques
et Minières

B.P. 6009

45060 Orléans Cedex 2
France

Tel: 33-38-64-36-34
Fax: 33-38-64-36-43

Director
Managing Director, Geology
Waste Storage
Hydrogeology
Geotechnology

Jean Pierre Hugon
H. Astie
P. F. R. Peudecerf
J. J. Collin
Ph. Masure

CEA (Atomic Energy Commission)

Commissariat à l'Energie
Atomique (CEA)

Centre d'Etudes Nucléaires (CEN)

31-33, Rue de la Fédération

75752 Paris Cedex 15

France

Tel: 33-1-40-56-10-00
Fax: 33-1-42-53-91-22

Chairman
High Commissioner

Philippe Rouvillois
Jean Teillac

CEA-IPSN (Institute for Nuclear Safety)

Institut de Protection et de
Sûreté Nucléaire (IPSN)

B.P. 6

92260 Fontenay-aux-Roses

France

Tel: 33-1-46-54-70-80
Fax: 33-1-47-35-14-23

Director
Dep. Director
Dir., Nuc. Security Research
Dir., Safety
Dir., Protection
Waste Protection Research

Jean Rastoin
Philippe Vesserou
Michel Livolant
Daniel Quenart
Annie Sugier
Anne-Marie Chapuis
33-1-46-54-72-33
Christian Devillers
33-1-46-54-70-53

Safety Analysis Services

CEA/CEN-CA (Cadache Nuclear Research Center)

Centre d'Etudes Nucléaires
de Cadarache

B.P. 1

13115 Saint-Paul-lez Durance
France

Tel: 33-42-25-24-68

Fax: 33-42-25-45-45

Director

Georg Vial

(Marseille-Marignane Airport; 65 km to Cadarache by car.)

Waste Management R&D: Treatment of TRU waste, LLW, and ILW; properties of non-HLW waste forms and waste isolation (radionuclide migration).

Facilities:

- **Solid Waste Treatment Pilot Plant (Prolxe, Ellse)**
Mission: TRU solid waste reduction by cryogenic crushing and Pu recovery by acid leaching.
Design Capacity: Eight 100 liter drums per batch, one batch every 24 - 48 hours.
History: Startup, 1985.
- **Bituminization Plant**
Design Basis: Immobilize reactor wastes; twin- screw extruder; capacity, 260 m³/a.
History: Startup, 1977.
- **MOX Fuel Fabrication**
- **LLW Incinerator**
- **Resin Embedding Pilot Facility**
- **Solvent Incinerator**

CEA/CEN-FaR (Fontenay-Aux-Roses Nuclear Research Center)

Centre d'Etudes Nucléaires
de Fontenay-aux-Roses

B.P. 6

92265 Fontenay-aux-Roses

France

Tel: 33-1-46-54-80-00

Fax: 33-1-46-54-75-22

Director

Georges Devic

CEA/CEN-G (Grenoble Nuclear Research Center)

Centre d'Etudes Nucléaires
de Grenoble

B.P. 85

38041 Grenoble Cedex

France

Tel: 33-76-97-41-11

Fax: 33-76-88-34-32

Director

Francis DeCool

Facility:

- **Waste Resin Embedding Facility**

CEA/CEN-VRH (Marcoule Nuclear Research Center)

Centre d'Etudes Nucléaires
de la Vallée du Rhône

B.P. 171

30205 Bagnols-sur-Ceze Cedex

Marcoule, France

Tel: 33-66-79-60-00

Fax: 33-66-89-38-50

Director

Albert Teboul

Manager, HLW

Claude Sombret

33-66-79-63-62

Deputy Manager

Jean-Pierre Moncouyoux

33-66-79-63-78

Decommissioning (DERD/VOIN)

Claude Lafaille

CEA/CEN-VRH (contd)**Facilities:**

- **APM** (Cogema-operated demonstration reprocessing plant for FBR, MOX and high burn-up fuels)
Mission: Develop technology for FBR, MOX and high burn-up fuels.
Design Basis: PUREX flowsheet, mixer-settlers and pulsed columns; 5 tHM/a.
- **PIVER** (Hot Pilot Plant-Vitrification)
Mission: Test batch vitrification processes (1969-1973); produce samples for characterization and advanced (high-temperature) waste forms.
Design Basis: Pot calciner/melter; capacity, 90 kg glass/batch or 25-30 m³ HLW/a; product, borosilicate glass blocks, 25 cm dia by 2.5 m high.
- **PIVER II.** Vitrification of HLW from APM.
- **Full Fusion Non-Radioactive Prototype.** Startup, 1984.
- **PEV Prototype** (full-scale, non-radioactive R7/T7 vitrification process). Startup, 1984.

CEA/CEN-S (Saclay Nuclear Research Center)

Centre d'Etudes Nucléaires
de Saclay

91191 Gif-sur-Yvette
France

Tel: 33-1-69-08-60-00
Fax: 33-1-69-08-79-90

Director
Dir., Fuel Cycle (DCC)
Dir., DCC Programs
WM/Reproc. Program Coord.

Jean Bazin
Jean-Yves Barret
Jean Lefevre
Guy Baudin

Facilities:

- **Bituminization Plant** (radioactive).
- **Metal Waste Melter** (startup, 1985).

COGEMA (Fuel Cycle Company)**COGEMA**

Direction Generale
2, Rue Paul-Dautier
B.P. 4

78141 Velizy-Villacoublay Cedex
France

Tel: 33-1-39-46-96-41
Fax: 33-1-34-65-14-52

President, CEO, COB
Vice President
Ind. Director, Reprocessing

Jean Syrota
Christian Gobert
Jean-Louis Ricaud

COGEMA, Inc.

7401 Wisconsin Ave.
Bethesda, MD 20814-3416

Tel: 301-986-8585
Fax: 301-652-5690

President, CEO
V.P.-Market Development

Michael McMurphy
Frank A. Shallo

NUMATEC, Inc.

(subsidiary of/same location as Cogema, Inc.)

President

William Gallagher

COGEMA-LA HAGUE

COGEMA, Centre de La Hague

B.P. 508
50105 Cherbourg Cedex
France

Tel: 33-33-03-60-00
Fax: 33-33-44-71-77

Director

Hugue Delaunay
33-33-03-60-01

Fuel Cycle Program: Spent fuel reprocessing and HLW vitri-
fication. The La Hague plant was originally designed to handle
magnesium-clad U metal fuels from gas/graphite power reactors.
Transfer of all reprocessing of gas/graphite fuels to Marcoule UP1
has been completed and La Hague is devoted to treating LWR
fuels with occasional FBR fuel campaigns through UP2.

COGEMA-LA HAGUE CENTER (contd)

Facilities

- **UP2 (Fuel Reprocessing Plant)**
Mission: Reprocess oxide fuels from LWRs and Phenix FBR (Phenix fuel has been reprocessed from 1979 to 1984, diluted with natural uranium fuel for criticality control).
Design Basis: PUREX flowsheet; oxide fuels: shear-leach HAO head-end; remote maintenance
Capacity: 400 t/a of LWR fuels.
History: UP2 startup, 1967; HAO startup, 1976. From startup (06/76) through 08/90 total HAO throughput was 2,310 t fuel from LWRs and 10 t from Phenix.
- **UP2-800 (Fuel Reprocessing Plant)**
Mission: Reprocess U oxide and MOX fuels from French LWRs.
Design Basis: Progressive expansion of UP2 plant from 400 to 800 tU/a of LWR fuel started in 1984, to be completed in 1992. Chop leach head-end, PUREX flowsheet, AVM vitrification process [R7 vitrification plant: rotary calciner, metallic or ceramic melter; capacity, 600 m³/a HLW feed three lines - 60 liters/h HLW, 25 kg/h glass; canister dimensions: 42 cm dia x 1.3 m high (400 kg glass)].
Capacity: 800 tU/a.
History: Startup, 1992; R7 startup, 1989, 125 glass canisters poured at the end of 1989. (UP2 HLW backlog).
- **UP3 (Fuel Reprocessing Plant)**
Mission: Reprocess LWR fuels.
Design Basis: Chop-leach head-end; PUREX flow-sheet; AVM vitrification process (T7 plant: identical to R7 vitrification plant).
Capacity: 800 MTU/a.
History: Startup, 1989.
- **STE3 (Liquid Waste Treatment Facility)**
Mission: Processing/encapsulation in bitumen of liquid low- and intermediate-level wastes from reprocessing of spent fuel at the La Hague installations.
History: Startup, 1988.

COGEMA-MARCOULE CENTER

COGEMA, Centre de Marcoule

B.P. 170

30200 Bagnols-sur-Ceze

Marcoule, France

Tel: 33-66-79-60-00

Fax: 33-66-89-38-50

(Marseille-Marignane Airport, then by train to Avignon and by car to the Center.)

Director
Reprocessing Plant
AVM Manager

Jean Charlade
Maurice Mellano
Pierre Hugony

Facilities:

- **UP1 (Reprocessing Plant)**
Mission: Reprocess magnesium-clad natural uranium metal fuels from military power reactors.
Design Basis: Mechanical declad; PUREX flowsheet; contact maintenance
Capacity: 400-450 tU/a of reactor fuel.
History: Startup, 1958; total gas/graphite power reactor fuels processed up to 11/90: 4,600 tU.
- **AVM (Ateliers de Vitrification de Marcoule)**
Mission: Demonstrate AVM process: vitrify Marcoule UP1 wastes.
Design Basis: Rotary calciner feeding an induction-heated metallic melter; capacity 30 liters/h HLW feed and 360 kg/d (1 canister) borosilicate glass product; waste form, glass blocks 0.5 m dia x 1.0 m high.
History: Hot startup, 06/78; as of 01/01/90, 1,213 m³ of HLW had been vitrified (1,650 canisters = 530 t borosilicate glass).

COGEMA-MARCOULE (contd)

- **Incinerator**
- **Bituminization Facility**
- **APM: Reprocessing of fast breeder fuel; 1988.**
- **PIVER II: Vitrification of HLW from APM.**
- **Melox: MOX fuel fabrication (120 t/a); 1993.**

DAM (Directorate of Military Applications)

Direction des Applications Militaires
 Commissariat à l'Energie Atomique
 31-33 Rue de la Fédération
 B.P. 510
 75752 Paris, Cedex 15
 France

Tel: 33-1-40-56-10-00
 Fax:

Director, Quality/Security

Jean Ohmann

FBFC (Franco-Belge Company for Fuel Fabrication)

Société Franco-Belge de Fabrication
 de Combustibles
 Tour Manhattan La Défense
 2-6 Place de l'Iris
 92400 Courbevoie, France

Tel: 33-1-47-62-88-00
 Fax: 33-1-47-76-41-97

Vice President

Philippe Courcier

Facilities:

- **Fuel Fabrication Plant (Romans, France)**
Mission: Fabricate UO₂ fuels for power reactors.
Design Capacity: 400 t/a (to be increased to 600 t/a).
- **Fuel Fabrication Plant (Dessel, Belgium)**
Mission: Fabricate UO₂ fuels.
Design Capacity: 400 t/a.

FBFC (Franco-Belge Company for Fuel Fabrication) (contd)

- **Fuel Fabrication Plant (Pierre Palte, France)**
Mission: Fabricate UO_2 fuels.
Design Capacity: 400 t/a.

PARIS SCHOOL OF MINES

Ecole Nationale Supérieure
des Mines de Paris
Centre d'Informatique Géologique
35 Rue Saint-Honore
77305 Fontainebleau
France

Tel: 33-1-64-22-48-21
Fax: 33-1-64-22-39-02

Director, Math. Geol. Center
Deputy Director

Dr. Ghislain de Marsily
Dr. G. E. Ledoux

Waste Management R&D: Geologic waste isolation (fluid flow, heat transport and mass transport studies--theoretical, laboratory and field tests).

SGN

Société Générale pour les
Techniques Nouvelles
1 Rue des Hérons
Montigny-le-Bretonneux
78182 Saint-Quentin
en Yvelines Cedex
France

Tel: 33-1-30-58-60-00
Fax: 33-1-30-58-65-22

President
Vice President
Technical Director

Claude Ayçoberry
Jean Louis Ricaud
Claude Bernard

Function: Provide a variety of services related to the fuel cycle.

TN

Transnucléaire
11 Rue Christophe-Colomb
75008 Paris
France

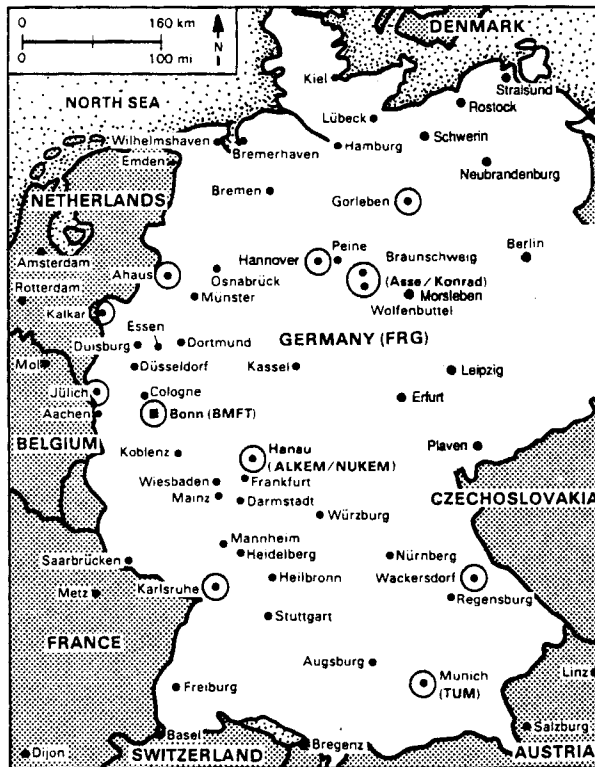
Tel: 33-1-47-23-78-50
Fax: 33-1-57-20-26-08

General Manager
Technical Manager

Bernard Savornin
Paul Blum

Function: Provide spent fuel/radwaste storage and transport services.

GERMANY



GERMANY

On October 1, 1990, East and West Germany reunified as the former GDR (German Democratic Republic) and Berlin joined the FRG (Federal Republic of Germany).

Previously, little information was publicly available about the status of the nuclear fuel cycle in the former GDR, i.e. programs, facilities, organizations involved. Since the reunification, a number of facts have surfaced but much remains unclear at this time, and continues in a state of flux.

While our map of Germany depicts the unified geographical area, the data on the following pages are still exclusively that of the former West Germany. Future issues will reflect the information for the entire nation, as it becomes available.

GERMANY (FRG)

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year	May 9	Ascension
Mar. 29	Good Friday	May 20	Pentecost
Mar. 31-		June 17	Day of Unity
Apr. 1	Easter	Dec. 25-26	Christmas
May 1	May Day		

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time Period: 03/31 - 09/28/91

PASSPORT/VISA

A passport is needed to depart and re-enter the United States. A visa is currently not required for a visit to Germany; however, it is recommended to consult a travel agency for up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 1.47 Mark (DM)
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Germany are complete as listed, after dialing international access code: 011. Country code is 49; listed local numbers include city code.

U.S. EMBASSY - BONN

American Embassy	
Deichmannsaue	
5300 Bonn 2	Tel: 49-228-339-1
Federal Republic of Germany	Fax: 49-228-339-2125
Science Counselor	Francis M. Kinnelly

ENERGY

Population	1988	60 million
Electric Power Plant Capacity	1988	96.4 GWe 22% nuclear
	1990	97.8 GWe 23% nuclear
	1995	98.0 GWe 23% nuclear
	2000	98.2 GWe 23% nuclear
Electric Power Production	1988	431.2 TWh 51% coal 34% nuclear 7% gas 5% hydro/geoth. 2% oil 1% solids
	1990	37% nuclear
	1995	35% nuclear
	2000	34% nuclear

NUCLEAR POWER

Nuclear Power Plant Capacity	1990	24.4 GWe
	1995	24.3 GWe
	2000	26.2 GWe
Reactor Mix	1990	PWR: 14 (1972-89) BWR: 7 (1975-85) FBR: 1 (1992)

INDUSTRIAL FUEL CYCLE

Policy: Full commercial capability--enrichment; fuel fabrication; plutonium recycle to FBRs and LWRs. Reprocessing is to be handled by foreign plants.

Waste Management Strategy: Vitrification of HLW (by foreign plants) and interim storage of HLW glass; disposal of reprocessing wastes in salt-dome repository; disposal of reactor and decommissioning wastes in abandoned iron mine or salt repository.

Cumulative Spent Fuel		
Arisings (LWR)	1985	1,800 tU
	1990	3,800 tU
	2000	8,950 tU
Cumulative Waste		
Arisings	2000	196,300 m³ conditioned, radioactive waste with negligible heat production
		5,800 m³ conditioned, radioactive waste with heat production

Industrial-Scale Activities

- Uranium enrichment (kSWU/a): 1986--200, 1988--400.
- Fuel fabrication
 - UO₂ fuel: 1500 tU/a
 - MOX fuel: either 40 tHM/a for LWR fuels or 10 tHM/a for FBR fuel elements.
- AFR spent fuel storage
 - 1,500 t, dry storage (Gorleben).
 - 1,500 t, dry storage (Ahaus).

Major Milestones

- Acceptance of HLW from Cogema/La Hague 1993
- Konrad (iron mine) repository (date pending) 1994/95
- Gorleben repository, HLW 2008

INTERNATIONAL RELATIONSHIPS**DOE/BMFT Agreement for Cooperative Radioactive Waste Management Technology Exchange**

Term: 12-20-74 to 06-30-91 (In process of being extended.)

Scope: Geologic disposal in salt deposits; retrievable surface storage; D&D; operational aspects of LL/ILW storage and disposal; transportation.

Emphasis: Waste treatment technology (design/operation of HLW vitrification pilot plants, conditioning of LLW/TRU wastes, waste form characterization), waste package development; collaboration in in-situ tests in FRG's Asse salt mine; U.S. observation of shaft drilling at the Gorleben repository site; cooperation in tests of transport/storage casks and in waste transportation studies.

DOE/BMFT Agreement in the Field of Remote Systems Technology

Term: 04-24-87 to 04-24-92.

Scope: Exchange of information regarding R&D, demonstration and operational activities in the field of remote/offgas technology.

Member of EC, IAEA, and OECD/NEA. Cooperative agreements and joint projects as well as commercial activities with numerous countries.

ORGANIZATION

- Federal Government
 - Coordinate FRG nuclear program
 - Sponsor R&D
 - Construction/operation of radioactive waste disposal facilities
 - Set licensing rules
- States (Länder)
 - License nuclear installations
 - Provide LLW interim storage area
- Utilities
 - Provide spent fuel/reactor waste storage, contract for reprocessing and waste treatment
 - Pay for waste disposal

**GOVERNMENT RESPONSIBILITIES --
NUCLEAR FUEL CYCLE/WASTE MGMT.****BMFT (Federal Ministry for Research and Technology)**

- Government Fuel Cycle/Waste Management R&D Program Administration
- GSF/IFT
 - FRG Geologic Waste Disposal R&D
 - Supporting Lab Work - Salt Properties
 - Asse II Studies
- KfK
 - LWR Fuel Cycle Waste Treatment/Packaging R&D
 - LWR Spent Fuel Management Alternatives R&D
 - HLW Vitrification R&D - PAMELA Support
- KFA
 - HTGR Fuel Cycle
 - Waste Treatment

**GOVERNMENT RESPONSIBILITIES --
NUCLEAR FUEL CYCLE/WASTE MGMT. (contd)**

BMWI (Federal Ministry for Economics)

-- BGR

- Geologic Survey
- Salt Dome Repository R&D (Salt Properties, Rock Mechanics)

BMU (Fed. Ministry-Environmental Protection/Reactor Safety)

- Storage/Transportation/Disposal of Radioactive Wastes
- Supervision of State Licensing Procedures
- Nuclear Safety/Radiation Protection

-- RSK (Reactor Safety Commission)

-- SSK (Radiation Protection Commission)

-- BIS

- Transportation/Storage/Licensing
- Responsibility for Repository Construction/Operation

-- DBE

- Construction/Operation (Repositories)
- Gorleben and Konrad Projects

LÄNDER (State Governments)

- Licensing of Nuclear Installations

NMU (Lower Saxony Ministry of Environment)

- Licensing of Final Repositories
Gorleben and Konrad Projects

INDUSTRIAL/UNIVERSITY RESPONSIBILITIES**DWK - Owned by nuclear utilities**

- KEWA
- WAK

**NUKEM - Owned by Degussa (35%), RWE (45%), RTZ (10%),
MG (10%)**

- LLW/TRU Waste Treatment R&D Facility Design
- R&D--Spent Fuel Packaging for Disposal

GNS - Owned by Nuclear Utilities

- Waste Treatment/Conditioning
- Transportation of Radioactive Materials
- Shipping Cask Development
- Engineering & D&D Services
- BLG - GNS Subsidiary
 - Operation of Gorleben Spent Fuel/LLW Storage Facilities
- BZA - GNS Subsidiary
 - Operation of Ahaus Spent Fuel Interim Storage Project

NCS - Nuclear Cargo Service

- Transportation of Radioactive Materials

SBII - Owned by Siemens AG

- Fabrication of Uranium/MOX Fuels, including R&D/Waste Management

TUM - Technical University Munich

- Actinide Chemistry R&D

BAM (Federal Materials Research/Testing Institute)

Bundesanstalt für Materialforschung
und -prüfung (BAM)
Unter den Eichen 87
1000 Berlin 45 Tel: 49-30-8104-1
Federal Republic of Germany Fax: 49-30-8112-029

Function: Testing and evaluation of materials used in nuclear programs.

BFS (Federal Institute for Radiation Protection)

Bundesamt für Strahlenschutz
Postfach 10 01 49
3320 Saltzgitter 1 Tel: 49-5341-188-0
Federal Republic of Germany Fax: 49-5341-188-188

Chief Executive Prof. Dr. Alexander Kaul

Department
Nuclear Waste Disposal/ Tel: 49-531-592-7600
Transport (Braunschweig) Fax: 49-531-592-7614

Director	Prof. Dr. Helmut Röthemeyer
Mining Safety	Gert Wosnik
Dir., Div. Project Mgmt.	Henning Rösel
Dir., Div. Waste Disposal	Prof. Dr. Horst Schneider
Safety	49-531-592-7620
Radioactive Waste	Dr. Ernst Warnecke
Geoscience	Dr. Gerhard Stier-Friedland
Radiology and Radiation	Dr. Dietrich Ehrlich
Protection	
System Analysis	Dr. Heinrich Illi
Dir., Div. Transport/Storage	Prof. Dr. Wilhelm Collin
of Radioactive Materials	

Function: Execution of the federal responsibilities concerning radiation protection, nuclear safety, radioactive waste disposal and transport/storage of radioactive materials, in particular the responsibility of construction and operation of repositories.

BFS (contd)

Facilities

- **Gorleben Site** (planned repository), 100 km northeast of Braunschweig.
Mission: Disposal of all types of solid radioactive waste.
Repository Concept: 300 to 600 m deep boreholes in tunnel floors at depths of about 850 m in the Gorleben salt dome.
Milestone: Startup of disposal, 2008.
- **Konrad Site** (planned repository in a former iron ore mine), 10 km southwest of Braunschweig.
Mission: Disposal of waste with negligible thermal impacts on host rock formation.
Milestone: Startup of disposal, 1994/95.

**BGR (Federal Institute for Geosciences
and Natural Resources)**

Bundesanstalt für Geowissenschaften
und Rohstoffe

Stilleweg 2, Postfach 510153

3000 Hannover 51

Federal Republic of Germany

Tel: 49-511-643-0

Fax: 49-511-643-2304

Director, Division 2,
Tech. Environmental Geology

Prof. Dr. Helmut Venzlaff

Director, Subdivision, .
Engin. Geology/Geotechniques

Prof. Dr. Michael Langer

Rock Mechanics

Prof. Dr. A. Pahl

Engineering Seismology

Dr. R. Lüdeling

Salt Mechanics

Dr. H. Albrecht

Mining Rock Mechanics

Dr. D. Meister

Salt Geology

Dr. W. Jaritz

Numerical Modeling

Dr. Manfred Wallner

Hydrogeology

Dr. H. Vierhuff

Groundwater Geophysics

Dr. W. Giesel

Function: Responsible to BMWI for all geological/geo-technical aspects related to planning, construction/operation of a final repository for radioactive wastes; also conducts special research for BMU.

BMFT (Federal Ministry for Research and Technology)

Bundesministerium für Forschung
und Technologie
Godesberger Allee 185-190
Postfach 200240
5300 Bonn 2
Federal Republic of Germany

Tel: 49-228-591
Fax: 49-228-59-3605

Minister, Science/Technology
Director General, Energy/
Environment/Raw Materials
Director, Energy Sci. Tech.
Fuel Cycle/Safeguards

Dr. Heinz Riesenhuber
Dr. Walter Borst

Dr. Knut Bauer
Dr. Rolf-Peter Randl
49-228-59-3759

Waste Mgmt./D&D

Dr. Stefan Theis
49-228-59-3754

U Supply/Fuel Fabrication

Dr. Ernst Budde
49-228-59-3757

U Enrichment

Dr. A. H. Remagen
49-228-59-3755

Waste Disposal

Dr. Diethard Lummerzheim
49-228-59-3762

Direct Disposal

Dr. S. Riotte
49-228-59-3764

Geological Disposal

W. Busch
49-228-59-3764

Function: Responsible for R&D programs on fuel cycle and radioactive waste management.

**BMU (Federal Ministry for Environmental
Protection and Reactor Safety)**

Bundesministerium für Umwelt,
 Naturschutz und Reaktorsicherheit
 Husarenstrasse 30
 5300 Bonn 1
 Federal Republic of Germany

Tel: 49-228-305-0
 Fax: 49-228-305-2899

Minister	Prof. Dr. Klaus Töpfer
Dir. Gen., Nuc. Installation Safety/Radiation Protection/ Nuclear Fuel Cycle	Walter Hohlefelder
Dir., Nuc. Installation Safety	Dr. Gast 49-228-305-2805
Director, Radiation Protection	Dr. von Oertzen 49-228-305-2905
Director, Fuel Cycle	Dr. Arnolf Matting 49-228-305-2950
Policy	Dr. Bröcking 49-228-305-2930
International Relations	Dr. Ch. Breest 49-228-305-2800
Fuel Supply	Arno Ehret 49-228-305-2831
Reprocessing/Conditioning	Armin Hagen 49-228-305-2821
Treatment/Storage/Transp.	Herbert Dreisvogl 49-228-305-2721
Final Repository	Dr. Manfred Bloser 49-228-305-2951
Chairman, Reactor Safety Commission (RSK)	Prof. Dr. Kessler
Chairman, Radiation Protection Commission (SSK)	Prof. Dr. A. M. Kellerer

Function: Responsible for storage, transportation, and disposal of radioactive wastes; supervision of state licensing procedures; federal standards for nuclear safety and radiation protection.

**DBE (German Company for Construction and Operation
of Waste Disposal Facilities)**

Deutsche Gesellschaft zum Bau
und Betrieb von Endlagern
für Abfallstoffe mbH
Woltorfer Strasse 74
3150 Peine 1
Federal Republic of Germany

Tel: 49-5171-43-1
Fax: 49-5171-43-218

Managing Directors

Dr. Jürgen P. Lempert
Manfred Florl
Dr. Hans-Jürgen Krug

Project Gorleben, Mgr.

Wolfgang Schulz
49-5171-43-250

Project Konrad, Mgr.

Rüdiger Putzer
49-5171-43-310

Project-Related R&D, Mgr.

Dr. Hans-Jürgen Engelmann
49-5171-43-272

Activities: Conceptual design of repositories, site investigations, construction of surface/subsurface facilities for repositories: heat-related stress analyses, development of emplacement techniques, construction of emplacement equipment, risk assessments, safety analysis operational/post-operational phases (long-term calculations), design/construction of engineered barriers.

DWK (German Fuel Reprocessing Company)

Deutsche Gesellschaft für Wiederaufarbeitung
von Kernbrennstoffen mbH
Hamburger Allee 4, Postfach 1407
3000 Hannover 1
Federal Republic of Germany

Tel: 49-511-3390-0
Fax: 49-511-3390-207

Managers

Bernd Zur Nedden
Dietrich Schulz

R&D/Cooperation Division

Dr. Karl-Dieter Kuhn
49-511-3390-676

DWK (contd)

Function: Support KEWA and WAK. Handling of issues from consequences of cancellation of reprocessing plant Wackersdorf and resulting transfer of site from "nuclear" to "industrial". Planning for decommissioning/dismantling of WAK plant.

GNS (Company for Nuclear Service)

Gesellschaft für
Nuklear-Service mbH
Goethestrasse 88
4300 Essen 1
Federal Republic of Germany

Tel: 49-201-7220-0
Fax: 49-201-7220-181

Managers

Dr. Henning Baatz
Dr. Klaus Janberg
49-201-7220-102
Norbert Semann

Function: Service to nuclear facilities, including waste treatment/conditioning, transportation of radioactive materials, shipping cask development and facility dismantling.

Ownership: Nuclear utilities.

Facility:

- **AFR Spent Fuel Storage Facilities** (Gorleben and Ahaus sites, operated by GNS subsidiaries, BLG, and BZA respectively)
Design Basis: Dry storage in CASTOR casks - 400 casks in a building which has dimensions of 600 ft x 125 ft x 62 ft high.
Capacity: 1500 t each.
History: Startup of AFR at Gorleben and Ahaus have been delayed due to litigation.

GNS (contd)

- **PKA Pilot Fuel Conditioning Plant (Gorleben)**
Mission: Conditioning and encapsulation of spent fuel to meet the requirements for interim storage and final disposal.
Design Basis: Hot cell with installations for rod consolidation, compaction of fuel assembly skeletons, loading of canisters.
Maximum throughput 35 tHM/yr.
Milestone: Startup, 1994.

GRS (Company for Reactor Safety)

Gesellschaft für
 Reaktorsicherheit mbH
 Schwertnergasse 1
 5000 Köln 1
 Federal Republic of Germany

Tel: 49-221-2068-0
 Fax: 49-221-2068-442

General Manager Prof. Dr. Adolf Birkhofer

Function: Provide technical support to BMU and other regulatory/licensing entities concerned with reactor safety issues.

GSE/IFT (Research Center for Environment and Health/
 Institute for Underground Storage)

Forschungszentrum für Umwelt und Gesundheit GmbH
 Institut für Tief Lagerung
 Theodor-Heuss-Strasse 4
 3300 Braunschweig
 Federal Republic of Germany

Tel: 49-531-8012-1
 Fax: 49-531-8012-200

Dir./IFT, Head/Disposal Prof. Dr. Klaus Kühn
 Technology 49-531-8012-231
 Engineering Development Alfred Beinlich
 Geotechnology Manfred W. Schmidt
 Test Fields Tilmann Rothfuchs
 Geophysics Dr. Dieter Flach

GSF/IfT (contd)

Dir./IfT, Head/Disposal Safety	Dr. Wernt Brewitz 49-531-8012-239
Safety Analysis	Dr. Richard Storck
Chemical Waste	Dr. Thomas Brassler
Geochemistry	Dr. Hermann J. Gies
Geology/Hydrogeology	Dr. Konrad Klarr
Data Processing	Gert Ohme
Dir./Project Management	Dr. Rolf Stippler 49-531-8012-220
ILW/HLW Projects	Dr. Ingo Müller-Lyda
Direct Disposal Project	Jürgen Kunze
Asse Projects	Christoph Starke
Konrad/Gorleben Work	Dr. Wolfgang Bode
Test Dam Project	Dr. Helmut Fleck
Long-Term Safety Projects	Dr. Peter Faber
Administration/Infrastructure	Erwin Sölter
Public Relations	Rainer Gömmel
Head/Mine Operations	Klaus Dürr 49-531-8012-211
Technical Planning	Helmut Kolditz

Waste Management R&D: Development/testing of techniques for safe, final geologic disposal of radioactive and chemical-toxic waste; acquisition of data for planning, construction and operation of underground repositories. Performance of long-term safety analyses for the post-operational phase of underground repositories.

Schachtanlage Asse

3346 Remlingen
Federal Republic of Germany

Tel: 49-5336-891

Mine Manager
Radiation Protection
Mine Survey

Oswald Opp
Herbert Meyer
Dr. Gerd Hensel

GSF/IFT (contd)**Facilities:**

- **Asse II Salt Mine** (12 km southeast of Wolfenbüttel)
Mission: In-situ testing and disposal technology development for a salt dome repository; through 1978, disposal of LLW and ILW.
History: Startup, 1967.
- **Mineralogical and GEOchemical Laboratories** (Braunschweig)
- **Rock Mechanics Laboratory** (Braunschweig)

KEWA (Fuel Cycle Consulting Company)

KEWA Kernbrennstoff
 Wiederaufarbeitungstechnik GmbH
 Hamburger Allee 4 Tel: 49-511-3390-0
 3000 Hannover 1 Fax: 49-511-3390-699 or
 Federal Republic of Germany 49-511-3390-207

Tech.Mang.Director Ernst Robinson
 49-511-3390-298

Function: Consulting/design services in the areas of reprocessing of LWR fuel elements; waste treatment and related areas such as remote handling, environmental protection, safety, and others.
 KEWA is a DWK subsidiary.

KFA (Jülich Research Center)

Forschungsanlage Jülich GmbH
 Postfach 1913
 5170 Jülich Tel: 49-2461-610
 Federal Republic of Germany Fax: 49-2461-61-5327

Director, Institute of Prof. Dr. Erich R. Merz
 Chemical Technology (ICT) 49-2461-61-3114
 Director, Institute of Prof. Dr. Hubertus Nickel
 Reactor Materials (IRW) 49-2461-61-3058

KFA (contd)

HTGR Fuel Cycle Project (HTA/HBK) ILW/Spent Fuel HTGR Fuel Disposal	Dr. Norbert Kirsch 49-2461-61-6991
Waste Treatment (ZFK-DE)	Dr. Heiner Brücher 49-2461-61-6409
Quality Assurance (PKS)	Dr. Manfred Laser 49-2461-61-5288
	Dr. Reinhard Odoj 49-2461-61-3058

Function: Develop advanced waste management technologies.

Activities: Hot cell experiments dealing with the development of advanced ILW/HLW conditioning processes; characterization of waste products/packages; conditioning of radioactive wastes generated from research center; development/demonstration of quality assurance measures for waste packages; retrievable in-situ testing of ILW disposal techniques in Asse salt mine including direct disposal of HTR fuel elements; LLW incineration using Jülich furnace design; HTR fuel reprocessing R&D terminated 1987; FIPS (HLLW vitrification facility) closed down 1987.

KfK (Karlsruhe Nuclear Research Center)

Kernforschungszentrum Karlsruhe GmbH
Postfach 3640
7500 Karlsruhe 1
Federal Republic of Germany

Tel: 49-7247-821
Fax: 49-7247-82-5070

(Convenient route from U.S. is by plane to Frankfurt, then by train or car to Karlsruhe.)

Internatl. Coord. for BMFT	Dr. Reinhard Kroebel 49-7247-82-2032 Fax: 49-7247-82-4315
WAK Decommissioning	Wolfgang Pfeifer 49-7247-82-4050
Program Management "Entsorgung" (PT E)	Dr. Klaus-Detlef Closs 49-7247-82-5790
Director, Inst. for Hot Chem.	Prof. Klaus Ebert 49-7247-82-2400

KfK (contd)

Director, Institute for Nuc. Waste Tech. (INE) Final Disposal	Prof. Dr. Kim Dr. R. Koester 49-7247-82-2302
Chemistry	Dr. Werner Lutze 49-7247-82-4457
Process Engineering	Dr. S. Weisenburger 49-7247-82-4288
Director, Institute for Radiochemistry (IRCh)	Prof. Ache 49-7247-82-3200
Director, Ctrl. Eng. Dept. (IT)	Dr. Hermann Rininsland 49-7247-82-3000
Remote Handling	G. Boehme 49-7247-82-2600

Facilities:

- **PASSAT Facility**
Mission: Development and testing of DOG filters.
Design Basis: Packed fiber mist eliminators, HEPA-filter, iodine-filter.
History: Startup, 1978 (program completion, 1990/91).
- **BEATE Facility**
Mission: Aerosol source term destination and VOG-behavior.
Design Basis: Stirring and transport of liquids by air and steam.
History: Startup, 1983 (program completion, 1990/91).
- **Ceramic Melter**
Mission: HLW vitrification process development with ceramic melter for the PAMELA pilot plant.
Design Basis: Liquid-fed, joule-heated melter;
PAMELA capacity: 30 liter/h HLLW or 30 kg/h glass.
History: Startup, PAMELA melter -- 1976;
Mark 1 -- 1985, hot; Mark 2 -- 1990, cold.
- **Waste Concreting Plant (radioactive)**
Mission: Immobilize KfK ILW.
Design Capacity: 2.5 t/d waste.
History: Startup, 1977.

NMU (Lower Saxony Ministry of Environment)

Niedersächsisches Umweltministerium
 Archivstrasse 2
 Postfach 41 07
 3000 Hannover 1
 Federal Republic of Germany

Tel: 49-511-104-0
 Fax: 49-511-104-3399

Minister	Monika Griefahn
Dir., Nucl. Energy/Rad. Protectn.	Klaus-Dieter Becherer
Nuclear Fuel Cycle	Arno Fricke
	49-511-104-3430
Final Repositories	Dr. Klaus-Arno Beckers
	49-511-104-3550
WM/Reprocessing/SP	Dr. Dietmar A. Kopp
	49-511-104-3429

Function: State authority for licensing of nuclear facilities, including planned repositories at Gorleben and Konead.

NUKEM

NUKEM GmbH
 Industriestrasse 13
 P.O. Box 1313
 8755 Alzenau
 Federal Republic of Germany

Tel: 49-6023-500-0
 Fax: 49-6023-500-214

Managing Directors	Bernd Jobst Breloer
	L. Aumüller, H. Pirk
Process Engineering	H.W. Binzel
Fuel Cycle Services	K. Schreiber
Non-Destructive Testing	Dr. R. Gerhardt
Environmental Technology	Dr. P.G. Maurer
System Manufacturing	H. Wagner
Solar Energy Technology	Dr. W. Hoffmann

Function: Nuclear fuel cycle services; environmental technology, hazardous waste/toxic residues treatment; off-gas/exhaust gas treatment, mist eliminator filters; general/nuclear process engineering, safety engineering, container systems.

SBH

Siemens AG Brennelementewerk Hanau

Postfach 110060

6450 Hanau 11 (Wolfgang)

Federal Republic of Germany

Tel: 49-6181-58-0

Fax: 49-6181-58-3502

Director

Horst Roepenack

49-6181-58-4600

Fabrication Manager

Jürgen Krellmann

49-6181-58-4599

Chemistry/Waste Management

Dr. Volker Schneider

49-6181-58-4590

Dr. F.-W. Ledebriek

49-6181-58-4169

Function: Fabrication of uranium fuel for BWR/PWR and MOX for BWR/PWR, including R&D/waste management.

Facility:**• Fuel Fabrication Plants**

Capacity: MOX - 40 t/a, LWR fuel; 10 t/a, FBR fuel;

UO₂ - 1500 tHM/a, LWR fuel.**TUM (Technical University Munich)**

Technische Universität München

Institut für Radiochemie

Walther-Meissner-Strasse

8046 Garching (München)

Federal Republic of Germany

Tel: 49-89-3209-220

Fax: 49-89-3209-2204

Director

Prof. Franz Baumgärtner

WAK (contd)

Design Basis: Liquid-fed ceramic melter, 0.72 m² surface area; capacity, 36 liters/h feed, 25 kg/h glass (3 canisters/d @ 150 kg glass/canister); product, borosilicate glass blocks, 0.3 m dia by 1.2 m high.

History: Hot operation, startup 1985 (KfK development). As of December 1990: 750 m³ waste vitrified, 2,010 canisters filled.

WAK-PAMELA

c/o Belgoprocess
Gravenstraat
2480 Dessel, Belgium

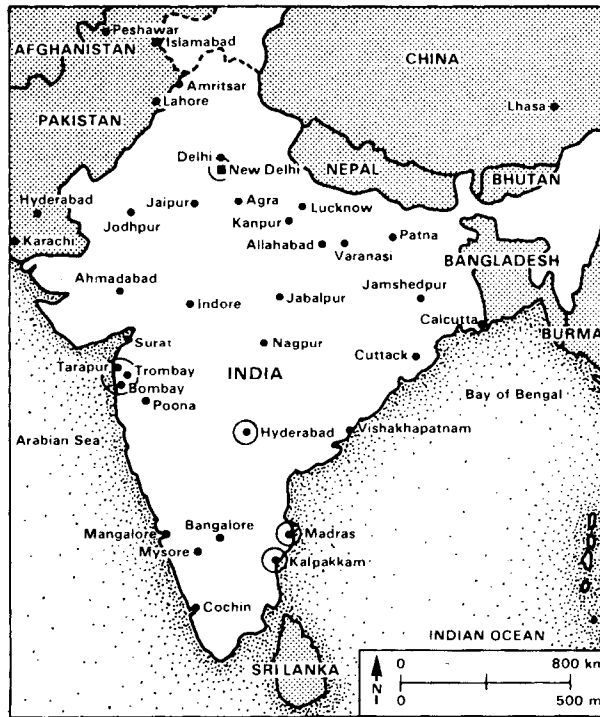
Tel: 32-14-244-501

Fax: 32-14-319-497

PAMELA Plant Manager

Horst Wiese

INDIA



INDIA

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year	Aug. 15	Independence Day
Jan. 26	Republic Day	Sept. 1	Janashtami
Feb. 27	Holi	Oct. 2	Gandhi's Birthday
Apr. 16-18	Ramadan Feast	Oct. 17	Duysschra
Apr. 28	Buddha Purima	Nov. 5	Festival of Lights
June 23-25	Sacrifice Feast	Nov. 21	Guru Nanak's Birthday
July 13	Islamic New Year	Dec. 25	Christmas

TIME

Standard Time Washington D.C.: + 10.5 hours

PASSPORT/VISA

A passport is needed to depart and re-enter the United States; in addition, a visa is currently required for a visit to India. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 18.44 Rupees
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

U.S. EMBASSY - NEW DELHI

American Embassy
Shanti Path
Chanakyapuri
New Delhi, 110021
India

Tel: 91-11-600-651
Fax: 91-11-672-476

Science Counselor

Peter L. Heydemann

ENERGY

Population	1988	817 million
Electric Power Plant Capacity	1988	45 GWe
	2000	2.8% nuclear 100 GWe
Electric Power Production	1988	166 TWh
		~ 58% coal
		~ 33% hydro
		~ 6% oil
	2000	3% nuclear 10% nuclear

NUCLEAR POWER

Policy: Heavy dependence on nuclear power to augment the nation's electric power generating capacity. A three-phase program--first phase, reactors fueled with natural uranium; second phase, FBRs fueled with Pu produced by first-phase reactors; third phase, self-sustaining thorium-uranium cycle reactors.

Nuclear Power Plant Capacity	1990	1.7 GWe
	1995	2.4 GWe
	2000	4.4 GWe
Reactor Mix	1990	BWR: 2 (1969)
		HWR: 5 (1973-89)
		7 (1991-96)
Reactor Development	1985	FBR 12-15 MWe test unit
	Late 1990s	FBR 500 MWe commercial

INDUSTRIAL FUEL CYCLE

Policy: Achieve self-sufficiency in CANDU-type and LWR fuel cycle--uranium milling, conversion to UO_2 , fuel fabrication, reprocessing (in small plants adjacent to power stations); if enriched UF_6 supply for India's BWRs is cut off, they may fuel with UO_2 - PuO_2 .

Waste Management Strategy: Vitrification of HLW, interim storage for at least 20 years and disposal in a crystalline rock formation. Disposal of LLW and short-lived ILW in near-surface engineered facilities. Disposal of long-lived ILW will be in deep geological repository.

Cumulative Spent Fuel	1980	370 tU
Arisings (LWR and HWR)	1985	780 tU
	1990	1,580 tU
	2000	5,000 tU

Cumulative Waste Arisings	<u>1982</u>	<u>2000</u>
Primary solid wastes	1,700 m ³	107,000 m ³
LLW concentrates	2,500 m ³	77,000 m ³
ILW	650 m ³	20,000 m ³
HLW	350 m ³	8,000 m ³

Industrial-Scale Activities

- Heavy-water design capacity (t/a): 1985--85, 1988--150; additional capacity is planned.
- Uranium mining and milling (t/a): 1985--130, 1988--170.
- UO₂ fuel fabrication (t/a): 1981--100; 1984--210; 2000--1500.
- Fuel reprocessing:
Trombay pilot plant, 30 t/a (1962--)
Tarapur plant, 100 t/a (1982--)
Kalpakkam plant, 100 t/a (1992/93).
- HLW vitrification: Tarapur (1985--)

Major Milestones

- Interim Storage Plant - Tarapur 1990
- Interim Storage/Waste Immobilization Plant
 - Trombay 1989
 - Narora 1989
 - Kalpakkam 1993

INTERNATIONAL RELATIONSHIPS

Member of IAEA. Agreement with U.S. on peaceful nuclear cooperation.

India has not signed the non-proliferation treaty (NPT) and has generally resisted the imposition of safeguards by individual suppliers (this has led to difficulties with supply of enriched uranium, reactor equipment, and heavy water).

India has agreements with several countries on various aspects of the nuclear fuel cycle. Among them, signed in mid-1990, agreements with Vietnam (pilot plant for monazite processing supplied by India) and Cuba (Cuban scientists being trained in nuclear power generation in India) for expanded cooperation in nuclear energy.

ORGANIZATION**Prime Minister**

- Department of Atomic Energy
 - Atomic Energy Commission
 - Atomic Minerals
 - Nuclear Fuels
 - Power Project Engineering
 - Research and Development
 - Reactor Research Center (Kalpakkam)
 - Fuel Cycle R&D
 - Waste Management
 - Atomic Research Center (Trombay)
 - Fuel Cycle R&D
 - Waste Management

BARC

Bhabha Atomic Research Centre Tel: 91-55-141711
Trombay, Bombay 400 085 Fax:
India Tlx: 011-71-017

Director	Dr. P. K. Iyengar
Director, Nuclear Safety Group	V. N. Meckoni
Waste Management Division	M. T. Samuel
Central. WM Facil., Kalpakkam	R. V. Amalraj
Radiol. Protection Division	K. G. Vohra
Director, Chem. Engineering Group	B. K. Garg
Fuel Reproc. Division	A. N. Prasad

Activities: BARC has five test reactors; radiochemistry and isotope laboratories; an isotope production and processing unit; pilot plants for production of heavy water, zirconium, titanium, etc.; a thorium plant; a uranium metal plant; a pilot-scale fuel reprocessing plant; the Fuel Irradiation and Processing Laboratory; and supporting facilities. Fuel cycle R&D includes fuel reprocessing, HLW solidification, treatment of alpha-emitting wastes (incineration, wet oxidation, decontamination, and immobilization of cladding hulls), D&D, and waste isolation in geologic formations.

Facilities:

- **Trombay Fuel Reprocessing Plant**
Mission: Reprocess natural uranium metal fuels.
Design Basis: Chemical declad, PUREX flowsheet; contact maintenance; capacity, 0.1-0.15 tHM/d.
History: On-line, 1965-1974; modified and being readied to operate again.
- **WIP (Waste Immobilization Plant) - Trombay**
Startup: construction, 1981; hot-operation, 1990.
- **Experimental Uranium Enrichment Facility**

DAE

Department of Atomic Energy
Chhatrapati Shivaji Maharaj Marg
Bombay 400 039, India

Minister, Science/Technology M. G. K. Menon

Atomic Energy Commission (AEC)
Chairman Dr. P. K. Iyengar
Secretary K. V. Mahadeva Rao

Atomic Energy Regulation Board (AERB)
Chairman A. K. De (Inst. of Tech.)

Function: Regulation and licensing of nuclear facilities.

Nuclear Power Corporation (formerly Nuclear Power Board)

Function: Design, construction, and operation/maintenance of nuclear power stations. Help realize nation's goal of having 10,000 MWe of nuclear power on line by the year 2000.

IGCAR

Indira Ghandi Centre
for Atomic Research
Kalpakkam 603 102
Tamil Nadu, India

Tlx: 041-6244

Fast Breeder Reactor Centre C. V. Sundaram

Located near Madras power station.

Function: Fuel cycle R&D; FBR technology; reprocessing of FBR fuels.

IGCAR (contd)**Facilities:**

- **Fast Breeder Test Reactor**
- **Kalpakkam Fuel Reprocessing Laboratory**
Mission: Develop and test equipment and unit operations for FBR fuel reprocessing.

KOLAR WASTE DISPOSAL RESEARCH STATION

Located in the Kolar gold mine area near Bangalore, Karnataka State.

Function: Assess the suitability of peninsular gneisses for location of a deep geological repository (in-situ studies).

Description: Tunnel extended from abandoned section of one of the Kolar gold mines into a neighboring gneissic formation.

History: Startup, late 1979.

MAPS

Madras Atomic Power Station
Kalpakkam, India

Function: Nuclear power production, fuel reprocessing and waste treatment, plutonium fuel fabrication for FBRs.

Facilities:

- **Fuel Reprocessing Plant Kalpakkam**
Mission: Reprocess spent fuel from the Kalpakkam reactors and from the 15-MW FBTR commissioned 1985.
Design Basis: PUREX process, with a separate line for FBTR mixed-carbide fuels; capacity, originally 0.5 tHM/d for PHWR fuels, now increased to 200 tHM/a. Cold operation to start 1991.

MAPS (contd)

- **WIP (Waste Immobilization Plant)-Kalpakkam**
Startup construction, 1983; commissioning, 1993.
- **ISF (Interim Storage Facility)-Kalpakkam**

NFC

Nuclear Fuel Complex
Hyderabad, India

Facility:

- **Fuel Fabrication Plant**
Initial throughput of 50 t/a increased 1990 to 350 t/a, and expected to go to 600 t/a eventually.

NSC

Nuclear Science Center
New Delhi, India

Function: Established through the University Grants Commission to encourage nuclear research outside of government-sponsored work. The facility below is only available to university researchers.

Facility:

- **Pelletron Accelerator Facility**
Commissioned early in 1991. Housed in 100-foot-high tower, can accelerate atoms up to 16 MeV.

TAPS

Tarapur Atomic Power Station
Tarapur, Maharashtra, India

Function: Provide electric power, reprocess spent fuel from Tarapur reactors and immobilize the associated wastes.

TAPS (contd)**Facilities:**

- **PREFRE (Fuel Reprocessing Plant) - Tarapur**
Mission: Reprocess natural and low-enriched UO₂ fuels.
Design Basis: Chop-leach head-end; PUREX flowsheet; contact maintenance; capacity, originally 0.5 tHM/d, since then increased to 150 tHM/a.
History: Construction completed, 1975; hot operation, 12/82.
- **WIP (Waste Immobilization Plant)**
Mission: Vitrify Tarapur HLW.
Design Basis: Two-step calcination and melting in drainable pot; capacity, 25 liters/h HLLW, 125 kg glass/canister, 1 canister/d; product, borosilicate glass blocks.
History: Construction completed, 1981. Hot startup, 1990.
- **SSSF (Solid Storage Surveillance Facility)**
Mission: Provide air-cooled storage for WIP products.
Design Basis: Stack-induced natural-draft air cooling; capacity for 20 years' storage of HLW from Tarapur and Trombay waste.
Milestone: Completion, 1990.
- **ILW Bituminization Plant**
- **Polymerization Facility**
- **Pilot (hot cell-sized) Mox Fuel Fabrication Facility**
(commissioned late 1990)

ITALY



ITALY

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year
Jan. 6	Epiphany
Mar. 31-Apr.1	Easter
Apr. 25	Liberation Day
May 1	Labor Day
Aug. 15	Assumption
Nov. 1	All Saints Day
Dec. 8	Immaculate Conception
Dec. 25-26	Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time Period: 03/31 - 09/28/91

PASSPORT/VISA

A passport is needed to depart and re-enter the United States. A visa is currently not required for a visit to Italy; however, it is recommended to consult a travel agency for up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 1110.0 Lira
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Italy are complete as listed, after dialing international access code: 011. Country code is 39; listed local numbers include city code.

U.S. EMBASSY - ROME

American Embassy
Via Veneto 119/A
00187 Rome
Italy

Tel: 39-6-4674-2
Fax: 39-6-4674-2356

Science Counselor

Reno L. Harnish

ENERGY

Population	1988	58 million
Electric Power Plant Capacity	1988	56.7 GWe 2% nuclear
	1990	59.2 GWe 0% nuclear
	1995	70.8 GWe 0% nuclear
	2000	79.3 GWe 0% nuclear
Electric Power Production	1988	203.6 TWh 44% oil 23% hydro/geoth. 17% coal 16% gas
	1990	0% nuclear
	1995	0% nuclear
	2000	0% nuclear

NUCLEAR POWER

Policy: The current national energy plan calls for abandonment of nuclear power, and increased use of coal and natural gas for electricity generation. Research into nuclear energy will continue but with a reduced R&D budget.

Nuclear Power Plant Capacity	1990	0.0 GWe
	2000	0.0 GWe
Reactor Mix (none operating)	1990	PWR: 1 (1965)
		BWR: 1 (1981)

INDUSTRIAL FUEL CYCLE

Waste Management Strategy: Spent fuel is being reprocessed abroad. Vitrified HLW will be returned, starting in 1995. Canisters will be temporarily stored until a final repository is available (clay formations are being considered). Disposal of LLW/ILW is planned to be in engineered structure in shallow ground facility.

Cumulative Spent Fuel	1990	342 tU LWR
Arisings		1,353 tU GCR

INTERNATIONAL RELATIONSHIPS

Member of EC, IAEA, and OECD/NEA. A CEC Joint Research Center establishment is located in Northern Italy at Ispra. Participation in Eurodif and SuperPhenix projects.

ORGANIZATION

- ENEA (National Organization for Nuclear and Alternative Energy Sources)--safety and regulatory; nuclear R&D (principally at Casaccia, Saluggia and Trisaia).
 - DISP (Directorate for Nuclear Safety and Health Protection)--safety inspection/control and Health/environment protection.
- ENI--government-owned oil and energy holding company which provides fuel cycle services.
- Nucleco--company jointly-owned by ENEA/AGIP; LLW/ILW management (except disposal).
- CIPE (Interministerial Committee for Economic Planning)--designated regions where nuclear plants were to be located.
- FN (Fabrizazioni Nucleari)--fuel fabrication/development.
- ENEL--state-owned power utility.

**ENEA (National Organization for
Nuclear and Alternative Energies)**

Comitato Nazionale per Energia
Nucleare e Energie Alternative
Viale Regina Margherita 125
00198 Rome, Italy

Tel: 39-6-8528-1
Fax: 39-6-8528-2591

President
Director General
Director Nuclear
Dir., Plant Dismantling
Spent Fuel/Waste Management
Plant Dismantling

Prof. Umberto Colombo
Dr. Fabio Pistella
Dr. Carlo Mancini
Dr. F. Pozzi
Dr. Piero Risoluti
Dr. M. Guidotti

Function: Direct pure and applied research on energy and environment (mostly non-nuclear). Current nuclear-related work includes cooperation in international programs and is carried out in three departments: Fusion, Innovative Reactors, and Fuel Cycle Plant Dismantling.

Activities - Dismantling: Decommission facilities, including removal of their stored nuclear material. Tasks: Conditioning of liquid/solid radioactive wastes stored at the Eurex (Saluggia) and Itrec (Trisaia) plants and the Casaccia Center; removal (foreign reprocessing being considered) of spent fuel from reprocessing pilot plants at the reactor sites; decontamination and dismantling of plants and laboratories, including Plutonium oxide fuel fabrication lab.

Owner: Government.

ENEL (National Electric Energy Agency)

Ente Nazionale per l'Energia Elettrica
Casella Postale 386 Tel: 39-6-85091
Via Giovan Battista Martini 3 Fax:
00198 Rome, Italy Tlx: 610518

Chairman Franco Viezzoli

Government agency, responsible for all electric power production.

FN

Fabricazioni Nucleari
P.O. Box 16
15062 Bosco Marengo (AL) Tel: 39-131-7571
Italy Fax: 39-131-757250

Chairman Dr. P. Venditti

Function: Fabrication and development of special oxide nuclear fuels.

Owner: ENEA (95%) - AGIP, Fiat (5%)

NUCLECO

Nucleco
Via Anguillarese 351 Tel: 39-6-3046-302
00060 Rome Fax: 39-6-3048-3081
Italy

President Ing. Silvio Cao

Function: Treat and dispose of low- and intermediate-level wastes from hospitals, laboratories, industrial establishments, and nuclear plants. Eventual plans include decommissioning work on nuclear installations.

Owner: Government (ENEA-40%; AGIP-60%).

ST

S.T. Sistemi e Tecnologie
per l'Energia
Via A. Bologni 34
00153 Rome
Italy

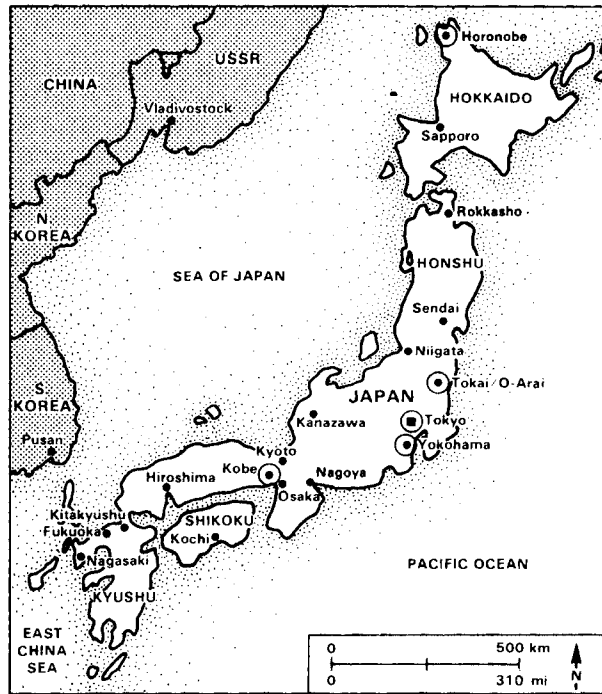
Tel: 39-6-589-4041
Fax: 39-6-580-9058

General Manager

Dr. Balestrieri

Function: Provide services, architect-engineering for energy-related systems, and for treatment of radioactive waste.

JAPAN



JAPAN

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year	Sept. 15/16	Respect for the Aged
Jan. 15	Adult's Day	Sept. 23	Autumnal Equinox
Feb. 11	National Foundation	Oct. 10	Sports Day
Mar. 21	Vernal Equinox	Nov. 3/4	Culture Day
Apr. 29	Greenery Day	Nov. 23	Labor Thanksgiving
May 3	Constitution	Dec. 23	Emperor's Birthday
May 4	Peoples' Day	Dec. 29-	Govt. Off Season
May 5/6	Children's Day	Jan. 3	

TIME

Standard Time Washington D.C.: + 14 hours

PASSPORT/VISA

A passport is needed to depart and re-enter the United States; a visa is currently not required for a visit to Japan. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 131.17 Yen
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Japan are complete as listed, after dialing international access code: 011. Country code is 81; listed local numbers include city code.

U.S. EMBASSY - TOKYO

American Embassy
10-1, Akasaka 1-chome, Minato-ku
Tokyo 107, Japan

Tel: 81-3-3224-5000
Fax: 81-3-3505-1862

Science Counselor
DOE Representative

Dr. Edward M. Malloy
Milton A. Eaton
Tel: 81-3-3224-5480
Fax: 81-3-3582-0496

ENERGY

Population	1988	123 million
Electric Power Plant Capacity	1988	154.5 GWe 17% nuclear
	1990	161.8 GWe 18% nuclear
	1995	181.0 GWe 21% nuclear
	2000	198.3 GWe 25% nuclear
	1988	753.7 TWh 29% oil 24% nuclear 19% gas 15% coal 13% hydro/geoth.
Electric Power Production	1990	30% nuclear
	1995	36% nuclear
	2000	40% nuclear

NUCLEAR POWER

Policy: Strong nuclear power program to lessen dependence on foreign energy sources--install LWRs for near-term needs; develop advanced HWR (ATR); aim for commercial FBR operation, ~2020-2030. Supply domestic needs and build export business.

Nuclear Power Plant Capacity	1990	30.4 GWe
	1995	38.5 GWe
	2000	50.8 GWe
Reactor Mix	1990	GCR: 1 (1966)
		BWR: 21 (1970-90)
		7 (1993-98)
		PWR: 18 (1970-89)
		5 (1991-97)
		HWR: 1 (1979)
FBR: 1 (1993)		
Reactor Development		HWR (ATR), LMFBR, HTGR

INDUSTRIAL FUEL CYCLE

Policy: Obtain ownership of foreign uranium resources; develop complete fuel cycle capability (enrichment, reprocessing and waste treatment, buying foreign reprocessing services until domestic capacity is available); recycle Pu to FBRs, HWRs, and LWRs.

Waste Management Strategy: HLW--vitrify with borosilicate glass, store for 30-50 years and dispose in geological formations.
LLW--disposal in engineered structures on shallow land facility, and at sea if politically feasible.

Cumulative Spent Fuel	1980	1,200 tU
Arisings (LWR)	1985	3,600 tU
	1990	7,500 tU
	1995	12,400 tU

Industrial-Scale Activities (Capacity)

- Uranium mining and conversion (tU_{F₆}/a): 200
- Uranium reconversion (tU/a): 1,028
- Uranium enrichment (tSWU/a): 1981 -- 50
1988 -- 250
2000 -- 3000
- Fuel fabrication
 - UO₂ (tU/a): 1987 -- 2495
 - MOX--FBR (t/a): 1988 -- 6
 - ATR (t/a): 1988 -- 10
1993 -- 50
- Reprocessing (t/a): 1981 -- 210
2000 -- 1010

Major Milestones

- Tokai Vitrification Facility (PNC) (Test operation start) 1992
- Storage facility for HLW from COGEMA and BNFL 1995
- MONJU LMFBR operation 1992
- Commercial uranium enrichment plant 1991
(Rokkasho-mura; FEPC/JNFI)
- Commercial LWR fuel reprocessing plant
(Rokkasho-mura; JNFS) ~1998
- Selection of demonstration site for
in situ test with HLW disposal package After 2000
- FBR fuel reprocessing pilot plant After 2000
- Startup of HLW disposal site After 2000
- Experimental sea-dumping of LLW TBD
- Commercial LLW storage facility ~1992
(Rokkasho-mura; JNFI)

INTERNATIONAL RELATIONSHIPS**DOE/PNC Agreement for Cooperation in the Area of Radioactive Waste Management**

Term: 12-3-86 to 12-3-96.

Scope: HLW/TRU waste; waste form development, assay and characterization; treatment/packaging/transportation; storage/disposal; D&D; facility operations; environment/safety and public acceptance issues.

Emphasis: Information exchange of HLW and TRU waste conditioning technology.

DOE/JAERI Agreement on Decommissioning Nuclear Facilities

Term: 07-02-87 to 07-02-92.

Scope: Cooperation in the development and verification of decommissioning technologies and techniques regarding dismantling, transportation, and disposal of resulting wastes, radiation exposure to workers, public, and environment. Exchange of information, equipment, and personnel related to activities at specific U.S. and Japanese facilities.

NRC/JAERI Agreement on Cooperation in Radioactive Waste Management Safety Research

Term: 11-07-84 to 11-07-89 (negotiations in progress for extension).

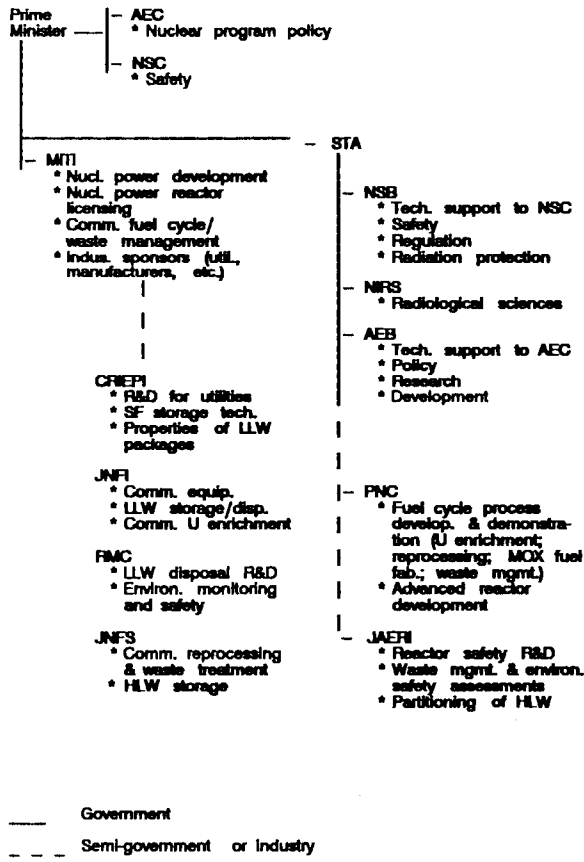
Scope: Cooperation in experimental and analytical studies through technology information exchange. LLW: radionuclide migration through soils; source terms of radionuclides in shallow-land burial sites; safety performance assessment of shallow-land burial sites. HLW: understanding of materials/engineering; characterization of natural barriers; performance assessment.

Member of IAEA and OECD/NEA. Cooperative agreements with Australia (SYNROC development), Canada, China, France, U.K..

ORGANIZATION

Government funds nuclear R&D and is responsible for HLW disposal. Industry handles the commercial fuel cycle and LLW disposal and pays for HLW disposal. See next three pages for organizational relationships and responsibilities.

NUCLEAR FUEL CYCLE/WASTE MANAGEMENT ORGANIZATION



PARTIAL PNC ORGANIZATION

President — Board of Directors

- Technology Management Division
- Policy Planning Division
- Safety Division
- International Division
- Reactor Technology Development Division
- Reactor Construction/Operation Project
- Radioactive Waste Management Project
- Nuclear Fuel Cycle Development Division
- Nuclear Fuel Cycle Engineering Division
- Nuclear Material Control Division
- Fuel Cycle Training Coordination Office
- Oarai Engineering Center
 - Technology Development Division
 - Health/Safety Division
 - Systems and Components Division
 - Fuels and Materials Division
 - Experimental Reactor Division
 - Safety Engineering Division
- Tokai Works
 - Nuclear Fuel Technology Development Div.
 - Plutonium Fuel Division
 - Reprocessing Technology Development Div.
 - Waste Technology Development Division
 - Nuclear Waste Treatment Division
 - Tokai Reprocessing Plant

PARTIAL JAERI ORGANIZATION

President

- Takasaki Radiation Chemistry Research Establishment
- Oarai Research Establishment
- Naka Fusion Research Establishment
- Tokai Research Establishment

- Department of Reactor Engineering
- Department of Fuels and Materials Research
- Department of High Temperature Engineering
- Department of Research Reactor Operation
- Department of JPDR
- Department of Radioisotopes
- Nuclear Safety Research Center

- Department of Reactor Safety Research
- Department of Fuel Safety Research
- Department of Reactor Fuel Examination
- Department of Environmental Safety Res.

- Environmental Radioactivity
- Radioactive Waste Management
- Airborne Waste--Environmental Safety

AEB

Atomic Energy Bureau
Science and Technology Agency Tel: 81-3-3581-1686 or
2-1 Kasumigaseki 2-chome 81-3-3581-5271
Chiyoda-ku, Tokyo 100, Japan Fax: 81-3-3592-1239

Director General Teiichi Yamamoto
Deputy Director General Hiroto Ishida
Director, Policy Tetsuo Naito
Dir., Power Reactor Dev. Div. Masao Sato
Dir., Nuclear Fuel Div. Tōichi Sakata

Function: Provide support to the Atomic Energy Commission.

AEC

Atomic Energy Commission
2-1 Kasumigaseki 2-chome Tel: 81-3-3581-2585 or
Chiyoda-ku, Tokyo 100 81-3-3581-5271
Japan Fax: 81-3-3581-5198

Chair (Minister of State
for Science/Technology) Ms. Akiko Santo
Acting Chair Dr. Takashi Mukaibo

Function: Formulate national policy on nuclear energy research, development and utilization; advise the Prime Minister.

CRIEPI

Central Research Institute
of Electric Power Industry
1-6-1, Ohtemachi Tel: 81-3-3201-6601
Chiyoda-ku, Tokyo 100, Japan Fax: 81-3-3287-2880

President Hiroshi Narita

Function: Provide R&D support for utilities.

Waste Management R&D: Transportation, storage, and disposal of LLW; intermediate and long-term storage of spent fuel; long-term storage and disposal of HLW.

CRIEPI (contd)

Energy and Environmental
 Research Laboratory for
 Energy and Electric Power
 2-11-1, Iwato-kita Tel: 81-3-3480-2111
 Komae-shi, Tokyo 201, Japan Fax: 81-3-3488-6697

GIRIO

Government Industrial Research
 Institute, Osaka
 1-8-31 Midorigaoka, Ikeda-shi Tel: 81-727-51-8351
 Osaka 563, Japan Fax: 81-727-51-6945

Director, 4th Department Dr. Ryozo Hayami
 Nuclear Waste Program Dr. Ryohei Terai

Waste Management R&D: Alternatives for HLW solidification;
 waste form characterization.

HITACHI

Hitachi, Ltd.
 6, Kanda-surugadai, 4-chome Tel: 81-3-3258-1111
 Chiyoda-ku, Tokyo 101, Japan Fax: 81-3-3258-6218

General Manager,
 Nucl. Power Systems Division Shigemi Sugino
 Sr. Chief Engineer Yoshiaki Korei
 Nuclear Power Development Hiromasa Kobayashi

Waste Management R&D: Development of volume reduction sys-
 tems for radioactive waste. Application of automation and robot
 technology. Development of advanced control technology through
 use of fiber optics.

Hitachi Engineering Co., Ltd.
 2-1 Saiwai-cho, 3-chome
 Hitachi-shi, Ibaraki-ken, 317 Tel: 81-294-24-1111
 Japan Fax: 81-294-22-8987

Nuc. Power Plant Construction Kiyoshi Shimizu
 Nuc. Fuel Project Yasuo Hirose
 Nuc. Fuel Cycle Project Sadatoshi Inoue

HITACHI (contd)

Waste Management R&D: Develop technology to reprocess spent LWR fuel; fixation, storage, and disposal of HLW; spent fuel storage; Pu fuel production; and decommissioning.

IHI

Ishikawajima-Harima
Heavy Industries Co., Ltd.
Shin-Ohtemachi Bldg.
2-1, Ohtemachi 2-chome Tel: 81-3-3244-5111
Chiyoda-ku, Tokyo 100, Japan Fax: 81-3-3286-2440

President Kousaku Inaba
Gen. Mgr., Nucl. Power Sales Masahiro Ogawa
Executive Vice President Makio Amano

IHI Research Institute
Yokohama Branch
1, Shin-nakaharacho, Isogo-ku Tel: 81-45-751-1231
Yokohama 235, Japan Fax: 81-45-753-9564

Waste Management R&D: Development of nuclear waste management system.

JAERI

Japan Atomic Energy
Research Institute
2-2, Uchisarwai-cho, 2-chome
Chiyoda-ku, Tokyo 100 Tel: 81-3-3592-2111
Japan Fax: 81-3-3580-6107

President Yoshinori Ihara
Vice President Tbyojiro Fuketa
Vice President Eiichi Tsuji
Exec. Director, International Harumitsu Yoshimura

Location: JAERI headquarters and Radioisotope Center are in Tokyo. The Tokai and Oarai Research Establishments share government reservations at Tokai-mura and Oarai-machi with PNC. Tokai and Oarai are 120 and 100 km, respectively,

JAERI (contd)

northeast of Tokyo, near the ocean. These sites can be reached by train from Tokyo to the city of Mito, then by taxi. The recently formed Naka Research Establishment (fusion energy) is in Naka-machi near Tokai-mura.

Function: Semi-governmental research organization implementing national long-term programs in nuclear energy, including joint projects and international cooperation.

JAERI: OARAI

Japan Atomic Energy Research Institute
Oarai Research Establishment
Oarai-machi, Higashi-
Ibaraki-gun Tel: 81-292-67-4111
Ibaraki-ken Pref. 311-13, Japan Fax: 81-292-66-2235

Director General Konomu Sanokawa

JAERI: TOKAI

Japan Atomic Energy Research Institute
Tokai Research Establishment
Tokai-mura, Naka-gun
Ibaraki-ken Pref. 319-11 Tel: 81-292-82-5111
Japan Fax: 81-292-82-0528

Director General Dr. Takumi Asaoka
Deputy Director General Dr. Shojiro Matsuura
Deputy Director General Tetsuya Onodera
Deputy Director General Naomoto Shikazono

JAERI: TOKAI (contd)**Facilities:**

- **WASTEF** (glove box and hot cell facilities)
Mission: Safety evaluations for high-level waste.
History: Startup: cold, 1981; hot, 1982.
- **STEM** (Simulation Test for Environmental radionuclide Migration)
Mission: Safety evaluation for land disposal of radioactive LLW.
History: Startup, 1983.

JGC

JGC Corporation
Nuclear and Advanced Technology
New Ohtemachi Bldg.
2-1 Ohtemachi 2-chome Tel: 81-3-3279-5441
Chiyoda-ku, Tokyo 100, Japan Fax: 81-3-3273-8050

Exec. Vice President	Dr. Takao Nakajima
General Manager, Director	Dr. Hiroshi Kuribayashi
Deputy General Manager	Shigemi Morikawa

Function: Design and construction of fuel reprocessing and radwaste treatment facilities.

JGC Nuclear Research Center
2205 Narita-cho, Oarai-machi
Higashi-Ibaraki-gun Tel: 81-292-66-3311
Ibaraki Pref. 311-13 Fax: 81-292-66-8810
Japan

Nuc. & Adv. Tech. Proj. Div. Yasuhiro Moriya

Waste Management R&D: Wet oxidation process (decomposition of organic materials such as spent ion exchanger resin) incinerator; waste solidification process (cementing, bituminization, plastic solidification); regeneration waste recycle process; selective nuclide removal process, ash melting process.

JGC (contd)**Facilities:**

- **Demonstration Incineration Plant**
Mission: Simultaneously melt combustible and noncombustible wastes.
Design Basis: 100 kg/h at 1500°C. Low-level radwaste combustion technology licensed from Belgonucleaire SA.
- **Contaminated Liquid Waste Recycle Plant**
Mission: Recovery of clean water for re-use from LLLW.
Design Basis: 20 GPM, filtration, reverse osmosis, active-carbon bed adsorption, chelate resin adsorption, ion-exchange adsorption, evaporation, etc.

JNFI

Japan Nuclear Fuel
Industries Co., Inc.
Daiichi Seimei Bldg.

Hirakawa-cho 1-7, Chiyoda-ku
Tokyo, Japan

Tel: 81-3-3239-6521
Fax:

President
V. President, U Enrichment
V. Pres., Environmtl. Adjmts.

Satoshi Yamori
Yuzuru Yukawa
Hiroshi Takashina

Function: Construct/operate facilities for **uranium enrichment**, at an estimated cost of U.S.\$ 865 million, with a capacity of 1.5 M SWU, and for **LLW terminal storage**, at an estimated cost of U.S.\$ 480 million, with a capacity for storing 1 million drums. Proposed site for both facilities is in the Ohishita area of Rokkasho-mura.

INFS

Japan Nuclear Fuel
Service Co., Ltd.
2-2, 2-chome, Uchisaiwaicho Tel: 81-3-3580-6911
Chiyoda-ku, Tokyo 100, Japan Fax: 81-3-3591-8723

President Masatoshi Toyoda
Exec. Mgr., Dir., Technology Akio Horiuchi
Dir., Plant Design/Reprocess. Sadao Ito

Facility:

- **Commercial Fuel Reprocessing Plant** (located in Iyasakatai area of Rokkasho-mura).
Mission: Reprocess Japanese fuels.
Design Basis: 800 tHM/a; 3000 tU storage pool; HLW vitrification/storage. Cost: 840 billion yen. Being built by SGN, France.
Milestone: FRP startup, 1997; spent fuel storage, 1993.

KOBE STEEL

Kobe Steel, Ltd.
No. 3-18, Wakinohamacho Tel: 81-78-251-1551
1-chome Fax: 81-232-3459
Chuoh-ku, Kobe 651, Japan

General Manager, Mechanical Toru Abe
Eng. Research Lab. (MERL)
Nuclear Engineering Fumiaki Komatsu

Kobe Steel, Ltd.
Tekko Building Tel: 81-3-218-7111
No. 8-2, Marunouchi 1-chome Fax: 81-3-218-6425
Chiyoda-ku, Tokyo 100, Japan

General Manager, Nuc. Eng. Norio Mitsushima
Deputy General Mgr., Nuc. Eng. Kiyoshi Asahina
Gen. Mgr., Nuc. R&D Planning Shoji Tsuchibuchi

Activities: Spent Fuel transportation/storage casks. Waste treatment, equipment/systems. LLW/HLW handling/storage.

MITI

Ministry of International
Trade and Industry

3-1, Kasumigaseki 1-chome
Chiyoda-ku, Tokyo 100, Japan

Tel: 81-3-3501-1511
Fax: 81-3-3501-0643/-0644

Minister
Vice Min., International Affairs

Eiichi Nakao
Naomichi Suzuki

MITI/ANRE

Agency of Natural Resources
and Energy

Ministry of International
Trade and Industry

3-1, Kasumigaseki 1-chome
Chiyoda-ku, Tokyo 100, Japan

Tel: 81-3-3501-1511
Fax: 81-3-3501-0643/-0644

Director-General
Dep. Director-General
Dep. Dir.-Gen., Nuclear Energy
Dir., Nuclear Industry
Dir., Int. Nuclear Affairs

Kenjiro Ogata
Wataru Fukazawa
Junichiro Mukai
Kazumasa Kusaka
Tadashi Izawa

MMC

Mitsubishi Metal Corporation
5-2 Ohtemachi 1-chome
Chiyoda-ku, Tokyo 100
Japan

Tel: 81-3-3213-2111
Fax: 81-3-3215-2435/-2436

General Manager, Nuc. Energy
Manager, Tech. Planning
General Manager, Tech. Dept.
General Mgr., Nuc. Resources
Development/Waste Mgmt.

Dr. Yumi Akimoto
Dr. Tamotsu Ishii
Eiji Yagi
Takaaki Kashiwagi

Waste Management R&D: Design and research on facilities for spent fuel storage and reprocessing, waste treatment and geologic disposal.

MOFA

Ministry of Foreign Affairs
 2-1 Kasumigaseki 2-chome Tel: 81-3-3580-3311
 Chiyoda-ku, Tokyo 100, Japan Fax: 81-3-3581-9470

Director, Nuclear Energy Tatsuaki Iwata
 Deputy Director Yutaka Yoshizawa

NIRS

National Institute of
 Radiological Sciences
 9-1, Anagawa 4-chome Tel: 81-472-51-2111
 Chiba-shi, Chiba Pref. 260, Japan Fax: 81-472-56-8301

Director General Hiromichi Matsudaira

Function: Attached to the Science & Technology Agency; responsible for carrying out studies on radiation hazards, applications for medical use, and education/training of engineers in these areas.

NSB

Nuclear Safety Bureau
 Science and Technology Agency
 2-1, Kasumigaseki 2-chome Tel: 81-3-3581-5271
 Chiyoda-ku, Tokyo 100, Japan Fax: 81-3-3581-0774

Director-General	Kenichi Murakami
Deputy Director-General	Hideki Osada
Dir., Nuc. Mtls. Reg. Div.	Katsuyoshi Omori
Dir., Nuc. Safety Policy Div.	Hiroshi Tani
Dir., Reactor Reg. Div.	Mikio Hattori
Dir., Safeguards Division	Jiro Shibata
Dir., Radiation Protec. Div.	Tetsuhiko Yoshida
Dir., Nuc. Safety Policy Res.	Haruo Suzuki

Function: Provide support to the Nuclear Safety Commission.

NSC

Nuclear Safety Commission
 2-1, Kasumigaseki 2-chome
 Chiyoda-ku, Tokyo 100, Japan

Tel: 81-3-3581-5271
 Fax: 81-3-3581-0774

Chairman Hideo Uchida

Function: Responsible for carrying out national policy in regard to safety and security of nuclear energy R&D and utilization; advisory body to the Prime Minister's office.

PNC

Power Reactor and Nuclear Fuel
 Development Corporation

Sankaido Building
 1-9-13 Akasaka
 Minato-ku, Tokyo 107, Japan

Tel: 81-3-3586-3311
 Fax: 81-3-3505-5125

President	Takao Ishiwatari
Exec. Vice Presidents	Mitsuru Sata, Hiroshi Ohishi
Exec. Dir., Nucl. Fuel/Reprocess.	Hiroyoshi Kurihara
Exec. Dir., Waste Mgmt.	Yoshikazu Hashimoto
Dir., Fuel Cycle Develop.	Hidechiyo Kashihara
Dir., Fuel Cycle Engineering	Naomi Tsunoda
Senior Dir., Waste Mgmt.	Masao Yamamoto
Deputy Dir., Waste Mgmt.	Aiji Yamato
Coordination	Kouichi Tasurumaki
Conditioning Research	Tadashi Mano
Isolat'n Syst. Research	Sumio Masuda
International Project	Hideki Sakuma
Geoscience Research	Minoru Yamakawa
Dir., International Division	Tadatomo Yamaguchi
International Cooperation	Takao Yagi
U.S. DOE Tech. Representative	Jim Scott
	81-3-3586-3311

PNC Washington Office:

Power Reactor and Nuclear Fuel
 Development Corporation
 Suite 715
 2600 Virginia Avenue NW
 Washington, DC 20037

Tel: 202-338-3770
 Fax: 202-333-1097

Manager

Masayori Tsutsumi

PNC: OARAI

PNC Oarai Engineering Center
Oarai-machi, Higashi Ibaraki-gun Tel: 81-292-67-4141
Ibaraki Pref. 311-13, Japan Fax: 81-292-67-7147

Director (PNC Exec. Dir.)	Masao Hori
Waste Management Mgr.	Hidehiko Miyao
Director, Fuels/Materials	M. Katsuragawa

Facilities:

- **Inclinerator**
Mission: Burn solid LLW.
Design Basis: Three chambers--pyrolysis, combustion, after-burning.
- **WDF (Waste Dismantling Facility)**
Mission: Condition large contaminated equipment; develop decontamination and decommissioning technology.
Design Basis: Capacity to condition 5.5 t/a.
History: Hot startup, 1984.

PNC: TOKAI

PNC Tokai Works	
Muramatsu 3371,	Tel: 81-292-82-1111
Tokai-mura, Naka-gun	Fax: 81-292-82-1469
Ibaraki-ken 319-11, Japan	-1845, -9398

Director	Tanehiko Yamanouchi
Deputy Directors	M. Toda, N. Saitoh, K. Matsumoto
Dir., Reprocessing Plant	K. Miyahara
Dir., Technology Dev. Coord'n	Y. Kishimoto
Dir., Health Safety	S. Araya
Dir., Waste Technology Devel.	Takao Tsuboya
HLW Technology	T. Takahashi
LLW Technology	F. Nakanishi
Geological Isolation Tech.	Noriaki Sasaki
Dir., Nucl. Waste Treatment	Yoshiro Asakura
Dir., Reprocess. Tech. Devel.	Shotaro Hayashi
Dir., Fuel Technol. Devel.	Nobuyuki Sasao

PNC: TOKAI (contd)**Facilities:**

- **Fuel Reprocessing Plant**
Mission: Reprocess low-enriched UO_2 .
Design Basis: Oxide fuels: chop-leach head-end. PUREX flowsheet; capacity, 0.7 tHM/d. Remote maintenance of chop-leach equipment; contact maintenance of other components.
History: Startup, 09/77; 509 tU spent fuel processed through 12/90.
- **Tokai Plutonium Conversion Development Facility**
Mission: Demonstrate PNC microwave process for co-conversion production of MOX.
Design Basis: 10 kg/d MOX (50% PuO_2 , 50% UO_2).
History: Startup of hot operation, 10/83.
- **Tokai Plutonium Fuel Fabrication Facility**
Mission: Fabricate FBR and ATR fuels.
Design Basis: FBR fuels--1 t/a (30% PuO_2 in enriched UO_2); ATR fuels--10 t/a (2% PuO_2 in UO_2).
Throughput: Since 1979, 100 t MOX produced through 05/89.
- **Tokai Plutonium Fuel Production Facility**
Mission: Fabricate large quantities of MOX fuel for FBR and ATR.
Design Basis: FBR fuels, 5 t/a; ATR fuels 40 t/a.
History: Startup of hot operation, 04/88.
- **EDF (Engineering Demonstration Facility)**
Mission: Nonradioactive, full-scale and/or engineering mockup tests of processes and equipment for FBR spent fuel reprocessing.
History: Startup, 04/82.
- **ETF (Engineering Test Facility)**
Mission: Develop engineering test of HLW vitrification and ceramic melter technologies.
Design Basis: Joule-heated melter.
History: Facility startup, 02/80.

PNC: TOKAI (contd)

- **CPF (Chemical Processing Facility)** - reprocessing and HLW treatment.
Mission: Radioactive studies of FBR spent fuel reprocessing and HLW solidification processes.
Design Basis: Five standard hot cells for breeder-fuel reprocessing R&D, five cells for waste conditioning R&D.
Reprocessing--1 kg/batch; HLW solidification--10 liter/batch HLW.
History: Hot tests, 09/82.
- **KRF - Krypton Recovery Facility (pilot plant)**
Mission: Demonstrate ⁸⁵Kr recovery from Tokai-mura reprocessing plant off gas.
Design Basis: Cryogenic distillation and pressurized cylinder storage.
History: Hot test, 03/88. Radioactive operation, 04/88.
- **Bitumization Demonstration Facility**
Mission: Immobilize low-level liquid waste concentrate.
Design Basis: 200 liter/h.
- **Incinerator**
Mission: Burn solid LLW.
Design Basis: 600 kg/d.
- **PWTF (Plutonium-Contaminated Waste Treatment Facility)**
Mission: Prepare PNC TRU wastes for disposal.
Design Basis: Acid digestion of chloride-containing wastes; incineration of combustibles; mechanical volume reduction.
History: Operation startup, 1987.
- **PWSF (Plutonium-contaminated Waste Storage Facility)**
Mission: Store PNC TRU waste.
Design Basis: 6000-drum capacity.
History: Operation startup, 1981.

PNC: TOKAI (contd)

- **TVF (Tokai Vitrification Facility)**
Mission: Vitrify and store HLW from the Tokai reprocessing plant; demonstrate technology.
Design Basis: Ceramic melter to produce a borosilicate glass; capacity, 0.35 m³ HLLW/d.
History: Construction started 4/88.
Milestone: Startup, 1992.
- **Recycle Equipment Test Facility** (site to be determined)
Mission: Demonstrate FBR fuel reprocessing equipment and process technology.
Design Basis: 10 kg/h
Milestone: Startup, 1994.
- **FBR Fuel Reprocessing Pilot Plant** (reprocessing and HLW treatment, site to be determined)
Mission: Demonstrate FBR fuel reprocessing and HLW solidification.
Design Basis: 120 kg MOX/d (12 t/a).
Milestone: Hot operation, 1997.

RWMC

Radioactive Waste Management Center

Mori Building#15

8-10, Toranomon 2-Chome

Minato-ku, Tokyo, 105, Japan

Tel: 81-3-3504-1081

Fax: 81-3-3504-1297

President

Managing Director

Toshio Fukuda

Syunichi Murakoshi

Function: Studies of safe and rational operation of low-level radioactive waste disposal.

Owners: Japanese industry, MITI and STA.

STA

Science and Technology Agency
2-1 Kasumigaseki, 2-chome
Chiyoda-ku, Tokyo 100
Japan

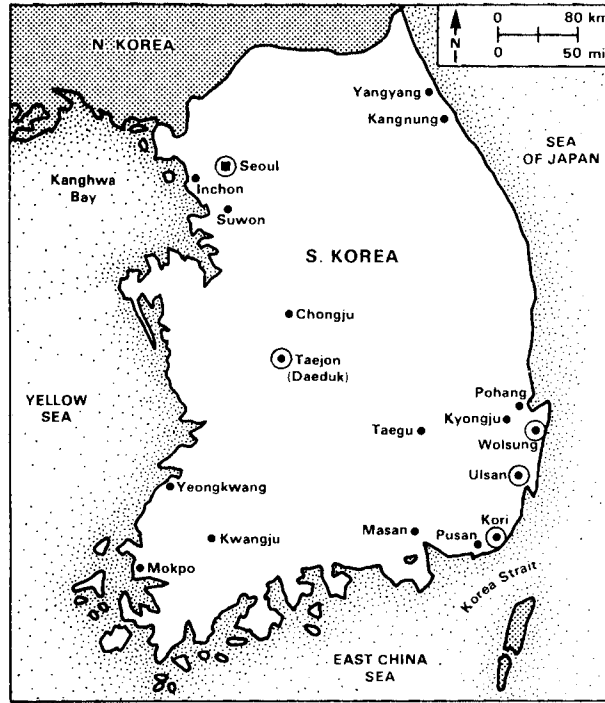
Tel: 81-3-3581-5271
Fax: 81-3-3592-1239

Minister, Science/Technology
Vice Minister
Deputy Minister
Director-General, AEB
Director-General, NSB
Dep. Director-General, AEB
Dep. Director-General, NSB
Dir., Policy Division, AEB

Ms. Akiko Santo
Moritaka Nakamura
Mitsugu Ishizuka
Teiichi Yamamoto
Kenichi Murakami
Hiroto Ishida
Hideki Osada
Tetsuo Naito

Function: Established as an extra-ministerial agency of the Prime Minister's office for comprehensive administration and the promotion of science and technology. The Atomic Energy Bureau (AEB) and the Nuclear Safety Bureau (NSB) are under STA jurisdiction. Appropriate listings are under AEB and NSB, respectively.

KOREA
(Republic of Korea)



REPUBLIC OF KOREA

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1-3	New Year
Mar. 1	Independence Movement
Apr. 5	Arbor Day
Apr. 8	Buddha's Birthday
May 5	Children's Day
June 6	Memorial Day
July 17	Constitution Day
Aug. 15	National (Independence) Day
Sept. 21-22	Chusok (Thanksgiving)
Oct. 3	National Foundation Day
Dec. 25	Christmas

TIME

Standard Time Washington D.C.: + 14 hours

PASSPORT/VISA

A passport is needed to depart and re-enter the United States; in addition, a visa is currently required for a visit to Korea. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 717.00 Won (W)
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Korea are complete as listed, after dialing international access code: 011. Country code is 82; listed local numbers include city code.

U.S. EMBASSY - SEOUL

American Embassy
82 Sejong-Ro, Chongro-Ku
Seoul
Korea

Tel: 82-2-732-2601
Fax: 82-2-738-8845

Science Counselor

Kenneth D. Cohen

ENERGY

Population	1988	44 million
Electric Power Plant Capacity	1988	19.9 GWe 36% nuclear
Electric Power Production	1988	81.0 TWh 46.9% nuclear ~ 27% coal ~ 21% oil ~ 5% hydro

NUCLEAR POWER

Policy: Continue expansion of electric power capacity; reduce dependence on foreign oil by strong nuclear program with indigenous manufacturing capability; long-term goal--develop FBR capability.

Nuclear Power Plant Capacity	1990	7.2 GWe
	1995	7.2 GWe
	2000	10.7 GWe
Reactor Mix	1990	PWR: 8 (1978-89)
		2 (1995-96)
		HWR: 1 (1983)

Reactor Development (feasibility studies): FBR

INDUSTRIAL FUEL CYCLE

Policy: Develop long-term contracts for fuel supplies, holdings of foreign uranium resources; fabricate fuel for PWR and HWR (CANDU); "wait and see"--reprocessing and recycle of Pu for FBR, CANDU and LWRs.

Waste Management Strategy: LLW/ILW repository to be constructed by mid-1990s with emphasis on engineered barriers. Candidate sites have been identified but final decision on site is pending. Utility surcharge of 2 mil/kWh to fund waste management. Extended storage (~ 60 years) of spent fuel planned, in AR and AFR facilities. No decision has been made on reprocessing or disposal.

Cumulative Spent Fuel	1980	17 tU
Arisings	1985	60 tU
	1987	500 tU
	1990	1,500 tU
	1995	2,600 tU
	2000	4,400 tU

Industrial-Scale Activities

- Uranium milling--3 t ore/d pilot plant.
- Uranium conversion, yellowcake to UO_2 --100 tU/a.
- UO_2 fuel fabrication pilot plant--10 tU/a.
- UO_2 fuel fabrication--200 tU/a. Startup, 1989.

Major Milestones

- LLW disposal site (500,000 drums) 1996

INTERNATIONAL RELATIONSHIPS

Member of IAEA. Agreement with U.S. for peaceful nuclear cooperation.

ORGANIZATION

Prime Minister ---- Atomic Energy Commission (AEC)

- Ministry of Energy and Resources (MER)
 - Electric Power Bureau (EPB)
 - Korea Institute of Energy and Resources (KIER)
 - Korea Electric Power Corporation (KEPCO)
 - Korea Power Engineering Company (KOPEC)
 - Korea Electric Power Operating Service Company, Ltd. (KEPOS)
 - Korea Heavy Industries/Construction Co. (KHIC)
 - Korea Nuclear Fuel Company, Ltd. (KNFC)
- Ministry of Science and Technology (MOST)
 - Atomic Energy Bureau (AEB)
 - Nuclear Policy Division
 - Nuclear Reactor Division
 - Nuclear Energy R&D Division
 - Nuclear Safety and Cooperation Office
 - Nuclear Safety Division
 - Nuclear Cooperation Office
 - Korea Advanced Institute of Science/Technology (KAIST)
 - Korea Atomic Energy Res. Institute (KAERI)
 - Korea Institute of Nuclear Safety (KINS)

AEB

Atomic Energy Bureau
Ministry of Science and Tech.
Gwacheon 171-11
Republic of Korea

Tel: 82-2-503-7654
Fax: 82-2-503-7673

Director-General
Director, R&D Division
Director, Nuclear Policy
Director, Nuclear Reactor
Director, Internl. Cooperation

Ki Hun Chang
Uk Jong Yoo
Sang Hoon Choi
Kyong Chul Jang
Tae Sik Min

Function: Licensing of nuclear power plants and fuel cycle facilities. Manage nuclear waste fund. Sponsor nuclear R&D.

AEC

Atomic Energy Commission
1, Chungang-dong
Kwachon Kyonggi-do
Republic of Korea

Tel: 82-2-503-7646
Fax: 82-2-503-7673

Chairman: Deputy Prime Minister Soon Cho

Function: Decision-making body for policies regarding nuclear energy: research and development plan for nuclear fuel and nuclear energy applications. Always chaired by current Deputy Prime Minister. Required members are ministers of MOST and MER, and president of KEPCO.

EPB

Electric Power Bureau
Ministry of Energy and Resources
Seoul, Republic of Korea

Tel: 82-2-503-7171
Fax: 82-2-503-9649

Dir. General, Nuclear Power Se-Jong Kim

Function: Establish plans and policies on energy and resources, in coordination with MOST and AEB. Manage nuclear fuel acquisition.

KAERI

Korea Atomic Energy Research
Institute
150 Tukjin-dong
Chung-gu, Taejon
Republic of Korea

Tel: 82-42-820-2000
Fax: 82-42-820-2702

President

Dr. Pil-Soon Han
82-42-820-2121

Sr. V.P., Nuclear
V.P for MRR Project
Dir., Rad. Waste Management
Director, Safety/Exam. Analysis
Dir., Nuclear Safety/Research
Dir., Spent Fuel Management

Kwang Jae Lee
Poong Eil Jhun
Hun Hwee Park
Seung Gi Ro
Sung Ki Chae
Hyun Soo Park

Function: Development of reactor engineering and nuclear fuel cycle technology. Assist government (MOST) with regulatory/licensing issues and in establishing national nuclear policy.

Waste Management R&D: Fuel fabrication, uranium ore processing and conversion, radioactive waste management, and post-irradiation examination.

KAIST

Korea Advanced Institute of
Science and Technology
207-43 Cheongryangri-dong
Seoul, Republic of Korea

Tel: 82-2-962-8835
Fax: 82-2-963-4013

President

Dr. Sang Soo Lee

Function: Research-oriented graduate school, conducting advanced research and development.

KEPCO

Korea Electric Power Corporation
 167, Samsung-dong
 Kangnam-Gu
 Seoul
 Republic of Korea

Tel: 82-2-550-3114
 Fax: 82-2-550-5981

President Ahn Byong Wha
 Gen. Mgr., Nuc. Safety/Tech. Eun Rae Roh

Function: Development of power resources, and the generation/transmission of electricity. (Operates all nuclear and conventional power plants in Korea.) Responsible to the government (MER).

KIER

Korea Institute of Energy and Resources
 71-2 Chang-dong
 Chung-gu, Taejon
 Republic of Korea

Tel: 82-42-861-9700
 Fax: 82-42-861-9734

President Dr. Jee-Dong Kim

Function: Research and develop energy technologies and alternative energy resources. Geological investigations, including uranium ore exploration and site evaluations for nuclear power plants and waste disposal facilities.

KINS

Korea Institute of Nuclear Safety Technology
 P.O. Box 7
 Daeduk-Danji, Choong-Nam
 Republic of Korea

Tel: 82-42-820-2000-1
 Fax: 82-42-820-2702

President Sang-Hoon Lee
 Director, Safety Review Byung-Joon Koh
 Director, Safety Inspection Philip Suc-Hyong Moon
 Director, Standards Development Chae-Shik Rho

Function: Established 1990 as independent regulatory organization to develop technical standards for nuclear safety.

KNFC

Korea Nuclear Fuel Company, Ltd.
150 Tukjin-dong, Chung-gu
Taejon Tel: 82-42-822-9441
Republic of Korea Fax: 82-42-820-1000

President Dr. Pil-Soon Han

Function: Development of domestic nuclear fuel fabrication.

Owners: KEPCO (90%), KAERI (10%).

Facility:

- Fuel Fabrication Plant, Daeduck site, 200 tU/a

KOPEC

Korea Power Engineering Co., Inc.
87 Samsung-dong, Kangnam-gu
Seoul Tel: 82-2-540-7701
Republic of Korea Fax: 82-2-540-4184

President Kee Jo Shin

Function: Architect-engineering services for nuclear and conventional power plants.

MER

Ministry of Energy and Resources
1, Chungang-dong
Kwachon, Kyonggi-do Tel: 82-2-503-9641
Republic of Korea Fax: 82-2-503-9649

Minister Dr. Bong-Suh Lee
Vice Minister Sang Jin Chang
Dir. General/Electric Power Se Jong Kim

Function: Lead government agency in power development and resource utilization.

MOST**Ministry of Science and Technology**

1, Chungang-dong
Kwachon, Kyonggi-do
Republic of Korea

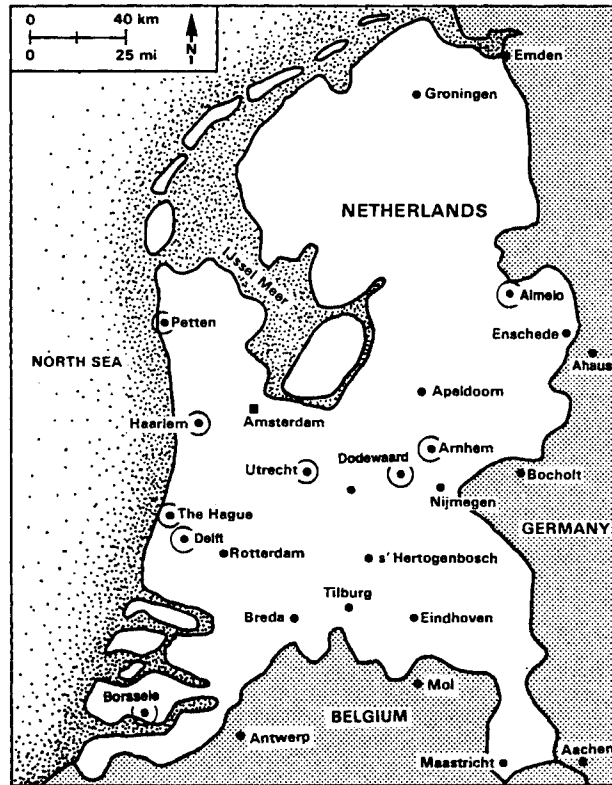
Tel: 82-2-503-7171
Fax: 82-2-503-7673

Minister
Vice Minister
Dir. Gen./Atomic Energy Bureau
Dir. Gen./Nuclear Safety
Assessment Officer
Director, Radiation
Director, Nuclear Policy
Director, Energy R&D
Director, Nuclear Cooperation

Shang Hi Rhee
Young Hwan Choi
Young Sung Hahn
Poong Il Chun
Hong Shik Choi
Sang Un Choi
Kun Soo Yim
Jong Taek Park

Function: Authority over (virtually) all scientific and technological efforts in Korea.

NETHERLANDS



NETHERLANDS

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year
Mar. 29	Good Friday
Mar. 31-Apr. 1	Easter
Apr. 30	Queen's Birthday
May 5	Liberation Day
May 9	Ascension
May 19-20	Pentecost
Dec. 25-26	Christmas

TIME

Standard Time Washington + 6 hours
Daylight Saving Time Period: 03/31 - 09/28/91

PASSPORT/VISA

A passport is needed to depart and re-enter the United States. A visa is currently not required for a visit to the Netherlands; however, it is recommended to consult a travel agency for up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 1.66 Guilder (Fl.)
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to the Netherlands are complete as listed, after dialing international access code: 011. Country code is 31; listed local numbers include city code.

U.S. EMBASSY - THE HAGUE

American Embassy
Lange Voorhout 102
2514 E The Hague
Netherlands

Tel: 31-70-3624911
Fax: 31-70-3614688

ENERGY

Population	1988	15 million
Electric Power Plant Capacity	1988	18.0 GWe 3% nuclear
	1990	17.6 GWe 3% nuclear
	1995	18.0 GWe 3% nuclear
	2000	18.8 GWe 2% nuclear
	1988	69.6 TWh 52% gas 36% coal 5% nuclear 6% oil 1% solids
Electric Power Production	1990	5% nuclear
	1995	4% nuclear
	2000	4% nuclear

NUCLEAR POWER

Policy: Expansion of nuclear capacity is on indeterminate hold as a consequence of events at Chernobyl.

Nuclear Power Plant Capacity	1990	0.5 GWe
	1995	0.5 GWe
	2000	0.4 GWe
Reactor Mix	1990	BWR: 1 (1969) PWR: 1 (1973)
Reactor Development	Participation in SNR-300 FBR	

INDUSTRIAL FUEL CYCLE

Policy: Use foreign services (fuel fabrication, reprocessing).
Participate with FRG and U.K. in URENCO (uranium enrichment consortium).

Waste Management Strategy: Designate single centralized waste collection service; extend interim storage of all wastes (50-100 years). Studies on final disposal of all radioactive wastes in geological formations are executed in the framework of the national research program (OPLA). Ocean dumping of LLW and ILW has been terminated; the Netherlands contributed to NEA feasibility study regarding subseabed disposal. Feasibility of disposal within international or bilateral framework is also being explored.

Cumulative Spent Fuel	1980	76 tU
Arisings (LWR)	1985	152 tU
	1990	228 tU
	2000	369 tU

INTERNATIONAL RELATIONSHIPS

Member of EC, IAEA and OECD/NEA.

ORGANIZATION

- Government--Ministries of Economic Affairs; Housing, Physical Planning and Environment; and Social Affairs exercise overall control of nuclear matters with Parliamentary approval of their decisions.
- COVRA (Centrale Organisatie Voor Radioactief Afval)--stores and collects all radioactive wastes.
- Interim Storage Center, 1994.
- ECN (Netherlands Energy Research Foundation)-- provides nuclear-related services, including waste treatment and disposal research.
- ILONA (Integrated National Research for Nuclear Waste - Policy Committee)--supervises and coordinates waste disposal research.

COVRA (CENTRAL ORGANIZATION FOR RADIOACTIVE WASTE)

Centrale Organisatie Voor
Radioactief Afval
Westerduinweg 3
1755 ZG Petten, Netherlands

Tel: 31-2246-3344
Fax: 31-2246-1556

Director
Radiation Protection
Waste Storage/Transportation

Dr. Jan Vrijen
Dr. H.D.K. Codee
U. Bakema

COVRA (contd)

Function: Responsible for collection, treatment and storage of all waste. (Multi-funded: utilities, government, ECN).

Facility:

- Interim storage center (located in Borsele)--for all radioactive wastes; scheduled to be fully operational in 1994.

ECN (Netherlands Energy Research Foundation)

Stichting Energieonderzoek

Centrum Nederland

Westerduinweg 3

Postbus 1

1755 ZG Petten

Netherlands

Tel: 31-2246-4949

Fax: 31-2246-4480

Chairman, Governing Board

Dr. G. M. V. van Aardenne

Function: Organize and sponsor energy research and development (partially government-funded).

Research Center

Managing Director

Prof. Dr. H. H. van den
Kroonenberg

Nuclear Energy Research

Dr. A. M. Versteegh

Nuc. Waste/Geologic Disposal

Dr. Klaas A. Duijves

Safety Assessment

Dr. J. Prij

Radionuclide Migration

Dr. A. van Dalen

Actinide Burning

Dr. A. Abrahams

Function: Scientific and technical center: applied energy research; waste treatment.

Waste Management R&D: Geologic waste isolation--salt dome repositories (conceptual design; thermo-mechanical, safety, and radionuclide migration studies), seabed disposal, decontamination study of large components actinide burning.

GEOLOGICAL SURVEY OF THE NETHERLANDS

Geological Survey of the Netherlands

Nieuwe Gracht 13

Postbus 157

2000 AD Haarlem

Netherlands

Tel: 31-23-319362

Fax: 31-23-351614

Director

Deep Subsurface Dept.

Dr. C. Staudt

Dr. H. M. van Montfrans

**KEMA (Research and Testing Electrochemical
Materials Company)**N.V. Tot Keuring van Elektro-
technische Materialen Arnhem

Utrechtseweg 310

Postbus 9035

6800 ET Arnhem

Netherlands

Tel: 31-85-569111

Fax: 31-85-515606

R&D Division

Nuc. Research Program

Quality Assurance

High-Level Waste

Aqueous Waste Mgmt.

Dr. A. H. M. Verkooijen

J. B. W. Kanij

Dr. H. A. W. Cornelissen

Dr. F. J. J. G. Janssen

J. L. Matteman

Function: Research and consulting development; services for utilities. Waste Management R&D: Characterization, quality assurance, volume reduction and storage of radioactive wastes.

MINISTRY OF ECONOMIC AFFAIRS

Ministerie van Economische Zaken

Postbus 20101

2500 EC Gravenhage

Netherlands

Tel: 31-70-3798911

Fax: 31-70-3796358

Dir. Electricity/Nuclear Energy

Radioactive Waste

Dr. H. F. G. Geyzers

31-70-3796471

Dr. J. N. A. Enst

31-70-3797849

**MINISTRY OF HOUSING, PHYSICAL
PLANNING AND ENVIRONMENT**

Ministerie van Volkshuisvesting
Ruimtelijke Ordening en
Milieubeheer

Postbus 450
dr. v.d. Stamstr. 2
2260 MB Leidschendam
Netherlands

Tel: 31-70-3174174
Fax: 31-70-3175017

Director, Rad. Protection
Radioactive Waste

Dr. C. M. Plug/R.J.P. Cornet
Dr. A. Cornelissen

MINISTRY OF SOCIAL AFFAIRS AND EMPLOYMENT

Ministry of Social Affairs
and Employment

Postbus 90801
2509 LV The Hague
Netherlands

Tel: 31-70-3335549
Fax: 31-70-3334018

Nuclear Safety

J. Versteeg

**RIVM (National Institute of Public Health
and Environment Protection)**

Rijksinstituut voor Volksgezondheid
en Milieuhygiene

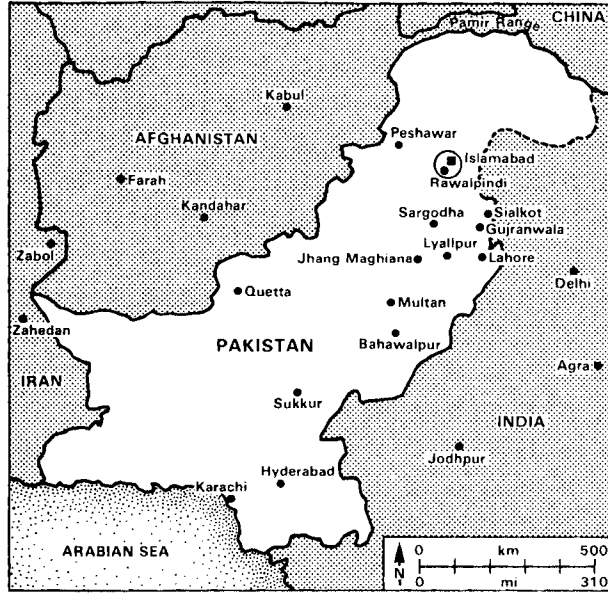
Antonie van Leeuwenhoeklaan 9
Postbus 1
3720 BA Bilthoven
Netherlands

Tel: 31-30-749111
Fax: 31-30-742971

Safety Assessment of
Underground Disposal Studies

Dr. Peter Glasbergen
31-30-743397

PAKISTAN



PAKISTAN

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year	Aug. 14	Independence Day
Mar. 17	Start of Ramadan	Sept. 6	Defense of Pakistan
Mar. 23	Pakistan Day	Sept. 11	Death of Quaid-i-Azam
Apr. 16-18	Ramadan	Sept. 22	Prophet's Birthday
May 1	May Day	Nov. 9	Iqbal Day
June 23-25	Sacrifice Feast	Dec. 25	Quaid-i-Azam Birthday
July 1	Bank Holiday	Dec. 31	Bank Holiday

TIME

Standard Time Washington D.C.: + 10 hours
Work week: Sunday - Thursday

PASSPORT/VISA

A passport is needed to depart and re-enter the United States; in addition, a visa is currently required for a visit to Pakistan. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 22.02 Rupees
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Pakistan are complete as listed, after dialing international access code: 011. Country code is 92; listed local numbers include city code.

U.S. EMBASSY - ISLAMABAD

American Embassy
P.O. Box 1048
Islamabad, Pakistan

Tel:92-51-826161
Fax:92-51-822004

Economic Section

Lawrence N. Benedict

ENERGY

Population	1988	100 million
Electric Power Plant Capacity	1988	6.7 GWe 1.5% nuclear
	2000	13.8 GWe <1% nuclear
Electric Power Production	1988	33.3 TWh
		~ 65% hydro
		~ 29% gas
		~ 5% coal
		0.6% nuclear

NUCLEAR POWER

Policy: Provide up to 50% of electrical power supply with nuclear.

Nuclear Power Plant Capacity	1990	0.1 GWe
	1995	0.1 GWe
	2000	0.1 GWe
Reactor Mix	1990	HWR: 1 (1972)

INDUSTRIAL FUEL CYCLE

Policy: Develop complete domestic fuel cycle: uranium mining, milling, conversion, and enrichment; fuel fabrication; reprocessing.

Cumulative Spent Fuel Arisings	1985	110 tU
	1990	170 tU
	2000	440 tU

INTERNATIONAL RELATIONSHIPS

Member of IAEA. Agreement with U.S. and other nations on peaceful nuclear cooperation. Has not signed non-proliferation treaty.

ORGANIZATION

- **PAEC** - Pakistan Atomic Energy Commission--control of nuclear matters.
- **PINSTECH** - Pakistan Institute of Science and Technology (Rawalpindi)--fuel cycle R&D, including lab-scale reprocessing facility.

PAEC

Pakistan Atomic Energy Commission
P.O. Box 1114
Islamabad, Pakistan

Tel: 92-51-811030-9
Tlx: 5725 ATCOM PK

Chairman (A)

Ishfaq Ahmad

Function: Strong advocate for increased nuclear energy generation to overcome serious energy shortages in a country substantially lacking in natural resources. In an effort to accelerate Pakistan's overall economic development, the commission also promotes the utilization of nuclear technologies in other areas, i.e., to enhance agricultural production and for medical diagnosis/therapy.

Facilities¹:

- Fuel Fabrication Plant at Kundian - manufacturing fuel for KANUPP since 1978. Located near the Chashma Site where SGN was to build a 50-100 tU/a spent fuel reprocessing plant (project started in 1974, halted in 1977).
- A. Q. Khan Research Laboratory at Kahuta - provides nuclear training and R&D on centrifuge enrichment.

PINSTECH

Pakistan Institute of
Science & Technology
Islamabad, Pakistan

Director

I. H. Qureshi

Function: Fuel cycle R&D activities include analytical chemistry, nuclear materials, metallurgy, fuel development, digital electronics, control instrumentation, and computational physics. Basic research facilities are open to scientists/engineers from universities as well as research organizations.

Facilities¹:

- CNS - Center for Nuclear Studies - offers a Master's course in nuclear engineering, and fulfills training requirements in health physics, nuclear medicine, instrumentation, and basic nuclear orientation.

PARR-1 - research reactor, designed for highly enriched (90% uranium) fuel, commissioned in 1965, is being raised from 5 MWt to 9 MWt and converted to low-enriched (20%) fuel in 1990.

PARR-2 - training reactor, 27 kW, designed and built in collaboration of the Chinese Institute of Atomic Energy (Beijing), went critical in late 1989.

Reprocessing plant, lab scale; non-radioactive startup, 1982.

- CTC - Computer Training Center - established in collaboration with a consortium of universities.

1. Based on publicly available information, organizational responsibility and specific location of some facilities cannot be identified with certainty; e.g., some reports appear to discuss the same facility, but their location is referred to variously at Kahuta, Rawalpindi or Islamabad which are in relative proximity to each other.

PINSTECH (contd)**Facilities¹:**

- CNS - Center for Nuclear Studies - offers a Master's course in nuclear engineering, and fulfills training requirements in health physics, nuclear medicine, instrumentation, and basic nuclear orientation.

PARR-1 - research reactor, designed for highly enriched (90% uranium) fuel, commissioned in 1965, is being raised from 5 MWt to 9 MWt and converted to low-enriched (20%) fuel in 1990.

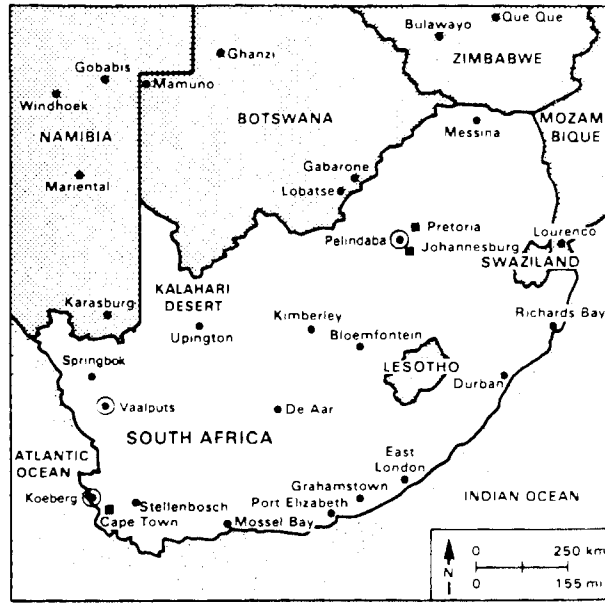
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1. Based on publicly available information, organizational responsibility and specific location of some facilities cannot be identified with certainty; e.g., some reports appear to discuss the same facility, but their location is referred to variously at Kahuta, Rawalpindi or Islamabad which are in relative proximity to each other.

SOUTH AFRICA



SOUTH AFRICA

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year
Mar. 29	Good Friday
Apr. 6	Founder's Day
Apr. 1	Family Day
May 1	Worker's Day
May 9	Ascension
May 31	Republic Day
Oct. 10	Kruger Day
Dec. 16	Day of the Vow
Dec. 25	Christmas
Dec. 26	Day of Goodwill

TIME

Standard Time Washington D.C.: + 7 hours

PASSPORT/VISA

A passport is needed to depart and re-enter the United States; in addition, a visa is currently required for a visit to South Africa. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 2.54 Rand
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to South Africa are complete as listed, after dialing international access code: 011. Country code is 27; listed local numbers include city code.

U.S. CONSULATE GENERAL - JOHANNESBURG

U.S. Consulate General
Kine Center, 11th Floor
Commissioner Street
P.O. Box 2155
Johannesburg 2000, South Africa

Tel: 27-11-331-1681
Fax: 27-11-331-1327

Science Officer

Robert J. McSwain

ENERGY

Population	1988	37 million	
Electric Power Plant Capacity	1988	33.2 GWe 7% nuclear	
	1995	34.1 GWe 5% nuclear	
	1998	37.9 GWe 5% nuclear	
Electric Power Production	1988	140.5 TWh 89% coal 7% nuclear 2% other 2% hydro	
		1995	5% nuclear
		1998	4% nuclear

NUCLEAR POWER

Policy: Expand electric power production capacity chiefly through coal-burning plants, but develop modest nuclear capability to complement coal, particularly post-2000.

Nuclear Power Plant Capacity	1990	1.8 GWe
	2000	1.8 GWe
Reactor Mix	1990	PWR:2 (1984/85)

INDUSTRIAL FUEL CYCLE

Waste Management Strategy: Interim storage of reactor wastes (LLW/ILW) at the reactor, followed by disposal at two shallow-land disposal facilities. Interim storage of spent fuel for ~40 years; plans for disposal not defined.

Cumulative Spent Fuel Arisings (LWR)	1985	22 tU
	1990	254 tU
	2000	714 tU

Major Milestone

- Dry spent fuel storage facility (Vaalputs) 1994

INTERNATIONAL RELATIONSHIPS

Member of IAEA.

ORGANIZATION

Ministry of Mineral and Energy Affairs

- Atomic Energy Corporation (AEC)
 - Pelindaba National Nuclear Research Center
 - R&D
 - Research Reactor
 - Isotope Production
 - Fuel Fabrication
 - LLW Disposal
 - Vaalputs National LLW Disposal Facility
 - LLW/ILW Disposal
 - Site Characterization
 - Valindaba Site
 - Uranium Enrichment
 - Uranium Conversion
- National Energy Council (NEC)
- Council for Nuclear Safety (CNS)
 - Independent Regulatory Licensing Agency

Eskom

- Electricity Production

AEC

Atomic Energy Corporation
of South Africa Ltd.
P.O. Box 582
Pretoria 0001
South Africa

Tel: 27-12-316-4911
Fax: 27-12-323-7731

Chief Executive Officer	Dr. W. E. Stumpf
Senior General Managers:	
Nucl. Fuel Production	Dr. J. J. Wannenburg
Technology Development	K. F. Fouche
Engineering	L. S. Snyders
Business Development	Dr. A. G. M. Jackson
Sr. Mgr., Nuc. Waste Technology	H. J. Van der Westhuizen

Function: Overall responsibility for Government nuclear activities including uranium conversion and enrichment, R&D, radioisotope production, radwaste disposal and repository.

Facilities:

- **Pelindaba National Nuclear Research Center** Tel: 27-12-316-4111

Mission: Perform nuclear R&D; operate research reactor, isotope production line, food irradiation facility; manufacture fuel; and operate LLW treatment/shallow-land disposal facilities.

- **Vaalputs National LLW Disposal Facility**
Mission: Operate LLW/ILW shallow-land disposal facilities; perform site characterization and environmental studies.
Design Basis: 1,470 m³/a LLW/ILW disposal.
- **Valindaba Uranium Enrichment and Conversion Plants**
Mission: Perform enrichment R&D; operate semi-commercial enrichment plant. Pilot-scale operations shut down in 1990.
Design Basis: 300,000 SWU/a enrichment plant
700 tU/a conversion plant

CNS

Council for Nuclear Safety
P.O.B. 7106
Hennopsmeer 0046
South Africa

Tel: 27-12-663-5500
Fax: 27-12-663-5513

Chairman
Vice-Chairman
Exec. Officer (A)
Dep. Gen. Mgr., Licensing

Prof. J. B. Martin
L. D. Hobbs
B. C. Winkler
J. Leaver

Function: Established by the 1988 Nuclear Energy Amendment Act as an independent regulatory/licensing agency for nuclear installations (construction and operation).

ESKOM

ESKOM
P.O. Box 1091
Johannesburg 2000
South Africa

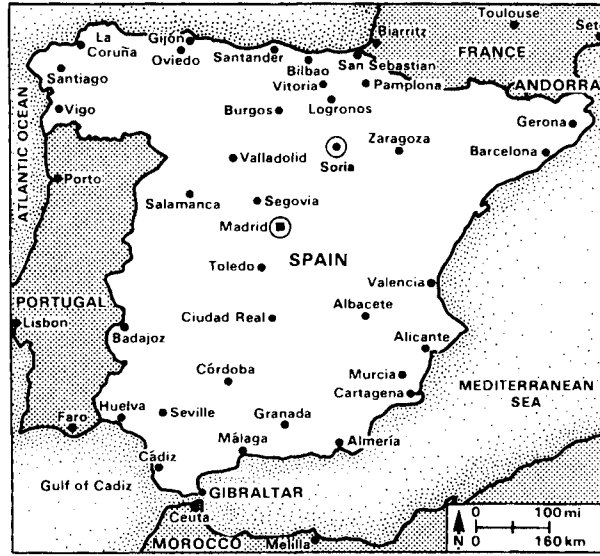
Tel: 27-11-800-8111
Fax: 27-11-800-4390

Chief Executive/COB
Chairman, Electricity Council
Gen. Mgr., Engineering

Ian C. McRae
Dr. John B. Maree
Alex Ham

Function: Provide electricity for public use.

SPAIN



SPAIN

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year	May 30	Corpus Christi
Jan. 6	Epiphany	June 24	King's Birthday
Mar. 19	St. Joseph	Oct. 12	Columbus Day
Mar. 28	Holy Thursday	Nov. 1	All Saints
Mar. 29	Good Friday	Dec. 8	Immaculate Concept.
May 1	Labor Day	Dec. 25	Christmas
May 20	Pentecost		

TIME

Standard Time Washington D.C.: **+6 hours**
Daylight Saving Time Period: **03/31 - 09/28/91**

PASSPORT/VISA

A passport is needed to depart and re-enter the United States; in addition, a visa is currently required for travel to Spain, unless a personal passport is used for the visit. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 92.55 Peseta
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct dialing to Spain are complete as listed, after dialing international access code: 011. Country code is 34; listed local numbers include city code.

U.S. EMBASSY - MADRID

American Embassy	
Serrano 75	Tel: 34-1-577-4000
Madrid, Spain	Fax: 34-1-577-5735
Science Attaché	Robert Morris

ENERGY

Population	1988	39 million
Electric Power Plant Capacity	1988	43.5 GWe 18% nuclear
	1990	43.5 GWe 18% nuclear
	1995	49.1 GWe 15% nuclear
	2000	50.4 GWe 19% nuclear
	1988	138.5 TWh 31% coal 36% nuclear 26% hydro/geoth. 5% oil 1% gas 1% solids
Electric Power Production	1990	37% nuclear
	1995	33% nuclear
	2000	35% nuclear

NUCLEAR POWER

Policy: Continue to operate existing nuclear power plants. Moratorium on new nuclear power plant construction has been in place for several years--changes pending revision of the National Energy Plan (PEN).

Nuclear Power Plant Capacity	1990	7.5 GWe
	1995	7.5 GWe
	2000	8.8 GWe
Reactor Mix	1990	PWR: 7 (1969-88) BWR: 2 (1971-85)

INDUSTRIAL FUEL CYCLE

Policy: Once-through fuel cycle for LWRs; no domestic reprocessing and no further contracts for foreign reprocessing, except GCR fuel (Vandellos I).

Waste Management Strategy: Store spent fuels at the reactor sites for at least 10 years. Reracking taking place in some reactor pools and dry storage in dual-purpose casks planned to provide additional capacity until geologic repository is ready to receive "high-level wastes" (spent fuels). Granite, salt and clay are being considered as host rock for repository. Shallow-land burial of LLW in fully engineered structures. Some low-level radioactive wastes are currently placed in a temporary storage facility (bays) at El Cabril (province of Córdoba).

Cumulative Spent Fuel	1985	202 tU
Arisings (LWR)	1990	950 tU
	1995	1800 tU
	2000	2800 tU

Industrial-Scale Activities

- Uranium mining and milling: 270 tU/a.
- Uranium enrichment: 11.1% interest in Eurodif.
- Fuel fabrication: 200 tU/a.
- Intermediate spent fuel storage: 3000 tU.

INTERNATIONAL RELATIONSHIPS

DOE/JEN (now: CIEMAT) Memorandum of Understanding for Cooperation in Energy Research and Development

Term: 06-06-86 to 06-05-91.

Scope: Includes nuclear safety technology and radioactive waste management.

Emphasis: General information exchange.

Member of EC, IAEA, and OECD/NEA.

CIEMAT (Energy Research Center)

Centro de Investigaciones
Energéticas, Medio Ambientales
y Tecnológicas
Avenida Complutense 22
Ciudad Universitaria
28040 Madrid, Spain

Tel: 34-1-3466000/01
Fax: 34-1-3466005

President
General Director
Director, Nuclear Technology
Waste Management

Victor Pérez Pita
Jose Angel Azuara Solis
Manuel Montes
Armando Uriarte

Function: Organized into four research institutes: nuclear technology (R&D--nuclear fuel cycle, decommissioning, material sciences and safety analyses); fundamental research; radiological protection and environment; and renewable energies.

Facility:

- Juan Vigon National Nuclear Energy Center, Madrid

CSN (Council of Nuclear Safety)

Consejo de Seguridad Nuclear
Justo Dorado, 11
28020 Madrid, Spain

Tel: 34-1-346-0100
Fax: 34-1-346-0471

President
Commissioners

Donato Fuejo Lago
Enrique Echavarri Lozano
Fabio Sarmiento Almeida
Rafael Caro Manso
Eduardo Gonzalez Gomez

Function: Independent body responsible to Parliament with powers on nuclear safety and radiation protection matters.

ENRESA (National Waste Management Company)

Empresa Nacional de Residuos
Radiactivos S.A.

Emilio Vargas, 7
28043 Madrid, Spain

Tel: 34-1-519-52-55
Fax: 34-1-519-52-68

President

Juan M. Kindelán
34-1-279-26-67

Director General

Alberto Lopez
34-1-279-28-58

Director, Engineering
International Relations

Aurelio M. Ulibarri
Alvaro R. Beceiro
34-1-519-5314

Function: Supply waste management services and disposal facilities to all Spanish nuclear companies and radwaste producers. Responsible to the Ministry of Industry and Energy. Funded by CIEMAT (80%) and the National Institute of Industry (20%).

Facility:

- LLW Surface Storage Facility, El Cabril, Córdoba

ENUSA (National Fuel Cycle Company)

Empresa Nacional del Uranio S.A. Tel: 34-1-533-6207
Santiago Rusinol 12 Fax:
28040 Madrid, Spain Tx: 43042 URAN E

President

José Manuel Jimenéz Arana

Function: Supply fuel cycle services except waste management and disposal (uranium mining and milling; fuel fabrication) for Spanish nuclear power plants.

Facility:

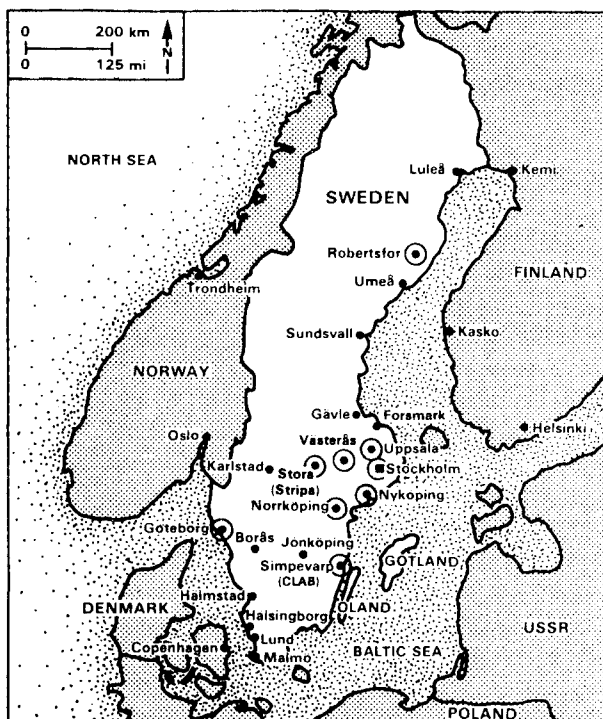
- **LWR Fuel Fabrication Plant**
Commissioned late 1985.
Capacity: 200 tU/a, can be expanded to 500 tU/a.

MINISTRY OF INDUSTRY AND ENERGY

Minister
Secretary General,
Energy/Mineral Resources
Director General, Energy

José Claudio Aranzadi Martinez
Victor Pérez Pita
Ramon Pérez Simarro

SWEDEN



SWEDEN

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year
Jan. 6	Epiphany
Mar. 29	Good Friday
Mar. 31-Apr. 1	Easter
May 1	Labor Day
May 9	Ascension Day
May 19-20	Pentecost
June 22	Midsummer Day
Nov. 1	All Saints
Dec. 25-26	Christmas

TIME

Standard Time Washington D.C.: **+ 6 hours**
Daylight Saving Time Period: **03/31 - 09/28/91**

PASSPORT/VISA

A passport is needed to depart and re-enter the United States. A visa is currently not required for a visit to Sweden; however, it is recommended to consult a travel agency for up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 5.56 Krona (SEK)
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Sweden are complete as listed, after dialing international access code: **011**. Country code is **46**; listed local numbers include city code.

U.S. EMBASSY - STOCKHOLM

American Embassy
Strandvagen 101
10000 Stockholm
Sweden

Tel: 46-8-783-5300
Fax: 46-8-661-1964

ENERGY

Population	1988	8.5 million
Electric Power Plant Capacity	1988	32.9 GWe 30% nuclear
	1990	33.4 GWe 30% nuclear
	1995	34.1 GWe 27% nuclear
	2000	34.1 GWe 25% nuclear
	Electric Power Production	1988
	1990	50% nuclear
	1995	46% nuclear
	2000	42% nuclear

NUCLEAR POWER

Policy: Phase out all nuclear plants at the latest by the year 2010. Change of this policy would require a new decision by Parliament.

Nuclear Power Plant Capacity	1990	9.9 GWe
	2000	9.9 GWe
Reactor Mix	1990	BWR: 9 (1972-85)
		PWR: 3 (1975-83)

INDUSTRIAL FUEL CYCLE

Policy: Direct disposal of spent fuel. No Pu recycle is planned. Costs for waste management and for future decommissioning of nuclear power plants are paid by fees collected from the nuclear utilities.

Waste Management Strategy: Store spent fuel for 30-40 years in an underground pool storage facility; encapsulate spent fuel in a highly corrosion-resistant canister; emplace in a deep geologic (crystalline rock) repository.

Cumulative Spent Fuel	1985	1,330 tU
Arising (LWR)	1990	2,360 tU
	2010	7,800 tU
Cumulative Waste Arisings (conditioned and encapsulated - ready for disposal)	2020	
	Spent fuel	5,600 canisters
	TRU waste	6,000 m ³
	Reactor waste	95,000 m ³
	" core comp.	19,000 m ³
	D&D waste	113,000 m ³

Industrial-Scale Activities:

- LWR fuel fabrication: 400 tU/a.

Major Milestones (Spent Fuel Repository)

- Start characterization of three candidate sites 1992
- Start up underground Hard Rock Laboratory 1994
- Perform detailed investigations of two sites 1996
- Submit license application 2003
- Start repository construction 2010
- Start repository operation 2020

INTERNATIONAL RELATIONSHIPS**DOE/SKB Agreement for Cooperation in Waste Management**

Term: 07-01-77 to 09-09-95.

Scope: Preparation and packaging of waste forms; storage; field and laboratory testing; geologic disposal; safety and environment; institutional and public relations issues.

Emphasis: Collaboration in Stripa Mine test program (NEA coordination); U.S. participation in performance assessment computer model and code intercomparison sponsored by SKB.

Member of IAEA and OECD/NEA. Waste management cooperative agreements with Canada, EEC, Finland, France, Spain, Switzerland. Host country for NEA Stripa Project.

ORGANIZATION**• Waste Management**

- **SKB** (Swedish Nuclear Fuel and Waste Management Company)--executes spent fuel and waste management program for the utilities; manages waste disposal R&D programs.
- **SKN** (National Board for Spent Nuclear Fuel)--administers waste management fund collected from the nuclear utilities; oversees back-end of the fuel cycle activities.

• Licensing Responsibilities

- **SKI** (Swedish Nuclear Power Inspectorate)--licensing for construction/operations of nuclear facilities.
- **SSI** (Swedish National Institute of Radiation Protection)
- National Swedish Franchise Board for Environment Protection
- Municipality where the facility is to be located (right of veto).

CHALMERS (TECHNICAL UNIVERSITY)

Chalmers Tekniska Högskola
412 96 Goeteborg
Sweden

Tel: 46-31-72-10-00
Fax: 46-31-16-84-94

Nuclear Chemistry

Jan-Olof Liljenzin

Waste Management R&D: Radionuclide transport by groundwater, sorption on natural clays and rock minerals.

KEMAKTA

Kemakta Konsult AB
Luntmakargatan 94
113 51 Stockholm
Sweden

Tel: 46-8-54-06-80
Fax: 46-8-52-16-07

Bertil Grundfelt

Function: Computer calculations on hydrology/nuclide migration.

KTH (Royal Institute of Technology)

KTH
100 44 Stockholm
Sweden

Tel: 46-8-790-60-00
Fax: 46-8-109-199

Chemical Engineering
Inorganic Chemistry

Ivars Neretnieks
I. Grenthe

Waste Management R&D: Near- and far-field migration modeling, rock-matrix diffusion experiments. Actinide-chemistry, solubility calculations, groundwater sampling and characterization.

NUCLEAR SAFETY AND TRAINING CENTER

Kärnkraftssäkerhet och
Utbildning AB

Box 5864
102 48 Stockholm
Sweden

Tel: 46-8-665-2800
Fax: 46-8-782-9528

Director

Svante Nyman

Function: Promote coordination cooperation among the Swedish utilities in their nuclear power plant safety work; nuclear simulator training in Sweden.

SGAB (Swedish Geological Company)

Sveriges Geologiska AB
Vretgränd 18
Box 670

751 28 Uppsala
Sweden

Tel: 46-18-15-64-20
Fax: 46-18-14-02-10

Geology, Site Investigations
Hydrogeology
Geologic Waste Disposal

Kaj Ahlbom
Leif Carlsson
Otto Brotzen

Waste Management R&D: Evaluation of rock formations for use as waste disposal sites (permeability; groundwater behavior, age and chemistry).

SKB (Nuclear Fuel and Waste Management Company)

Svensk Kärnbränslehantering AB

Box 5864
102 48 Stockholm
Sweden

Tel: 46-8-665-28-00
Fax: 46-8-661-57-19

President

Sten Bjurström
46-8-665-2803

R&D, Director

Per-Eric Ahlström
46-8-665-2834

R&D, Dep. Dir./Safety Analysis

Tönis Papp
46-8-665-2832

Geoscience

Lars Olaf Eriksson
46-8-665-2801

SKB (contd)

Chemistry	Fred Karlsson 46-8-665-2830
Design & Engineered Barriers	Anders Bergström 46-8-665-2829
Material Sciences	Lars Werme 46-8-665-2825
International Relations	Torsten Eng 46-8-665-2833
Systems/Facilities, Director	Hans Forsström
WM Int'l Consulting Services	Bo Gustafsson 46-8-665-2816

Function: Coordinate and arrange for nuclear fuel supply and reprocessing services for all Swedish nuclear power reactors; manage and fund R&D for the back-end of the fuel cycle. Responsible for design, construction, and operation of all necessary storage and disposal facilities. Demonstrate that spent nuclear fuel and other long-lived wastes can be disposed of safely and permanently. Provides transportation of spent fuel outside reactor sites.

Owners: Utilities.

Facilities:

- **CLAB** (Central Storage for Spent Fuel, located at Simpevarp adjacent to Oskarshamn Power Station)
Mission: AFR storage facility.
Design Capacity: Initially, 3000 t.
History: Startup construction, 05/80; startup operation, 1985.
- **SFR** (Swedish Final Repository for LLW and ILW, located in rock 50 m below seabed, 1 km outside Forsmark harbor on Gulf of Bothnia).
Design: Concrete silos inside cylindrical rock caverns isolated by layer of bentonite clay backfill between silo and rock for ILW. Conventional tunnel rooms for LLW. 1 km-long tunnels leading to repository to be plugged with concrete.
Capacity: 90,000 m³.
History: Startup Phase 1 construction, 1983; startup operation, 1988; startup Phase 2 operations, late 1990s.

SKB (contd)• **Stripa Mine**

Stripa Mine Service AB
717 00 Stora Sweden
Tel: 46-581-414-20
Fax: 46-581-419-19

Stripa Project Manager Mine Operations
Bengt Stillborg
Gunnar Ramqvist

(Near Kopparberg, 15 km north of Lindesberg and about 250 km west of Stockholm. Site of the NEA Stripa Project.)

Function: Research in realistic environment of geologic disposal in crystalline rock. Development of investigation methods and instruments; measurement of radionuclide migration/supporting studies.

Description: Granite body, about 350-400 m below surface, at the Stripa iron mine.

• **Äspö Hard Rock Laboratory**

Swedish Nuclear Fuel & Waste Management Co.
R&D/Äspö Hard Rock Laboratory/Project Office
Box 5864
10248 Stockholm Sweden
Tel: 46-8-665-5719
Fax: 46-8-665-2831

Project Manager
Göran Bäckblom

Swedish Nuclear Fuel & Waste Management Co.
Äspö Hard Rock Laboratory/Site Office
PI 300
570 93 Figeholm Sweden
Tel: 46-491-34340
Fax: 46-491-34350

Site Manager
Olle Zellman

Underground research laboratory (located on Äspö Island at Simpevarp) under construction; start up/operation 1994.

SKI (Nuclear Power Inspectorate)

Statens Kärnkraftinspektion

Box 27106

102 52 Stockholm

Sweden

Tel: 46-8-663-55-60

Fax: 46-8-661-90-86

Director

Waste Management

Olof Hörmander

Soeren Norrby

Function: Responsible for licensing nuclear facilities.**SKN (National Board for Spent Nuclear Fuel)**

Statens Kärnbränsle Nämnd

Sehlstedtsgatan 9

115 28 Stockholm

Sweden

Tel: 46-8-667-98-20

Fax: 46-8-661-67-35

Director

Chief Engineer

Olof Söderberg

Nils Rydell

Function: Evaluate and supervise nuclear industry's development program on the management and disposal of spent nuclear fuel and on decommissioning of nuclear power plants; administer the Swedish nuclear waste financing system; provide information to the public on spent fuel management and disposal.**SSI (National Institute of Radiation Protection)**

Statens Straalskyddsinstitut

Box 60204

104 01 Stockholm

Sweden

Tel: 46-8-729-71-00

Fax: 46-8-729-71-08

Director

Radwaste Group, Head (A)

Gunnar Bengtsson

Gunner Johansson

Function: Responsible for establishing and enforcing radiation protection regulations.

STUDSVIK AB (Energy Technology Company)

Studsvik Energiteknik AB
611 82 Nyköping
Sweden

Tel: 46-155-210-00
Fax: 46-155-630-44

Director, Nuclear Division
Waste Technology
Power Plant Services

Stig Bergstroem
Karin Broden
Claes Harfors

Function: Nuclear energy R&D and services to support Swedish power programs (contract research).

Owner: Government (Ministry of Industry).

Waste Management R&D: LLW and ILW treatment, D&D techniques, leaching from spent fuel, biosphere migration, dose-calculations. AMOS project: Waste treatment plant (1986).

SWEDISH STATE POWER BOARD

Statens Vattensfallsverk
162 87 Vaellingby
Sweden
SVTELVXS S

Tel: 46-8-739-50-00
Fax: 46-8-737-01-70

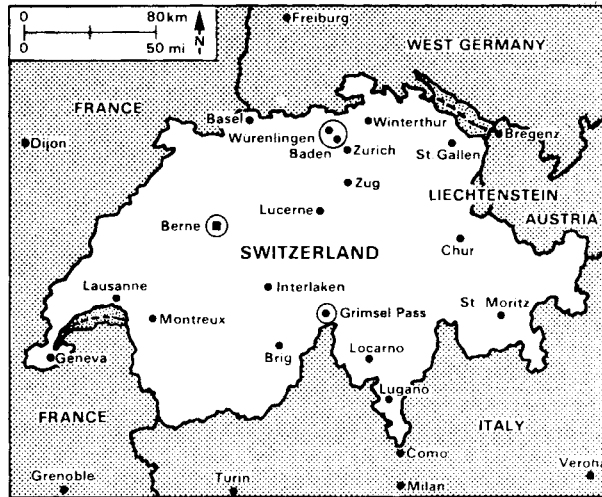
President
Vice President, Production
Nuclear Power

Carl-Eric Nyquist
Lars Gustafsson
Stig Sandklef

Function: Operate the power distribution grid in Sweden, produce power (owner of Ringhals Nuclear Power Plants).

Owner: Government (Ministry of Industry).

SWITZERLAND



SWITZERLAND

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1-2	New Year
Mar. 29	Good Friday
Mar. 31-Apr. 1	Easter
May 1	Labor Day
May 9	Ascension
May 19-20	Pentecost
May 30	Corpus Christi
Aug. 1	National Day
Dec. 25-26	Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time Period: 03/31 - 09/28/91

PASSPORT/VISA

A passport is needed to depart and re-enter the United States. A visa is currently not required for a visit to Switzerland; however, it is recommended to consult a travel agency for up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 1.25 Franc
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Switzerland are complete as listed, after dialing international access code: 011. Country code is 41; listed local numbers include city code.

U.S. EMBASSY - BERN

American Embassy
Jubiläumstrasse 93
3005 Bern
Switzerland

Tel: 41-31-43-70-11
Fax: 41-31-43-73-44

ENERGY

Population	1988	6.5 million
Electric Power Plant Capacity	1988	15.3 GWe 20% nuclear
	1990	15.4 GWe 20% nuclear
	1995	15.5 GWe 19% nuclear
	2000	16.8 GWe 18% nuclear
	Electric Power Production	1988
	1990	36% nuclear
	1995	36% nuclear
	2000	34% nuclear

NUCLEAR POWER

Policy: Federal Government is in favor of nuclear power but local opposition has delayed its expansion.

Nuclear Power Plant Capacity	1990	2.9 GWe
	2000	2.9 GWe
Reactor Mix	1990	BWR: 2 (1972/84)* PWR: 3 (1969-79)

INDUSTRIAL FUEL CYCLE

Policy: Purchase most services from other countries, including reprocessing of spent fuels; recycle dPu to either LWRs or FBRs.

Waste Management Strategy: Develop two waste repositories: a horizontally accessed rock cavern in a geologic host rock with considerable overburden for LLW/ILW, and a deep repository in crystalline rock or sedimentary formations for HLW glass or unreprocessed spent fuel elements and alpha wastes. Sea-dumping of LLW discontinued 1982.

Cumulative Spent Fuel	1980	380 tU
Arisings (LWR)	1985	650 tU
	1990	1,090 tU
	2000	2,000 tU

Cumulative Waste		
Arisings	LLW/D&D Waste	95,000 m ³
[Planning basis:	LLW/ILW	80,000 m ³
after 40 yr operation	HLW glass	750 m ³
(total 4 GWe)]	or	
	Spent fuel	2,500 m ³

Major Milestones

- Initial receipt of HLW glass from COGEMA (France) >1993
- Intermediate-depth repository for LLW/ILW 2000
- Geologic repository for HLW or spent fuels and alpha wastes After 2020

INTERNATIONAL RELATIONSHIPS

DOE/NAGRA Agreement for Cooperation in Radioactive Waste Management

Term: 04-19-85 to 03-19-91 (in process of being extended).
 Scope: Preparation and packaging of wastes; field and laboratory testing; storage; geologic disposal; environment and safety; design and operational issues; transportation requirements; public acceptance issues.
 Emphasis: Information exchange and direct cooperation, in particular, concerning Grimsel Pass URL activities.

NRC/NAGRA Agreement on Cooperation in Radioactive Waste Management Safety Research**Term:** 09-26-86 to 09-25-91.**Scope:** Experimental/analytical studies relating to safety research.**Emphasis:** General information exchange.

Member of IAEA and OECD/NEA. Cooperative agreements with SKB/Sweden; CEA/France; Euratom/EEC; ONDRAF/Belgium; PNC/Japan; BfS, BMFT, GSF, BGR/Germany; and TVO/Finland.

ORGANIZATION

- **Nagra**--National Cooperative for the Disposal of Radioactive Waste--formed by utilities/government to handle fuel cycle/waste management activities.
- **PSI**--Paul Scherrer Institute--formed (1987) through merger of EIR (Federal Institute for Reactor Research) and SIN (Swiss Institute for Nuclear Research).
- **Federal Energy Office**--sets criteria for waste management practices, including geologic disposal.

BEW (Federal Office for Energy)

Bundesamt für Energiewirtschaft
Nuclear Safety Inspectorate (HSK)
5303 Würenlingen
Switzerland

Tel: 41-56-98-28-53
Fax: 41-56-99-39-07

Waste Management Section Dr. U. Niederer

Function: Licensing and inspection of nuclear installations.

**NAGRA/CEDRA/CISRA (National Cooperative
for the Disposal of Radioactive Waste)**

Nationale Genossenschaft für die Lagerung
radioaktiver Abfälle (Nagra)
or
Société coopérative nationale pour
l'entreposage de déchets radioactifs (Cédra)
or
Società cooperativa nazionale per
l'immagazzinamento di scorie radioattive (Cisra)

Hardstrasse 73
5430 Wettingen
Switzerland

Tel: 41-56-37-11-11
Fax: 41-56-37-12-07

President	Dr. Hans Issler
Director, Science/Technology	Dr. Charles McCombie
Geology	Dr. Marc F. Thury
Field Operations/Testing	Dr. Ch. Sprecher
Engineering	Andreas L. Nold
Nuclear Technology	Dr. Piet Zuidema
Director, Repository Projects	Dr. E. Kowalski

Function: Provide for safe disposal of radioactive wastes produced by the Swiss nuclear industry.

Owners: Utilities and government.

Facility:

- URL at Grimsel Pass--operational since 1984.
(Tests/experiments in crystalline rock.)

PSI (Paul Scherrer Institute)

Paul Scherrer Institute
5303 Würenlingen
Switzerland

Tel: 41-56-99-2111
Fax: 41-56-98-2327

Director	Prof.-Dr. A. Menth
Manager, Waste Mgmt. Project	Dr. J. Hadermann

Owner: Federal government--Department of Interior.

PSI (contd)

Waste Management R&D: Incineration of TRU wastes, modeling of radionuclide migration through heterogeneous geologic media, chemical behavior of radionuclides during migration, transport of radionuclides through the biosphere, natural analogues studies, hydrological studies, sorption constants on different rocks, immobilization of LLW and ILW in cements, leaching rates on LLW and ILW forms, and long-term corrosion tests on waste package materials.

Facilities:

- Hot Cells, Active Laboratories, Incinerator
- ADA (Acid Digestion Plant) for TRU wastes.
Design Basis: Carbonization/digestion in H_2SO_4/HNO_3 at 0°C; capacity, 1 kg/h solid wastes.
History: Non-Pu runs, late 1981; Pu runs, 1982.

ZWILAG (Interim Waste Storage Facility)

Zwischenlager Würenlingen AG
Parkstrasse 23
5401 Baden
Switzerland

Tel: 41-56-203-111
Fax: 41-56-203-755

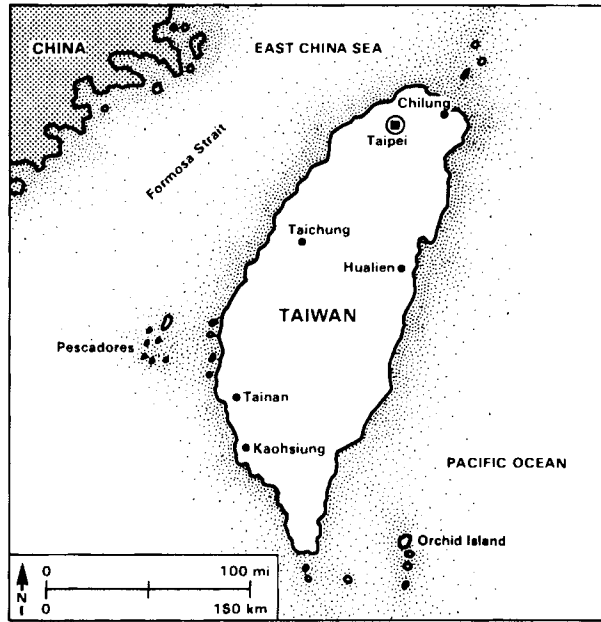
Director
Tech. Project Manager

R. Véya
Dr. C. Vuilleumier

Function: Provide interim storage for spent fuel, HLW, and low- and medium-level wastes. The facility was voter-approved 11/89 and will be managed by the local council and the nuclear utilities. Construction is expected to take at least two years (start up in 1992) and to cost ca. U.S.\$ 4.8 million.

Owner: Consortium of Swiss nuclear utilities.

TAIWAN



TAIWAN

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1-3	Commemoration Day	Oct. 17	Double Ten Day
Feb. 15-16	Chinese New Year	Oct. 25	Taiwan Restoration
Mar. 29	Youth Day	Oct. 31	Chiang Kai-Shek's Birthday
Apr. 5	Tomb Sweeping Day		
June 16	Dragon Boat Festival	Nov. 12	Dr. Sun Yat-Sen's Birthday
Sept. 22	Moon Festival		
Oct. 4	Confucious' Birth	Dec. 25	Constitution Day

TIME

Standard Time Washington D.C.: + 13 hours

PASSPORT/VISA

A passport is needed to depart and re-enter the United States; in addition, a visa is currently required for a visit to Taiwan. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 26.63 Taiwan Dollar
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Taiwan are complete as listed, after dialing international access code: 011. Country code is 886; listed local numbers include city code.

AIT - TAIPEI

American Institute in Taiwan
7 Lane 134
Hsin Yi Road, Sec. 3
Taipei, Republic of China

Tel: 886-2-709-2000
Fax: 886-2-702-7675

Science Officer

Matt Mathews

ENERGY

Population	1988	20 million
Electric Power Plant Capacity	1988	16.6 GWe 30% nuclear
Electric Power Production	1988	71.5 TWh 41% nuclear ~ 32% coal ~ 14% hydro ~ 13% oil
	1989	35% nuclear

NUCLEAR POWER

Policy: Look to nuclear power to meet rapidly growing demand for electric energy, and to continue with nuclear power at about 1/3 of total electricity.

Nuclear Power Plant Capacity	1990	4.9 GWe
	1995	4.9 GWe
	2000	7.7 GWe
Reactor Mix	1990	BWR: 4 (1978-83) PWR: 2 (1984/85)

INDUSTRIAL FUEL CYCLE

Policy: Purchase fuel materials and enrichment; develop indigenous fuel production capability: UF₆ conversion; UO₂ pellets; fuel hardware; fuel assembly.

Waste Management Strategy: Evaluating spent fuel/HLW interim storage options; may reprocess (in other countries); LLW being stored in National Waste Storage Facility on nearby Orchid Island. LLW/ILW will be eventually disposed of on the sea floor, if internationally acceptable, or in shallow land facility.

Cumulative Spent Fuel	1980	70 tU
Arisings (LWR)	1985	430 tU
	1990	1,140 tU
	2000	2,600 tU

MAJOR MILESTONES

- Concept for LLW Disposal 1996
- Spent fuel/Interim Storage Facility 1999

ORGANIZATION

- **TAIPOWER** (Taiwan Power Company)--operation of nuclear power plants (owned by the government), country's only electric utility.
- **AEC** (Atomic Energy Council)--regulatory functions. RWA (Radwaste Administration)--radwaste disposal.
- **INER** (Institute of Nuclear Energy Research)--nuclear R&D.

AEC

Atomic Energy Council
65, Lane 144
Keelung Road, Section 4
Taipei 107, Taiwan
Republic of China

Tel: 886-2-392-4180
Fax: 886-2-341-5377/
-5448

Chairman
Secretary General

Dr. Y. Y. Hsu
Prof. Yu-Hao Lee

Director, Radwaste Admin.

Dr. Chao-Ming Tsai
886-2-396-4324

Director, Planning Division
Director, Rad. Protection Div.
Director, Nuc. Regulatory Div.

Chao-Chin Tung
Dr. Yi-Ching Yang
Yi-Ching Yang

INER

Institute of Nuclear Energy
Research

P.O. Box 3
Lung-Tan, Taiwan 325
Republic of China

Tel: 886-2-381-4014
Fax:
Tx: 34154 CAEC

Deputy Directors

Sung-Ling Ho
886-2-381-2300
Sen-I Chang
886-2-381-2302

Radwaste Mgmt. Tech. Program

Dr. Tise-Sheng Chou
886-2-381-2525

Radwaste Mgmt. Division

Dr. Chia-Pao Tung
886-2-381-2524

Nuc. Materials Res. Division

Dr. Yaw-Nan Chen
886-2-381-2422

Fuel Engineering Division

Chung-Jyi Wu
886-2-381-2418

Health Physics Division

Dr. Wei-Li Chen

Fuel Cycle R&D: Solvent extraction technology; yellowcake conversion to UO_2 ; production of Zr; cement and thermoplastic waste forms for reactor wastes; HLW conditioning processes; irradiation of sewage sludge with spent fuels; burial of LLW.

TAIPOWER

Taiwan Power Company
17F, 242 Roosevelt Rd., Sec. 3
Taipei 107, Taiwan
Republic of China

Tel: 886-2-396-7777
Fax: 886-2-396-8593

President
Director, Nuclear Engineering
Deputy Dir., Nuc. Engineering

S. M. Chang
Y.S. Yeh
886-2-396-2521
Peng-Chang Chen

UNITED KINGDOM



UNITED KINGDOM

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year	May 27	Spring Holiday
Mar. 29	Good Friday	June 9	Queen's Holiday
Mar. 31-Apr. 1	Easter	Aug. 26	Summer Holiday
May 6	Bank Holiday	Dec. 25-26	Christmas

TIME

Standard Time Washington D.C.: **+ 5 hours**
Daylight Saving Time Period: **03/31 - 10/26/91**

PASSPORT/VISA

A passport is needed to depart and re-enter the United States. A visa is currently not required for a visit to the United Kingdom; however, it is recommended to consult a travel agency for up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. \$ = 0.508 Pound
per Wall Street Journal, 01/31/91. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to the United Kingdom are complete as listed, after dialing international access code: **011**.
Country code is **44**; listed local numbers include city code.

U.S. EMBASSY - LONDON

American Embassy 24/31 Grosvenor Square West 1A 1AE London United Kingdom	Tel: 44-71-499-9000 Fax: 44-71-409-1637
Science Counselor	James B. Devine

ENERGY

Population	1988	58 million
Electric Power Plant Capacity	1988	71.3 GWe 15% nuclear
	1990	74.4 GWe 15% nuclear
	1995	80.8 GWe 15% nuclear
	2000	82.1 GWe
Electric Power Production	1988	308.2 TWh 67% coal 21% nuclear 9% oil 2% hydro 1% gas
	1990	19% nuclear
	1995	18% nuclear
	2000	14% nuclear

NUCLEAR POWER

Policy: Substantial development of nuclear power based, to date, on gas-cooled reactors but now diversifying to PWRs; eventual active FBR pursuit expected.

Nuclear Power Plant Capacity	1990	12.1 GWe
	1995	11.7 GWe
	2000	10.5 GWe
Reactor Mix	1990	GCR: 22 (1956-72) AGR: 14 (1976-89) PWR: 1 (1994) FBR: 1 (1976) HWR: 1 (1968)
Reactor Development		Currently PWR's; long-term LMFBR development.

INDUSTRIAL FUEL CYCLE

Policy: Reprocess and recycle U to AGR and LWR systems; develop and maintain complete fuel cycle capability (UF₆ conversion, enrichment, UO₂ and MOX fuel fabrication, spent fuel reprocessing); sell fuel cycle services abroad.

Waste Management Strategy: Reprocess spent magnox fuels as rapidly as plant capacity permits; reprocess other thermal reactor fuel after several years' cooling; vitrify HLW (French process); long-term interim storage of HLW glass for at least fifty years before disposal; shallow-land burial of LLW currently; future deep-land disposal of LLW and ILW.

Cumulative Spent Fuel	1987	750 tU
Arisings (AGR)	1990	1,300 tU
	2000	3,250 tU

Industrial-Scale Activities

- Uranium conversion (Springfields)
 - UF₆ production: 9,000 t/a
 - UO₂ conversion: 10,000 t/a.
- Uranium enrichment (Capenhurst)
 - centrifuge plant: 800K SWU/a.
- Fuel fabrication
 - Springfields
 - U metal (Magnox): 1300 tU/a
 - AGR fuels: 300 t/a
 - Sellafield
 - MOX fuels capacity, 1987: 6 t/a (FBR)
- Fuel reprocessing
 - Magnox fuels (Sellafield): up to 1500 t/a
 - UO₂ fuels (THORP, " "): 1200 t/a (1992)
 - FBR fuels (PFR reprocessing pilot plant, Dounreay): 50 kgHM/d
- HLW vitrification
 - Sellafield Vitrification Plant
 - radioactive operation (1990)

INTERNATIONAL RELATIONSHIPS**DOE/UKAEA Agreement in the Field of Decommissioning Nuclear Facilities**

Term: 03-01-85 to 03-01-93

Scope: Techniques used, schedules, costs, manpower, radiation exposures, and waste arisings relevant to decommissioning projects (U.S./Shippingport Station - U.K./Windscale AGR). Treatment, packaging, storage, transportation and disposal methods, and costs for wastes arising from the decommissioning operations.

Emphasis: Exchange of technical information, specialist teams/individuals, samples, materials, instruments, testing equipment, etc.

DOE/UKAEA Agreement in the Field of Radioactive Waste Management Technology

Term: 10-30-86 to 10-29-91.

Scope: LLW/ILW, TRU waste and D&D technology; treatment/geol. disposal; transportation; storage; environment/safety and public acceptance issues; performance assessment; packaging.

Emphasis: Technical information exchange, primarily TRU waste treatment.

Member of EC, IAEA and OECD/NEA. Agreements/partnerships with various nations.

ORGANIZATION

- **AEA Technology:** nuclear research; laboratories at Harwell, Risley, Sellafield, Springfields, Dounreay
- **DoE (Department of Environment):** develops waste management strategy, funds and coordinates generic waste management R&D
- **BNFL (British Nuclear Fuels plc):** commercial fuel cycle and engineering services for domestic and foreign customers
- **NIREX ("private limited" company):** LLW and ILW disposal in deep repository
- **BGS and IOS (British Geological Survey and Institute of Oceanographic Sciences):** supporting R&D for the waste management program
- **NRPB (National Radiological Protection Board):** environmental R&D
- **NII (Nuclear Installations Inspectorate):** licensing
- **MAFF (Ministry of Agriculture, Fisheries and Food):** regulation of waste management

NUCLEAR FUEL CYCLE RESPONSIBILITIES

National Government

- Department of Environment (DoE)
 - H.M. Inspectorate of Pollution (HMIP)
 - Rad. Waste Mgmt. Advisory Committee (RWMAC)
 - Building Research Establishment (BRE)
- Department of Health/Social Services
 - National Radiological Protection Board (NRPB)
- Department of Education and Science (DES)
 - Nat. Environment Research Council (NERC)
 - British Geological Survey (BGS)
 - Inst. of Oceanographic Sciences (IOS)
- Department of Energy (DEN)
 - Nuclear Electricity Authorities
 - NIREX
 - British Nuclear Fuels plc (BNFL)
 - AEA Technology
- Health and Safety Executive (HSE)
 - Nuclear Installations Inspectorate (NII)
- Ministry of Defense (MOD)
 - Atomic Weapons Research Establishment (AWRE)
- Ministry of Agriculture, Fisheries and Food (MAFF)
 - Fisheries Laboratories

FUEL CYCLE/WASTE MANAGEMENT RESPONSIBILITIES**Department of Energy (DEN)**

- **Nuclear Electricity Authorities**
(Nuclear Electric, Scottish Nuclear)
 - Nuclear Electricity Production
 - Reactor Waste Management
- **British Nuclear Fuels plc (BNFL)**
 - **Risley (HQ)**
 - Engineering
 - **Sellafield**
 - Reprocessing
 - Waste Conditioning
 - MOX Fuel Production
 - LLW Disposal (Drigg)
 - **Springfields**
 - Fuel Fabrication
 - UO₂ Production
 - Uranium Conversion
 - **Capenhurst**
 - Uranium Enrichment
- **AEA Technology**
 - AEA Decommissioning and Radwaste
 - AEA Fuel Services
 - AEA Reactor Services
 - AEA Fusion
 - AEA Safety and Reliability
 - AEA Industrial Technology
 - AEA Environment & Energy
 - AEA Oil & Gas Technology
- **NIREX**

AEA

AEA Technology
Corporate Headquarters
11 Charles II Street
London SW1Y 4QP
United Kingdom

Tel: 44-71-389-6565
Fax: 44-71-389-6841

Chairman
Dep. Chairman/Chief Exec.
Managing Dir., Nuc. Bus. Group
Managing Dir., Ind. Bus. Group
Managing Dir., Site Operations
Member for Corp. Develop.
Chief Technologist, Nuclear

John Maltby
Brian L. Eyre
Dr. Derek Pooley
R. Stuart Nelson
Graeme G. E. Low
Charles C. S. Chapman
Dr. Ron H. Flowers

Government-owned nuclear research and applications agency, since 1986 operating on a fully commercial basis. Provides contract R&D, technical and engineering services to governments and companies in the U.K. and worldwide.

AEA D&R

AEA Decommissioning and
Radwaste
Winfrith Technology Center
Dorchester, Dorset DT2 8DH
United Kingdom

Tel: 44-305-20-2066
Fax: 44-305-20-2761

Chief Executive
Head, Business Development

Dr. Mel H. Wood
Dr. Ron K. Webster

Activities: Decommissioning of all types of nuclear facilities; all aspects of radioactive waste storage, processing, transport and disposal; decontamination technology and robotic handling.

AEA E&E

AEA Environment & Energy
Harwell Laboratory
Oxfordshire OX11 0RA
United Kingdom

Tel: 44-235-43-5530
Fax: 44-235-43-4361

Chief Executive
Head, Business Development

Dr. J. Rae
Dr. A. E. J. Eggleton

Activities: R&D and consulting services to industry and regulatory bodies covering pollution control technology, waste management, and regional and global environmental impacts.

Facility:

- **Harwell Ceramic Melter Test Unit (nonradioactive)**
Mission: Develop ceramic melter capability for AEA.
Design Basis: Liquid-fed ceramic melter; capacity, 700 kg/d glass; product, borosilicate glass.
History: Initial studies in 1/3 (linear) scale unit 1982-84. Startup, (full scale) 1986.

AEA FS

AEA Fuel Services
AEA Technology Dounreay
Caithness KW14 7TZ
United Kingdom

Tel: 44-847-6-2121 Ext. 674
Fax: 44-847-6-2121 Ext. 666

Chief Executive
Head, Business Development

Owen Pugh
Dr. Robert Anderson

Activities: Fuel reprocessing, special fuel manufacturing and testing, laser enrichment, waste conditioning, R&D in radioactive handling equipment and safeguards.

AEA FS (contd)**Facilities:**

- **PFR Reprocessing Plant**
Mission: Reprocess Dounreay Prototype Fast Reactor (MOX) fuels.
Design Basis: Shear single pins and leach; PUREX process; capacity 9-10 tHM/a of 180-day cooled PFR assemblies with 8-10% burnup.
History: Dounreay fast reactor fuels processed from 1961 to 1975; plant rebuilt to handle PFR oxide fuels, resumed operation in October 1980.
- **Solidification Plant**
Mission: Condition liquid wastes by cementation.
History: startup, 1987 (cost US\$ 8.84 million)
- **Marshall Laboratory**
Fuel-processing research, opened in 1986.

AEA FUSION

Culham Laboratory
Culham, Abingdon
Oxfordshire OX14 3DB
United Kingdom

Tel: 44-235-46-3556
Fax: 44-235-46-3256

Chief Executive
Head, Business Development

Dr. D. R. Sweetman
I. M. Pollard

Function: Management of U.K. participation in international fusion programs, in particular the Joint European Torus (JET).

AEA IT

AEA Industrial Technology
Harwell Laboratory
Oxfordshire OX11 0RA Tel: 44-235-43-2138
United Kingdom Fax: 44-235-43-2064

Chief Executive Dr. Chris Wright
Head, Business Development Dr. Steve J. Curl

Function: Provide advanced technology to the process, manufacture, electronics, defense, and aerospace industries. Technologies include: process technology and plant design, instrumentation and control, materials technology and manufacture, structural assessments, advanced computing, laser applications, and computational fluid dynamics.

AEA S&R

AEA Safety and Reliability
Wigshaw Lane, Culcheth
Warrington WA3 6AT Tel: 44-925-25-4241
United Kingdom Fax: 44-925-25-4535

Chief Executive Dr. Geoff Ballard
Head, Business Development Anthony R. Taig

Function: Safety and reliability analysis and assessment services to government and companies in the nuclear and non-nuclear sectors, including oil and gas, defense contractors, insurance, manufacturing, and engineering companies.

AEA RS

AEA Reactor Services
Risley, Warrington
Cheshire WA3 6AS Tel: 44-925-25-3019
United Kingdom Fax: 44-925-25-2196

Chief Executive Dr. Tony Broomfield
Head, Business Development Dr. Neil M. Irvine

AEA RS (contd)

Activities: Fast reactor and thermal reactor technology. Management of fast reactor program and participation in international fast reactor programs, especially the European Fast Reactor. Design and operational techniques for thermal reactors aimed at improving the economies of existing plants and the design of new plants.

AWRE

Atomic Weapons Research
Establishment
Aldermaston, Reading RG7 4PR
United Kingdom

Tel: 44-73-56-4111
Fax: 848104/5
Tlx: 848104/5

Waste Management Ms. D. Hunter

BGS

British Geological Survey
Nicker Hill, Keyworth
Nottingham, NG12 5GG
United Kingdom

Tel: 44-60-77-6111
Fax: 44-60-77-6602

Director G. I. Lumsden

British Geological Survey
Harwell Laboratory
Building 151
Harwell, Oxon OX11 0RA
United Kingdom

Tel: 44-235-2-4141
Fax: 83135 ATOMHA G
Tlx: 83135 ATOMHA G

BNFL

British Nuclear Fuels plc
 Risley, Warrington
 Cheshire WA3 6AS
 United Kingdom

Tel: 44-925-83-2502
 Fax: 44-925-82-2711
 Verif: 44-925-83-2369

[About 20 miles by car from Manchester International Airport; or train from London to Warrington (approx. 3 hours), then 6 miles by car to Risley.]

Chairman Christopher G.F. Harding
 44-925-83-5000
 Chief Exec. Officer Neville L. Chamberlain
 44-925-83-5006
 Dir., Corp. Marketing Douglas S. B. Marr
 Dir., Fuel/Engineering Group Peter F. P. Roberts
 Dir., Reprocess/Reactors Group Dr. Greg G. Butler

Dir., Engineering Division Dr. Anthony D. Stevens
 44-925-83-5416

Function: Provision of spent nuclear fuel handling/waste management technology and engineering services, including R&D feasibility studies, process design, equipment supply, safety assessment and criticality, construction/commissioning of plants.

Dir., Transport Division W. A. MacLaughlan
 44-925-83-2090

Function: Spent fuel transportation; development, design, licensing/procurement of transport packages; consultation, design/safety studies including monitoring emergency response/recovery.

INFL

Int'l Nuc. Fuels, Ltd., Gen. Mgr. Derek May
 44-925-83-3108

BEL

British Engineering Ltd., Gen. Mgr. J. M. Glanville

BNFL, Inc.

1776 I Street NW
 Washington, DC 20006

Tel: 202-785-2635
 Fax: 202-785-4037

President R. "Landy" Langley

BNFL: CAPENHURST

British Nuclear Fuels plc
Capenhurst Works
CHESTER
Cheshire CH1 6ER
United Kingdom

Tel: 44-51-339-4101
Fax: 44-51-339-5541

Dir., Enrichment Division

Dr. Peter C. Upson

Function: Enrichment of U by centrifuge process (URENCO).

BNFL: SELLAFIELD

British Nuclear Fuels plc
Sellafield, Seascale
Cumbria CA20 1PG
United Kingdom

Tel: 44-9402-8333
Fax: 44-9467-28987

[By train from London-Euston Station to Carlisle Station (4 hours); transport can be arranged by BNFL from Carlisle to site (approx. 1-1/2 hours). From Manchester International Airport to site by car is approx. 3 hours.]

Dir., Magnox Reprocessing

Grahame K. Smith
44-9402-74245

Dir., THORP Division

Ken G. Jackson

Dir., Waste Mgmt./Decom. Div.

Stuart Donn

Dir., Reactor Division

A. D. Evans

Function: Provides spent fuel management services, including storage, reprocessing and waste management. In addition, transport of spent fuel/wastes and complete fuel cycle service.

BNFL: SELLAFIELD (contd)**Facilities:**

- **B205 (Magnox Fuel Reprocessing Plant)**
Mission: Reprocess Magnox (magnesium-clad, U metal) fuels from U.K. GCRs.
Design Basis: Magnox fuels--mechanical declad; PUREX flowsheet; "no-maintenance" concept; nominal capacity, 1500 t/a. HLLW storage--SS tanks, 70 m³ and 150 m³, in SS-lined concrete cells.
History: Magnox fuels--B205 startup, 1964; annual throughput of Magnox fuels, 1000-1200 tHM. Oxide head-end (installed in B204), operated 1969-1973 and processed 90 t oxide fuel, before plant was shut down after a contamination release incident.
- **Magnox Fuel Handling Plant**
 - Storage and decanning of magnox fuel.
 - Storage and dismantling of AGR fuel.
- **THORP (Thermal Oxide Reprocessing Plant)**
Mission: Reprocess AGR, domestic and foreign LWR fuels.
Design Basis: PUREX flowsheet, pulsed columns and mixer-settlers. No maintenance concept. Nominal capacity, 1200 tU/a.
Milestone: Startup, 1992.
- **Drigg Waste Disposal Facility** (300-acre site, 4 miles from Sellafield)
Mission: LLW disposal.
Design Basis: Shallow-land disposal, clay-based trenches and concrete vaults.
Capacity: 650,000 m³ LLW disposed of through 1989.
- **MOX Fuel Fabrication Facilities**
 - Pilot plant, capacity--6 t/a FBR fuels.
 - Production plants (planned), capacity--100 t/a; startup, 1995.

BNFL: SELLAFIELD (contd)

- **Vitrification Plant**
Mission: Solidify Sellafield HLW.
Design Basis: AVM process; product, borosilicate glass blocks.
Capacity: 250-300 t/a glass.
History: Startup, 1990.
- **Waste Treatment Complex**
Mission: Prepare TRU waste for disposal.
History: Plant is currently on stand-by.
- **EP-1 and EP-2**
Mission: Encapsulate ILW in cement matrix in 500-l drums.
Capacity: 13 500-l drums/d (EP-1); 20 500-l drums/d (EP-2).
History: Startup EP-1, 1990
Milestone: Startup EP-2, 1992.
- **EARP (Enhanced Actinide Removal Plant)**
Mission: Remove actinides from liquid effluents by ultra-filtration and flocculation.
Capacity: 1000 m³/d.
Milestone: Startup, 1992.

BNFL: SPRINGFIELDS

British Nuclear Fuels plc
 Springfields Works
 Salwick, Preston
 Lancashire PR4 0XJ
 United Kingdom

Tel: 44-772-72-8262
 Fax: 44-772-72-5607

Director, Fuel Division

Dr. G. R. Smith

Function: Supplying fuel for U.K. reactor program. Facilities for UOC, UF₆ conversion, UF₆ - UO₂ powder/pellet production, and PWR fuel fabrication. Providing recycle services (enrichment in conjunction with Urenco).

BRE

Building Research Establishment
Department of the Environment
Building Research Station
Garston, Watford WD2 7JR
United Kingdom

Tel: 44-9273-74040
Fax:
Tlx: 92-3220

Asst. Dir., Geotech./Struc. Eng.
Seabed Disposal
Continental Disposal

Dr. J. B. Menzies
T. Freeman
Ms. C. M. Cooling

Waste Management R&D: Emplacement engineering and related activities; rock mechanics.

DoE

Department of the Environment
H.M. Inspectorate of Pollution
43 Marsham Street
London SW1 3PY
United Kingdom

Tel: 44-71-276-3000
Fax: 44-71-276-8100

Chief Executive

Dr. David Slater
44-71-276-8080

Chief Inspector

Dr. Alan Duncan
44-71-276-8129

Research

Dr. Steven Brown

Waste Management Responsibility: Administer U.K. waste management programs; fund and coordinate waste treatment and waste isolation R&D at Harwell, BGS, NRPB, etc.; regulate discharge of radioactive materials to the environment.

IOS

Institute of Oceanographic Sciences
Brook Road, Wormley, Godalming Tel: 44-42-879-4141
Surrey GU8 5UB Fax:
United Kingdom Tlx: 85-8833

Director Dr. Colin Summershayes
Nuclear Waste Dr. R. B. Whitmarsh

Function: Modelling radionuclide transport in the ocean.

MAFF

Ministry of Agriculture,
Fisheries and Food
Fisheries Laboratories
Pakefield Road Tel: 44-502-62244
Lowestoft, Suffolk NR33 OHT Fax:
United Kingdom Tlx: 97470

Director, Fisheries Research D. J. Garrod

Function: Regulation of waste management.

NII

Nuclear Installations Inspectorate
Baynards House
1 Chepstow Place
London W2 4TF Tel: 44-1-243-6000
United Kingdom Fax: 44-71-727-4116

Chief Inspector/Nuc.Installations E. A. Ryder
Overseas Liaison J. S. MacLeod

NIREX

U.K. Nirex Ltd.
Curie Avenue, Harwell
Didcot, Oxon OX11 ORH
United Kingdom

Tel: 44-235-83-5153/-3009
Fax: 44-235-83-1239

Managing Director
Technical Program Director
Project Director

P. Tom McInerney
H. Beale
Cedric S. Mogg

Function: Commission/manage research and development to propose (to the government) a site suitable for a deep repository for low- and intermediate-level radioactive wastes; construct and operate the repository and continue necessary R&D on long-term waste emplacement.

Owners: BNFL (42.5), Nuclear Electric plc (42.5), Scottish Nuclear Ltd. (7.5), and UKAEA (7.5) are partners in the "private limited" company. One special share, having absolute power of veto, is held by the Secretary of State for Energy.

NRPB

National Radiological
Protection Board
Chilton Didcot
Oxfordshire OX11 ORQ
United Kingdom

Tel: 44-235-83-1600
Fax: 44-235-83-3891

Director
Secretary
Asst. Dir., Environ. Sci.
Asst. Dir., Physical Sci.
Asst. Dir., Medical Sci.

Dr. Roger H. Clarke
G. A. M. Webb
B. Holliday
Dr. J. A. Dennis
Dr. B. H. MacGibbon

Function: As an independent board (established in 1970 as a result of the Radiological Protection Act, members appointed by the Health Ministry) advises governmental and industrial organizations on radiological protection matters and standards. Also carries out contract research to improve radiological protection and provides some technical services.

USSR
(Union of Soviet Socialist Republics)



USSR

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year
Mar. 6	Women's Day
May 1-2	Solidarity Days
May 9	Victory Day
Oct. 9	Constitution Day
Nov. 7-8	October Revolution

TIME

Standard Time Washington D.C.: (Moscow) + 8 hours
Daylight Saving Time Period: 03/31 - 09/28/91

PASSPORT/VISA

A passport is needed to depart and re-enter the United States; in addition, a visa is currently required for a visit to the USSR. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY

The exchange rate is unlisted. Please consult your bank or travel agent.

DIRECT DIALING

Individual numbers for direct-dial to the USSR are complete as listed, after dialing international access code: 011. Country code is 7; listed local numbers include city code. Please note that not all telephones in the USSR are accessible for international calls.

U.S. EMBASSY - MOSCOW

American Embassy	
Ulitsa Chaykovskogo 19/21/23	Tel: 7-095-252-2450/-59
Moscow	Fax:
USSR	Tlx: 41-3160 USGSO SU
Science Attaché	Jack P. Cosnell

ENERGY

Population	1988	286 million
Electric Power Plant Capacity	1988	327 GWe 11% nuclear
Electric Power Production	1988	1706 TWh ~ 12.6% nuclear
	1989	12.3% nuclear

NUCLEAR POWER

Policy: Major program to develop nuclear power, to avoid transport of fossil fuels from east of the Ural Mountains to European Russia.

Nuclear Power Plant Capacity	1990	35.2	GWe
	1995	46.3	GWe
	2000	55.8	GWe
Reactor Mix	1990	LGR:	20 (1976-90)
			1 (1992)
		PWR:	24 (1970-89)
			19 (1990-94)
		BWR:	1 (1966)
	FBR:	2 (1973/81)	
			1 (1993)

Reactor Development LMFBRs, 1500-MWe PWRs

INDUSTRIAL FUEL CYCLE

Policy: Complete domestic fuel cycle capability, including enrichment, fuel fabrication (UO_2 and MOX), and reprocessing. Provide complete fuel cycle services, including spent fuel storage and waste disposal to foreign buyers of USSR reactors and fuel. Shift to PWRs (since Chernobyl accident in 1986).

INDUSTRIAL FUEL CYCLE (contd)

Waste Management Strategy: Spent nuclear fuels are stored 3-10 years, followed by reprocessing. Reprocessing is done to allow for recycle of fissile materials, and separation of a number of other specific radionuclides for beneficial uses and separate disposition. HLW is vitrified for disposal in geologic repository. Geologic characterization is currently underway in at least eight unidentified sites in the Soviet Union.

LLW from nuclear reactor operations is currently evaporated, incorporated into bitumen or cement and stored and/or disposed of at reactor complexes and at about 35 other regional disposal facilities. Several sites for LLW burial "are expected to be selected in one or two years" (according to the USSR State Committee for the Utilization of Atomic Energy, 5/88). The Institute of Inorganic Materials is responsible for the LLW management program and is campaigning to cut liquid LLW volumes by 30% through more precise methods of sampling from the primary circuit, organizational methods, and recycling of soluble salts.

Dry waste, compacted at the site, is also stored/disposed of at reactor sites. Regional burial facilities are considered to minimize transportation-related risk.

INTERNATIONAL RELATIONSHIPS

DOE/MAPI Agreement on Scientific and Technical Cooperation in the Field of Peaceful Uses of Atomic Energy
Term: 05-25-90 to 05-24-95 (initiated 1973)
Scope: Technology information exchange

DOE/MAPI Memorandum of Cooperation in the Fields of Environmental Restoration and Waste Management
Term: 09-18-90 to 09-17-95
Scope: Technology information exchange related to policy and practices; evaluation of problems in environmental remediation, D&D of facilities and materials, R&D, analysis/investigations of waste partitioning and geologic disposal of radioactive wastes.

Member of IAEA, CMEA and WANO.

ORGANIZATION**Nuclear Program Control**

- **Ministry for Atomic Power and Industry (civilian and defense nuclear fuel cycle; waste management)**
- **State Committee for Safe Working Practices in Industry and the Nuclear Power Sector (nuclear regulatory and safety body)**

Research and Development

- **Institute of Physical Chemistry, Moscow, a branch of the USSR Academy of Sciences (radionuclide migration; waste form properties)**
- **V. G. Khlopin Radium Institute, Leningrad (chemical separation; fuels reprocessing; geochemistry)**
- **All-Union Scientific Research Institute for Inorganic Materials, Moscow (disposal of HLW; properties of solid waste forms)**
- **Chemical Plant Research Institute, Sverdlovsk (vitrification pilot plants)**
- **I. V. Kurchatov Institute of Atomic Energy (nuclear power R&D)**

**ALL-UNION SCIENTIFIC RESEARCH INSTITUTE
FOR INORGANIC MATERIALS**

All-Union Scientific Research
Institute for Inorganic Matls

Ferganskaya 25
109507 Moscow, USSR

Tel: 7-095-377-0104
Tlx: 411026 UKLON SU

Director

Alexander S. Nikiforov

Function: HLW management and standards for disposal.

I. V. KURCHATOV INSTITUTE OF ATOMIC ENERGY

I. V. Kurchatov Institute of
Atomic Energy

Kurchatov Square 1
123182 Moscow, USSR

Tel: 7-095-194-2969
Tlx: 411594 Shuga

Nuclear Safety

Ilya V. Elkin
Yuri P. Buzulukov

Function: Primary nuclear power research institute. Performs R&D on LLW and ILW.

V. G. KHLOPIN RADIUM INSTITUTE

V. G. Khlopin Radium Institute

Roentgen Str. 1
197022 Leningrad, USSR

Tel: 7-812-247-5737
Fax: 7-812-534-7752

Director-General
Deputy Director
Chief of Laboratory

Alexander Karelin
A. A. Rimsky-Korsakov
Valeriy N. Romanovskiy
7-812-247-6522

Chief Scientist

Leonard N. Lasarev

Waste Management R&D: Develop processes for spent fuel (reprocessing, thermal decladding, meltdown of hulls), improved partitioning of HLW wastes, waste immobilization technology, handling off-gases, and storing ⁸⁵Kr.

V. G. KHLOPIN RADIUM INSTITUTE (contd)Facilities:^(a)

- **Reprocessing Research & Development Facility**
Owner: Khlopin Radium Institute, Leningrad
Mission: Develop LWR fuel reprocessing technology.
Design Basis: Chop-leach head-end; PUREX flowsheet;
capacity, 3 kg/d uranium.
History: Startup, 1973.

MAPI

Ministry for Atomic Power
and Industry
7, Kitaisky Troezd
103074 Moscow, USSR

Tel: 7-095-220-6402

Minister	Vitaly F. Kononov
Dep. Dir., Intl. Relations	Vladimir P. Kuchinov
Dep. Minister, Nuclear Power	Viktor Sidorenko
Dep. Minister, Nuclear Fuel Cycle	Boris V. Nikipelov

Function: Management of all aspects of nuclear power industry.

Facilities:^(a)

- **Cold Pilot Plant-Vitrification**
Mission: Develop waste vitrification technology.
Design Basis: Liquid-fed ceramic melter, two-chamber unit;
100 liters/h HLLW; 25 liters/h glass; product, phosphate glass
in crucibles.
History: Startup, ca. 1974.

^(a) Because there is only limited information available, it is not always known for which nuclear agency a facility is operated and where it is located.

MINISTRY FOR ATOMIC POWER AND INDUSTRY
MAPI (contd)

- **KS-KT-100** (cold pilot plant-vitrification)
Location: Chemical Plant Research Institute, Sverdlovsk.
Design Basis: Fluid bed calciner; in-crucible melter (two-stage process); capacity, 100 liters/h HLLW, 20 kg/h glass; 160-180 kg glass/batch; product, phosphate glass crucibles.
History: Startup ca. 1975.
- **Reprocessing of Power Reactor Fuel**
Location: Kyshtym site, Chelyabinsk
Design Basis: Started reprocessing VVER-440 reactor fuel in 1978, with about 2000 MT reprocessed to 1989.
- **Fully Radioactive HLW Vitrification**
Location: Kyshtym site, Chelyabinsk
Design Basis: Single stage joule-heated ceramic melter with a feed rate of 500 l/hr. About 160 MT of HLW phosphate glass was produced from 1987-1988. Melter was shut down due to electrode problems. A new melter is being built for expected operation in 1990/1991.

**STATE COMMITTEE FOR SAFE WORKING PRACTICES IN
INDUSTRY AND THE NUCLEAR POWER SECTOR**
(GOSPROMATOMNADZOR)

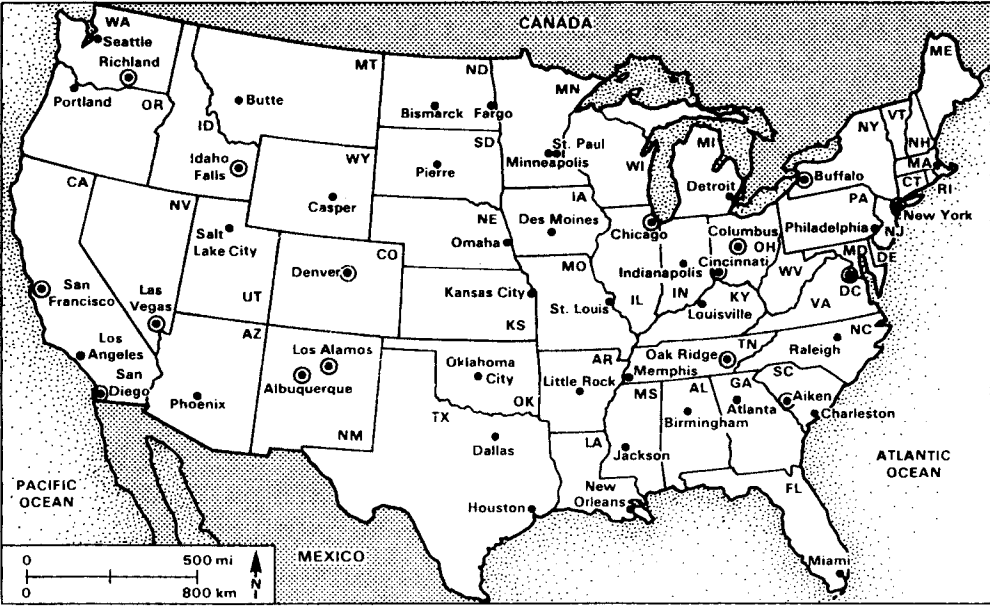
State Committee for Safe Working
Practices in Industry &
the Nuclear Power Sector
34, Taganskaya
Moscow, USSR

Tel: 7-095-272-4710

Chairman

Vadim M. Malyshev

Function: Monitoring the operational safety of technical installations.



UNITED STATES

UNITED STATES

MAJOR PUBLIC HOLIDAYS (1991)

Jan. 1	New Year	Sept. 2	Labor Day
Jan. 21	Martin Luther King Day	Oct. 14	Columbus Day
Feb. 18	Presidents Day	Nov. 11	Veterans Day
May 27	Memorial Day	Nov. 28	Thanksgiving Day
July 4	Independence Day	Dec. 25	Christmas

STATE ABBREVIATIONS

AL -Alabama	LA -Louisiana	OH -Ohio
AK -Alaska	ME -Maine	OK -Oklahoma
AZ -Arizona	MD -Maryland	OR -Oregon
AR -Arkansas	MA -Massachusetts	PA -Pennsylvania
CA -California	MI -Michigan	RI -Rhode Island
CO -Colorado	MN -Minnesota	SC -South Carolina
CT -Connecticut	MS -Mississippi	SD -South Dakota
DE -Delaware	MO -Missouri	TN -Tennessee
FL -Florida	MT -Montana	TX -Texas
GA -Georgia	NB -Nebraska	UT -Utah
HI -Hawaii	NV -Nevada	VT -Vermont
ID -Idaho	NH -New Hampshire	VA -Virginia
IL -Illinois	NJ -New Jersey	WA -Washington
IN -Indiana	NM -New Mexico	WV -West Virginia
IA -Iowa	NY -New York	WI -Wisconsin
KS -Kansas	NC -North Carolina	WY -Wyoming
KY -Kentucky	ND -North Dakota	

FOREIGN NATIONAL VISITS TO U.S. DOE FACILITIES

Foreign visitors to U.S. DOE facilities must complete and submit an IA-473 form (OMB 1910-2100) "Request for Foreign National Unclassified Visit or Assignment" to the laboratory or site to be visited at least 45 days before the proposed visit. The itinerary should be based on prior arrangement with appropriate DOE or DOE contractor staff.

ENERGY

Population	1988	248 million
Electric Power Plant Capacity	1988	709 GWe 13% nuclear
	1990	724 GWe 14% nuclear
	1995	745 GWe 14% nuclear
	2000	818 GWe 13% nuclear
Electric Power Production	1988	2872 TWh 57% coal 19% nuclear 10% gas 8% hydro/geoth. 6% oil
	1990	18% nuclear
	1995	17% nuclear
	2000	15% nuclear

NUCLEAR POWER GENERATION

Policy: Construction and operation of nuclear power stations is by private and public utilities under close regulatory control by NRC and State Public Review Commissions; continued R&D emphasizes LWR safety and small, modular concepts.

Nuclear Power Plant Capacity	1990	102.0 GWe
	1995	104.4 GWe
	2000	104.1 GWe
Reactor Mix	1990	PWR: 72 (1961-89) 4 (1990-92)
		BWR: 37 (1963-90)

NUCLEAR FUEL CYCLE

Policy: Current U.S. commercial nuclear fuel cycle activities include all phases: uranium mining, milling, and enrichment; fuel fabrication; interim spent fuel and waste storage; transportation, conditioning, and disposal of radioactive waste; except spent fuel reprocessing and disposal of spent fuel/HLW. Mining, milling, fabrication of UO₂ fuel, and LLW disposal are done predominantly by private firms; enrichment and HLW/spent fuel disposal are the responsibilities of the federal government; a private enrichment enterprise is being started. While permitted by law, commercial reprocessing is not envisioned in the near future primarily because of economic considerations.

Waste Management Strategy: Disposal of U.S. commercial spent fuel in a geologic repository is planned, possibly after interim storage in a monitored retrievable storage (MRS) facility. The Nuclear Waste Policy Act (NWPA) of 1982 and its 1987 amendments (NWPAA) mandate start of spent fuel acceptance in 1998 by the U.S. Government for eventual disposal. Short-lived LLW is disposed of in near-surface disposal facilities. States/compacts are developing new commercial LLW disposal facilities. Demonstration of defense transuranic waste disposal is planned in a geologic repository in a salt formation.

Cumulative Spent Fuel Arisings	1988	17,642 MTIHM
	1990	21,800 MTIHM
	1995	31,400 MTIHM
	2000	40,400 MTIHM

Major Milestones

- Start Demonstration Project at Waste Isolation Pilot Plant (defense TRU waste) 1991
- Candidate site identified for MRS facility 1992
- States/compacts must have civilian LLW disposal capability or otherwise manage their own LLW 1993
- Startup of MRS Facility with limited waste acceptance 1998
- Start construction for geologic repository 2004

Major Milestones (contd)

- Startup of repository for spent fuel and HLW 2010
- Study need for second repository for spent fuel and HLW 2007-2010
- Complete environmental cleanup of DOE sites 2019

INTERNATIONAL RELATIONSHIPS

Member of OECD/NEA and IAEA. Bilateral agreements for cooperation with Belgium, Canada, CEC, China, Germany, France, Japan, Spain, Sweden, Switzerland, USSR and the United Kingdom. A brief outline of DOE agreements, primarily related to waste management, is provided in the appropriate country's summary. International cooperation and exchange of waste management technology is encouraged.

ORGANIZATION

- DOE (Department of Energy) - Responsible for planning and implementing programs for the safe handling of radioactive wastes generated by its federal activities, and for disposal of all high-level waste, spent fuel, TRU waste, and Greater-Than-Class-C LLW. Responsible also for ensuring availability of adequate technology for safe and efficient management of nuclear wastes from both civilian and federal activities.
- HQ (Headquarters) - Provides policy, guidance and funding for nuclear waste management, including environmental restoration, and fuel cycle programs. Specific responsibilities are divided among the offices of:
 - RW (Office of Civilian Radioactive Waste Management) - Disposal of spent nuclear fuel and HLW; development of an MRS facility; development of transportation systems for spent fuel and HLW.

DOE ORGANIZATION (contd)

- **EM (Office of Environmental Restoration & Waste Management)** - Environmental cleanup, compliance, technology development, transportation and waste management activities for DOE sites identified in the Environmental Restoration & Waste Management Five-Year Plan. Includes previous waste management responsibilities of DP (Defense Programs), NE (Nuclear Energy) and ER (Energy Research). Management (treatment, storage, and disposal) of wastes at DOE sites including high-level, low-level, transuranic, hazardous, and mixed wastes; remediation of previously disposed DOE wastes; D&D of selected facilities; technology development for EM program; assistance to states on commercial LLW.
- **IE (International Affairs and Energy Emergencies)** - Coordination of DOE's international activities.
- **F.O. (Field/Operations Offices)** - Implement HQ policy and directives, issuing orders to specific sites. Direct efforts of DOE contractors.
- **Contractors** - Operate DOE facilities in accordance with HQ and F.O. guidance and orders.
- **DOI (Department of the Interior)**
 - **USGS (U.S. Geological Survey)** - Laboratory and field geologic investigations.
- **DOT (Department of Transportation)** - Development, issuance and enforcement of safety standards, governing aspects of radioactive and hazardous materials transport.
- **EPA (Environmental Protection Agency)** - Establishment and enforcement of general standards for the protection of the environment.
- **NRC (Nuclear Regulatory Commission)** - Issuance of regulations, licenses, and enforcement for commercial nuclear activities and disposal of spent fuel and HLW, in compliance with general environmental standards issued by the EPA.

DOE (DEPARTMENT OF ENERGY) PARTIAL ORGANIZATION

Secretary

Deputy Secretary

Under Secretary

- RW - Office of Civilian Radioactive Waste Management
 - YMPO
- EM - Office of Environmental Restoration and Waste Management
- IE - International Affairs and Energy Emergencies
- Other Offices
- Field/Operations Offices
 - AL - Albuquerque
 - LANL -- MOUND -- RFP -- SNL -- WIPP
 - CH - Chicago
 - ANL -- BNL -- BATTELLE
 - ID - Idaho
 - INEL -- WINCO -- WVNS
 - NV - Nevada
 - OR - Oak Ridge
 - ORNL
 - RL - Richland
 - PNL -- WHC
 - SAN - San Francisco
 - GA -- LBL -- LLNL -- ROCKETDYNE
 - SR - Savannah River
 - WSRC

NRC (NUCLEAR REGULATORY COMMISSION) PARTIAL ORGANIZATION

**Chairman
Commissioners**

-- **GPA - Governmental and Public Affairs**

-- **Executive Director for Operations**

-- **NMSS - Nuclear Material Safety and Safeguards**

-- **RES - Nuclear Regulatory Research**

-- **NRR - Nuclear Reactor Regulation**

-- **Regional Offices**

- **Region I (Philadelphia)**
- **Region II (Atlanta)**
- **Region III (Chicago)**
- **Region IV (Dallas)**
- **Region V (San Francisco)**

DOE-Headquarters

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	Verif:	896-5100

U.S. Department of Energy	Tel:	301-353-4511
Germantown	FTS:	233-4511
Washington, DC 20545	Fax:	233-3888/2866
	Verif:	233-5465

Secretary James D. Watkins

Office of Environmental Restoration and Waste Management

EM-1	Director	Leo P. Duffy	586-7710
	Deputy Director	Paul D. Grimm	-7745
EM-10	Plan./Resource Mgmt	James E. Dieckhoner (A)	-1665
EM-20	Envir. QA & QC	Randal S. Scott	-8754
EM-30	Waste Operations	Jill E. Lytle	-0370
EM-32	Site Operations	Larry H. Harmon	353-7105
EM-33	Program Support	James A. Turi	-7147
EM-34	Waste Mgmt. Projs.	Mark W. Frei	-7201
EM-35	Technical Support	Joseph Coleman	-7105
EM-40	Envir. Restoration	R.P. (Pat) Whitfield	586-6331
EM-42	Eastern Area	James J. Fiore (A)	353-8141
EM-43	Program Support	William Wisenbaker (A)	-8105
EM-44	Northwestern Area	Sally A. Mann (A)	-8161
EM-45	Southwestern Area	Ralph G. Lightner (A)	-8180
EM-50	Tech. Development	Clyde W. Frank	586-6382
50.1	Transp. Mgmt.	Susan H. Denny (A)	353-7268
EM-52	Integration/Envir.		
	Education Devel.	Susan M. Prestwich	-7924
EM-53	Program Support	(vacant)	
	Intn'l Tech. Exch.	Donald H. Alexander	-7954
EM-54	Research & Devel.	Steven C.T. Lien	-7911
EM-55	Demon. Tstng./Eval.	(vacant)	

AREA CODES: 202 for prefix 586; FTS: 896
301 for prefix 353; FTS: 233

DOE-HQ (contd)**Office of Civilian Radioactive Waste Management**

RW-1	Director	John W. Bartlett	586-6842
RW-2	Dep. Director	Franklin G. Peters	-6850
RW-3	Quality Assurance	Donald G. Horton	-8858
RW-4	Strategic Plng/Intn'l	Thomas H. Isaacs	-1252
	Intn'l Coord'n	William J. Danker	-5624
	Intn'l Coord'n	Renee M. Jackson	-2283
RW-5	Ext. Relations	Jerome D. Saltzman	-2277
RW-10	Prog/Resource Mgmt	Samuel Rousso	-9116
RW-20	Geologic Disposal	Carl P. Gertz	702-794-7920
	YMPO	(As noted below)	
RW-30	System & Compliance	Dwight D. Shelor	-6046
RW-40	Storage & Transp't'n	Ronald A. Milner	-9694

Yucca Mountain Site Characterization

Project Office (YMPO)	Tel:	702-794-7900
Phase 2, Suite 200	FTS:	544-7900
101 Convention Ctr. Dr.	Fax:	-7907/-7908
Las Vegas, NV 89109	Verif:	-7919

Manager	Carl P. Gertz	-7920
Dep. Proj. Mgr.	Maxwell B. Blanchard	-7939
Institutnl. Affrs.	A. C. (Ace) Robinson	-7593
Intl. Programs	Robert A. Levich	-7946
Reg./Site Evals.	David C. Dobson	-7940
Engrng. Develop.	Edgar H. Petrie	-7961
Proj./Oper. Cntrl.	Wendy R. Dixon	-7947
Quality Assurance	Donald K. Horton	-7913
YM Site Office	Wynfred A. Wilson	702-295-5914

Office of International Affairs and Energy Emergencies

IE-1	Assistant Secretary	John J. Easton, Jr.	586-5800
IE-2	Prin. Dep. Asst. Sec.	Arlean I. Erdahl	-5858
IE-10	Deputy Asst. Sec.	Richard Williamson	-5918
IE-12	Intn'l R&D Policy	Harold Jaffe	-6770

AREA CODES: 202 for prefix 586; FTS: 896
301 for prefix 353; FTS: 233

DOE OPERATIONS OFFICES**ALBUQUERQUE OPERATIONS (AL)**

U.S. Department of Energy	Tel:	505-845-4154
Albuquerque Operations Office	FTS:	845-4154
P.O. Box 5400	Fax:	-6058
Albuquerque, NM 87115	Verif:	-6319

Manager	Bruce G. Twining	845-6049
Energy/Special Programs	James Bickel	-4829
Waste Isolation Pilot Plant	Arlen E.Hunt	887-8101
Uranium Mill Tailings	Mark Mathews	845-4628

DOE Rocky Flats Office (Denver Site)	Tel:	303-966-7000
Rocky Flats Plant	FTS:	320-7000
P.O. Box 464	Fax:	-4092
Golden, CO 80402-0464	Verif:	-2719

Manager	Robt. M. Nelson, Jr.	-2025
Deputy Manager	David P. Simonson	-2025
Dir.(A), Env. Restoration	Richard Schassburger	-4888

CHICAGO OPERATIONS (CH)

U.S. Department of Energy	Tel:	708-972-2000
Chicago Operations Office	FTS:	972-2000
9800 South Cass Avenue	Fax:	972-2343/-2206
Argonne, IL 60439	Verif:	-2209

Manager (A)	David T. Goldman	-2110
Repos. Tech. Prog. (RTP)	Richard C. Baker	-2071
Transportation Prog. (TPO)	Jeffrey B. Roberts	-2228
Waste Operations-Materials Integration Office (MIO)	Joel C. Haugen	-2093

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Idaho Falls, ID 83402	Verif:	-1503

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Deputy Manager	Robert E. Tiller	-1324
Asst. Mgr., Nuclear Programs	Robert M. Stallman	-1995
Dir., Mat'ls Processing Div.	Michael J. Bonkoski	-1412
Dir., Reactor Research & Technology Div.	Neil S. Burrell	-1984
SMC Program Office	Richard L. Carlile	-0091
Asst. Mgr., Envir. Restoration & Waste Management	James E. Solecki	-1989
Waste Management	Scott T. Hirschberger	-8288
W. Valley Proj. (NY Site)	Thomas J. Roland	716-942-4312
Process Technology	W. Stephen Ketola	-4314

NEVADA OPERATIONS (NV)

U.S. Department of Energy	Tel:	702-295-1212
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Las Vegas, NV 89193-8518	Verif:	-1369

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Environ'l Protection	Don Elle	-0956

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Oak Ridge Operations Office	FTS:	626-5454
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Dir. Energy Prog. Div.	Thomas Jelinek	-0710
Laboratory Operations	Connor Matthews	-1373
Fusion/Nuclear Tech.	Martha J. Rohr	-0717
Dir., Waste Mgmt. Div.	Larry Radcliffe	-0732
Program Manager	Larry W. Clark	-2675

RICHLAND (HANFORD) OPERATIONS (RL)

U.S. Department of Energy	Tel:	509-376-7411
Richland Operations Office	FTS:	444-7411
825 Jadwin Avenue	Fax:	444-6540
P.O. Box 550	Verif:	-7317
Richland, WA 99352		

Manager	John D. Wagoner	-7395
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Quality Assessment	(vacant)	
Safety/Envir./Security Assmnt.	(vacant)	
Deputy Mgr., Operations	J. Phillip Hamric	-6278
Asst. Mgr., Operations	John R. Hunter	-7434
Waste Management	Ken W. Bracken	-1366
Tank Farm Project	Ron E. Gerton	-9106
Asst. Mgr., Tech. Support	John J. Keating	-7387
Technical Support	Richard A. Holten	-7461
Safeguards/Security	Joe W. Wiley	-7441
Deputy Mgr., Environmental		
Restoration & Projects	Willis W. Bixby	-0024
Asst. Mgr., Envir. Mgmt	Leo E. Little	-6628
Environmental Restoration	E.(Liz) A. Bracken	-7277
Research & Development	Joe J. Sutey	-7591
Asst. Mgr., Projects	John H. Anttonen	-7591
Vitrification Project	Robert W. Brown	-7391
EMSL Project	Leif Erickson	-1758
WRAP Project	J. Brian Sullivan	-0679

SAN FRANCISCO OPERATIONS (SAN)

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San Francisco Operations Office	FTS:	536-4237
1333 Broadway	Fax:	-6207
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Manager	Donald Pearman	-7111
Waste Management	Daniel Nakahara	543-8394
Environ. Safety & Support	Bill Holman	536-6370

SAVANNAH RIVER OPERATIONS (SR)

U.S. Department of Energy	Tel:	803-725-6211
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Aiken, SC 29801		-1259/-3626

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Asst. Mgr. for Environ.		
Restoration & Waste Mgmt	A. C. Svostnom	-1378
Dir., High Level Waste Div.	A. Lee Watkins	557-1055
Dir., Waste Ops. & Tech.	Michael G. O'Rear	725-5541
Dir., Environ. Restorat'n Div.	Lewis C. Goidell	-3966

DOE CONTRACTORSANL

Argonne National Laboratory	Tel:	708-972-2000
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Argonne, IL 60439	Fax:	972-2343
		-2206/-2528
	Verif:	-2209
Director	Alan Schriesheim	-3872
Waste Management	James E. Helt	-7335
Applied R&D	Nicholas Beskid	-6677
Natl. Energy Software Cntr.	Margaret K. Butler	-7172
Special Projects Office	Charles E. Klotz	-6385
ANL-West (ID), Mgr.	H. McFarlane	208-526-7106

Fuel Cycle and Waste Management Activities:

Remedial action for formerly-used MED/AEC sites (FUSRAP) and for surplus facilities management program (SFMP) - D&D of ANL-East contaminated facilities - Materials Integration Office - Mixed waste treatment and disposal, groundwater treatment - LLW/TRU waste technology - TRUOX process development - Pyro-metallurgical and pyro-chemical fuel reprocessing, electrorefining - Environmental Restoration and Waste Management - Applied R&D program support for EM - SARP review - Civilian Radioactive Waste, socioeconomic impact assessment, transportation planning, spent fuel and waste glass performance, interaction of waste package with repository environment, instrumentation development - National Energy Software Center.

Major Facilities:

ANL-East: High-Level Hot-Cell Facilities - Large Gamma Radiation Facility - Alpha-Gamma Hot-Cell Facility (AGHFC).

ANL-West: Experimental Breeder Reactor No. 2 (EBR-II) - Zero Power Plutonium Reactor (ZPPR) - Transient Reactor Test Facility (TREAT) - Hot Fuel Examination Facility (HFEF) - Radioactive Scrap and Waste Facility - Sodium Process Demonstration (SPD) Facility - Radioactive Liquid Waste Treatment Facility (RLWTF) - Facility North/South (FCP, HFEF/S).

BATTELLE

Battelle - Columbus Operations	Tel:	614-424-6424
505 King Avenue	FTS:	614-424-6424
Columbus, OH 43201	Fax:	424-5263
	Verif:	-4182

Energy Systems

V.P./General Manager	Richard A. Nathan	-4295
LLW Programs	Wayne A. Carbiener	-4507
Technology Development	Walter E. Newcomb	-4318
Nuclear Safety	Peter Cybulskis	-7509
Chemical Process Safety	Fred L. Leverenz	-4623
Energy Syst. Tech. (A)	Walter E. Newcomb	-4318

Fuel Cycle and Waste Management Activities:

Site survey/characterization - Waste packaging - Disposal technology - Transportation - Performance assessment - Environmental/Socioeconomic assessments - Decontamination and decommissioning - Systems integration - Quality assurance - Licensing - Nuclear Engineering/technology - Policy support - Institutional interactions - Communications and outreach - Safety.

Hazardous Chemical and Mixed Waste Activities:

Transportation - Risk assessment - Modelling - Regulation - Waste management - Policy support.

BNL

Brookhaven National Laboratory	Tel:	516-282-2123
Associated Universities, Inc.	FTS:	666-2123
Upton, NY 11973	Fax:	666-3000
	Verif:	-2547

Director	N. P. Samios	-2772
HLW & NRC LLW Progs.	Peter Soo	-4094
DOE LLW Programs	Peter Colombo	-3045

Fuel Cycle and Waste Management Activities:

Low-level waste form evaluation - Waste management criteria

Major Facilities: Hot and Cold Development Laboratories

GA

General Atomics	Tel:	619-455-3000
P.O. Box 85608	FTS:	619-455-3000
3550 General Atomics Court	FAX:	-3621
San Diego, CA 92186-9784	Verif:	-3457

Chairman/Chief Executive	J. Neal Blue	-2152
Transp./Utility Waste Mgmt	Robert Grenier	-2583

Fuel Cycle and Waste Management Activities:
HTGR spent fuel treatment - Transportation technology for commercial wastes.

INEL

Idaho National Engineering Laboratory	Tel:	208-526-0111
EG&G Idaho, Inc.	FTS:	583-0111
P.O. Box 1625	Fax:	-9591
Idaho Falls, ID 83415	Verif:	(recipient)

Manager	James O. Zane	-9671
Waste Management (A)	Jay N. Davis	-1348
Nat'l LLW Mgmt Program	Calvin B. Ozaki	-0004
Power Reactor Programs	Frank C. Fogarty	-8742
Spent Fuel Technology	Gary R. Trohkimoinen	525-5920

Fuel Cycle and Waste Management Activities:
National LLW technology - D&D (EBR-II, MTR, OMRE, Spent Reactors) - TMI-2 R&D - Operation of stored waste examination pilot plant (SWEPP) for TRU waste - LLW disposal operation - Cask systems development - Cask transport and testing - Prototypical rod consolidation.

Major Facilities:
Radioactive Waste Management Complex (RWMC) - Processing Experimental Pilot Plant (PREPP) - Waste Experimental Reduction Facility (WERF) - Stored Waste Examination Pilot Plant (SWEPP) - Test Area North/Spent Fuel Storage Area (TAN) - Advanced Test Reactor (ATR).

LANL

Los Alamos National Laboratory	Tel:	505-667-5061
University of California	FTS:	843-5061
P.O. Box 1663	Fax:	-1754-8873
Los Alamos, NM 87545	Verif:	-5113/4960
Director	Siegfried S. Hecker	-5101
Dir., Energy, Environ. & Program Development	Michael E. Berger	-4960
Nuc. Waste Mgmt. R&D	Richard J. Herbst	-9286

Fuel Cycle and Waste Management Activities:

Fundamental studies of waste materials (BES) - Migration from low-level waste sites (BES) - D&D of various site facilities - Tuff repository support (NNWSI).

Major Facilities:

Waste Disposal Field Experimental Facility - Controlled Air Incinerator Demonstration Facility - Glove Box Reduction Facility - TRU Waste Assay Systems.

LLNL

Lawrence Livermore National Laboratory	Tel:	415-422-1100
University of California	FTS:	532-1100
P.O. Box 808	Fax:	-1370
Livermore, CA 94550	Verif:	-4546
Director	John H. Nuckolls	-5435
Dir., YMSCP	Leslie Jardine	543-5032
Technical Manager	Lyndon Ballou	532-4911
Energy Programs	Jesse L. Yow, Jr.	-3521

Fuel Cycle and Waste Management Activities:

Particulate filter development - Fundamental geoscience studies - Development of waste package for tuff repository - Waste package design criteria - Monitoring techniques for geologic repositories - Geochemical code for tuff repository performance assessment.

Major Facility:

• CLIMAX Spent Fuel Test Facility at NTS (now shut down).

MOUND

EG&G Mound Applied Technologies	Tel:	513-865-4020
P.O. Box 3000	FTS:	774-4020
Miamisburg, OH 45343	Fax:	-3742/-4532
	Verif:	-3575

Director	Donald E. Michel	-5090
Nuclear Waste Technology	Eric T. Kirk	-4842
D&D	Ralph R. Jaeger	-3275
Waste Management	James F. Griffin	-3831

Fuel Cycle and Waste Management Activities:

Solid waste volume reduction with glass melter - TRU waste technology/record systems - TRU waste treatment/ liquid waste, incineration - Tritium recovery from waste - D&D of Pu-238 facilities.

Major Facilities:

Glass Melter - Incinerator - Waste Treatment Facility - Combined Electrolysis Catalytic Exchange System (CECE) - Tritium Effluent Recovery System (ERS) - Hydrogen Isotope (Cryogenic Distillation) Separation System (HISS).

ORNL

Oak Ridge National Laboratory	Tel:	615-576-5454
Martin Marietta Energy Systems, Inc.	FTS:	626-5454
P.O. Box 2008	Fax:	-2912
Oak Ridge, TN 37831	Verif:	624-6068

Director	Alvin Trivelpiece	626-2900
Dir., Waste Mgmt./Remedial Actions (Nuc. Chem. Waste)	L. E. McNeese	624-7456
Dir., Fuel Recycle	S. A. Meecham	-7065
Reprocessing Program	William D. Burch	-7065
Dir., OCRWM Programs	Ronald B. Pope	-6461
Dir., Waste R&D Programs	A. P. Malinauskas	626-1092

ORNL (contd)**Waste Management Activities:**

Operate waste management facilities, including disposal - Develop LLW & TRU waste treatment technology, including assay and package certification - Hazardous waste remedial actions - Waste operations control center - UMTRA radiological survey - Environmental restoration and facilities upgrade - Waste management R&D.

Major Facilities:

LLW Disposal/Storage Facilities - TRU Assay Facility - Tower Shielding Facility (fuel/waste cask drop tests) - TRU Storage/Certification Facilities - Liquid LLW processing/storage - Waste processing/disposal - Tumulus LLW Disposal Facility - Non-Radiological Waste-water Treatment Plant - Hazardous waste storage and packaging facility.

Fuel Cycle and Reprocessing Activities:

Develop reprocessing, remote systems, and safeguards technologies and facilities design optimizations.

Major Facilities:

Integrated Equipment Test Facility including Fuel Element Disassembly and Shearing Systems, Continuous Rotary Dissolver, Chemical Rack Systems, Advanced Integrated Maintenance System and Environmental Test Chamber.

PNL

Pacific Northwest Laboratory		
Battelle Pacific Northwest	Tel:	509-375-2121
Laboratories	FTS:	509-375-2121
Battelle Boulevard	Fax:	509-376-3876
P.O. Box 999	FTS:	444-3876
Richland, WA 99352	Verif:	(recipient)

Director	William R. Wiley	375-2201
Waste Technology Center	Jack L. McElroy	376-6253
Waste Treatment Technology	Harry C. Burkholder	376-3090
Waste Process Engineering	Charles R. Allen	376-1712
Waste Systems	Gary W. McNair	376-4435
Intn'l Program Support	Abe E. Van Luik	376-0933
Reactor Technology Center	Bill D. Shipp	375-2921
Envir. Mgmt. Operations	R. William Root	375-3888
Mat'ls & Chemical Sciences	Walter W. Laity	375-2780
Molecular Sciences Research	Michael L. Knotek	375-2272
Laboratory Programs	J. Adrian Roberts	375-2614
Off. of Envir. Technology	Mark S. Hansen	375-6812

Fuel Cycle and Waste Management Activities:

Waste systems integration (economic/contract analyses and implementation) - Civilian nuclear waste treatment - International program support - NRC D&D evaluations - Tuff repository and Performance Assessment Scientific Support (PASS) studies - HLW technology - TRU technology - LLW technology - Remedial action planning and technology - Byproduct utilization - Transportation technology.

Major Facilities:

Hot and Cold Development Laboratories - Hot cells for Development and Pilot Scale Programs and Spent Fuel Characterization.

RFP

EG&G Rocky Flats, Inc.	Tel:	303-966-7000
Rocky Flats Plant	FTS:	320-7000
P.O. Box 464	Fax:	-4092
Golden, CO 80402-0464	Verif:	-2719

President	P. Warner	-4361
Waste Operations	H. H. Burlangame	-6013
Waste Minimization	Ann C. Ficklin	-4293
Technology Development	Ed R. Naimon	-7900

Fuel Cycle and Waste Management Activities:

Defense TRU waste technology - LLW technology development -
Waste treatment facilities operations.

Major Facilities:

Solid Waste Reduction Facility - LLW Incinerators - TRU Waste
Supercompaction - TRU Waste Assay - Liquid Waste Treatment
and Fixation Facilities - Microwave Melting of Liquid Waste
Treatment Sludges.

ROCKETDYNE

Rockwell International Corporation	Tel:	818-700-8200
Atomics International Division	FTS:	818-700-8200
Rocketdyne	Fax:	818-718-3352
6633 Canoga Avenue	Verif:	-2471
Canoga Park, CA 91303		

V.P.-Advance Programs	Hank Wieseneck	-3301
Nuclear Products/Services	Robt. M. Musica	-3355
D&D	Thomas A. Moss	-3326
Actinides	Mark Gabler	-3458

Fuel Cycle and Waste Management Activities:

Operation of Energy Technology and Engineering Center (ETEC)
- Remote and fuel handling equipment development - Actinide
Pyro-partitioning and Transmutation

Major Facilities:

Energy Technology and Engineering Center

SAIC

Science Applications International Corporation
 Suite 407
 101 Convention Center Drive
 Las Vegas, NV 89109

Tel: 702-794-7000
 FTS: 544-7000
 Fax: -7008
 Verif: -7780

Technical Project Officer John H. Nelson -7864

SNL

Sandia National Laboratories
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 FTS: 844-5678
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President Al Narath -7261
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 Transp. Tech. Center (A) Robert E. Luna 845-8788
 WIPP Scientific Support Wendell D. Weart 844-4855
 Nucl. Regulatory Research D.J. McClosky 846-0834
 Yucca Mtn. Proj. Suppt.(A) Thomas E. Blejwas 844-9160

Fuel Cycle and Waste Management Activities:
 Radioactive material transportation technology - Tuff repository support - Salt repository scientific support (WIPP) - Safety assessment of facilities for NRC - Advances in reactor technology.

Major Facilities:

Research reactors and numerous test facilities.

SRL/SRP (see SRS)

SRS

Savannah River Site
 Westinghouse Savannah River Co.(WSRC) Tel: 803-725-6211
 P.O. Box 616 FTS: 239-6211
 Aiken, SC 29802 Fax: 239-2780
 -3945/-1865
 Verif: -1555

V.P./Gen. Mgr., Nuclear		
Fuels Processing (NFP)	Ed W. Pottmeyer	239-2701
Deputy Gen. Mgr., NFP	Robert Maher	-3575
Mgr., Waste Management	G. Todd Wright	-1527
Mgr., DWPF	Clay B. Jones	-1050

Fuel Cycle and Waste Management Activities:
 Operate fuel reprocessing facilities - Operate Associated Spent
 Fuel Storage, HLLW Tank Storage and Treatment Facilities -
 Operate LLW Shallow-land Burial Grounds - Start-up and operate
 Defense Waste Processing Facility - Store Mixed Waste.

Major Facilities (existing and planned):
 Reprocessing Plants - Canyon Mockup Shop - LLW Incinerator -
 HLW Tank Farm - Defense Waste Processing Facility (DWPF) -
 Hazardous Waste/Mixed Waste Processing Facility - Consolidated
 Incinerator Facility (Hazardous, LLW, and Mixed Waste) -
 Transuranic Waste Facility - LLW Preparation Facility.

Savannah River Laboratory (SRL) Fax(FTS): 239-1660
 -4704/-2978
 Verif: -5331

Vice Pres./Director	Richard T. Begley	803-725-3422
Defense Waste Processing	Dan L. McIntosh	-3113
Chem. Processing Technol.	Lou M. Padouchado	-3701

Fuel Cycle and Waste Management Activities:
 Fuel Reprocessing R&D - HLW Storage and Solidification R&D -
 HLW Form Development and Characterization - HLW Packaging
 R&D - TRU Technology Development - LLW Technology
 Development - Defense HLW Technology Development.

SRS (contd)**Major Facilities:**

HLW Vitrification Pilot Plant - HLW Tank Mockup - HLW Caves for Process Development.

TESS

TRW Environmental Safety Systems Inc.	Tel:	703-934-7600
One Federal Systems Park Dr.	FTS:	703-934-7600
Fairfax, VA 22033	Fax:	-7622
	Verif:	-7679

President & General Mgr.	Roland L. Robertson	-7610
Asst. Gen. Mgr., Operations	Ray W. Godman	-7620
Asst. Gen. Mgr., Systems	Art B. Greeberg	-7630
Nevada Site Manager	L. Dale Foust	702-794-1804

Function: As Management and Operating Contractor (M&O), TRW supports the DOE Office of Civilian Radioactive Waste Management (OCRWM), through systems engineering, design, development, and technical direction of the Nuclear Waste Management System. The OCRWM mission is the permanent disposal of the nation's spent nuclear fuel and high-level radioactive waste in a manner that protects the health and safety of the public and the quality of the environment.

WHC

Westinghouse Hanford Company	Tel:	509-376-7411
P.O. Box 1970	FTS:	444-7411
Richland, WA 99352	Fax:	-4668
	Verif:	-5777

President	Thomas M. Anderson	-5107
Executive V-P	Ralph R. DiSibio	-7803
V-P., Restorat'n/Remediat'n	Ronald J. Bliss	-6427
Defense Waste Remediat'n	Denny J. Newland	373-3144
HWVP Project	Robert A. Smith	-8041
Applied Technology	E. Thomas Weber	-9181
V-P, Waste Tank Safety, Operat'ns/Remediat'n	Harry D. Harmon	373-4724

WHC (contd)

V-P, Engineered Applications	Michael K. Korenko	-9992
Nuclear Process Engineering	Eric W. Gerber	-9356
Processing/Analytical Labs	Eugene J. Kosiancic	373-1594
Charctr./Waste Minimization	Rod W. Powell	-9336
Dir., Environment, Safety, Health/QA	Kenneth R. Jordan	-3692

Fuel Cycle and Waste Management Activities:

HLW tank storage - Ca/Sr recovery and encapsulation - HLW concentration and solidification - Liquid LLW treatment and fixation - TRU waste assay - Hanford waste disposal - D&D Hanford reactors and fuel cycle facilities - Breeder fuel development and fabrication - Spent fuel integrity in storage - Surplus facilities program - Solid waste disposal operations.

Major Facilities:

Encapsulation Plant - Fast Flux Test Facility (FFTF) - Fuel Cycle Plant (FCP previously FMEF) - Fuel Development Laboratories.

WINCO

Westinghouse Idaho Nuclear Co., Inc.	Tel:	206-526-0111
Idaho Chemical Processing Plant	FTS:	583-0111
P.O. Box 4000	Fax:	-3499
Idaho Falls, ID 83403	Verif:	-3506

President	W.C. Moffitt	-0998
Production	L. F. Ermold	-4628
Technology	Bert R. Wheeler	-3373

Fuel Cycle and Waste Management Activities:

Operate associated spent fuel storage, fuel reprocessing, HLW tank storage, and HLLW calcining facilities.

Major Facilities:

Idaho Chemical Processing Plant (ICPP) - Fuel Reprocessing, Uranium Recovery, HLLW Storage. Waste Calcining Facility (WCF) and Remote Mockup - Wet and Dry Fuel Storage - Kr-85 Cryogenic Recovery.

WIPP

Waste Isolation Pilot Plant		
Westinghouse Electric Corporation	Tel:	505-887-8100
Advanced Energy Systems Division	FTS:	571-2100
P.O. Box 2078	Fax:	505-887-0707
Carlsbad, NM 88221	Verif:	-8110

Project (DOE) Mgr.	Arlen E. Hunt	571-2101
Operations (WEC) Mgr.	A. L. Trego	-2200
Nucl. Waste (SNL) Tech. Mgr.	Wendell D. Weart	844-4355

Fuel Cycle and Waste Management Activities:

WIPP construction technical support, including design review, construction, safety assurance, operational planning, quality assurance systems.

Function:

Demonstrate defense transuranic waste disposal in a deep salt formation. If successfully demonstrated, WIPP will become a repository for this type of waste.

WVNS

West Valley Nuclear Services, Inc.		Tel:	716-942-3235
P.O. Box 191		FTS:	473-3235
West Valley, NY 14171-0191		Fax:	-4376
		Verif:	-4267

President	Joseph J. Buggy	-4200
Vice Pres./Dep. Proj. Mgr.	Williams G. Poulson	-4344

Fuel Cycle and Waste Management Activities:

Demonstration of HLW vitrification - Supernatant treatment by ion-exchange - LLW treatment using cement solidification.

Major Facilities:

HLW Vitrification Facility - Integrated Radioactive Treatment System (Supernatant processing, evaporation, remote cementation facility, product storage).

OTHER U.S. ORGANIZATIONSEPA

Environmental Protection Agency 401 M Street S.W. Washington, DC 20460	Tel: 202-382-2090 FTS: 382-2090 Fax: -7883 -7884/-7885 Verif: -2078
International Activities	
Assistant Administrator	Timothy B. Atkeson -4870
Multilat. Staff Director	Alan Sielen -4875
Radiation Programs	
Director (A)	Margo T. Oge 475-9622
Criteria, Standards	J. William Gunter 703-308-8777
Waste Mgmt. Standards	Floyd L. Galpin 475-9633
Solid Waste	
Director	Sylvia Lowrance 382-4627
Permit, State Programs	Matthew Hale -4746

Function: Establish and enforce general standards for the protection of the environment.

EPRI

Electric Power Research Institute 3412 Hillview Avenue P.O. Box 10412 Palo Alto, CA 94303	Tel: 415-855-2000 FTS: 415-855-2000 Fax: 855-1026 Verif: -2372
President	Richard Balzhiser -2141
V.P./Director, Nuc. Power	John J. Taylor -2030
LWR Fuel	Rosa Yang -2481
HLW/Spent Fuel Storage	Robert Shaw -2026
Low-Level Waste	Christopher J. Wood -2379

Fuel Cycle and Waste Management Activities:

Spent fuel rod consolidation study - Cooperative on-site demonstration of spent fuel storage in metal casks/concrete silos - Conceptual designs for LLW disposal sites - Demonstration of transportable spent fuel metal storage casks - Spent fuel storage and transportation studies - Fuel performance during load-following, high-temperature operation and extended burnup - Fuel performance computer models - HLW repository performance assessment.

NRC

U.S. Nuclear Regulatory Commission	Tel:	301-492-7000
Washington, DC 20555	FTS:	492-7000
	Fax:	-0259/-0260
	Verif:	-0262

Chairman	Kenneth M. Carr	-1759
Commissioner	Kenneth C. Rogers	-1855
Commissioner	James R. Curtiss	-1875
Commissioner	Forrest Remick	-1820

Governmental and Public Affairs (GPA)

Director	Harold R. Denton	-1780
International Programs	James R. Shea	-0347
International Security (Export/Import Regulations)	Ronald D. Hauber	-0344
International Cooperation	Albert P. Kenneke	-0336

Nuclear Material Safety and Safeguards (NMSS)

Director	Robert M. Bernero	-3352
HLW Management	B. Joe Youngblood	-3404
LLW Mgmt/Decommissioning	Richard L. Bangart	-3339
Safeguards/Transportation	Robert F. Burnett	-3365
Indust./Medical Nucl. Safety	R. E. Cunningham	-3426

Nuclear Reactor Regulation (NRR)

Director	Thomas E. Murley	492-1270
Reactor Projects I/II	Steven A. Varga	-1403
Reactor Projects III/IV/V	Dennis M. Crutchfield	-1353
Systems Technology	Ashok C. Thadani	-0884
Engineering Technology	James Richardson	-0722
Operational Events Assess.	Charles E. Rossi	-1163
Reactor Inspection/Safeguards	Brian K. Grimes	-0903
Rad. Protec./Emerg. Prepar.	Frank J. Congel	-1088
Performance/Quality Eval.	Jack W. Roe	-1004

NRC (contd)**Nuclear Regulatory Research (RES)**

Director	Eric S. Beckjord	-3700
Engineering	Lawrence C. Shao	-3800
Safety Issues Resolution	Warren Minners	-3900
Systems Research	Brian Sheron	-3500
Regulatory Applications	Bill M. Morris	-3750

Regional Offices

Philadelphia - Region I	Thomas T. Martin	215-337-5299
Atlanta - Region II	Stewart D. Ebnetter	404-331-5500
Chicago - Region III	A. Bert Davis	708-790-5681
Dallas - Region IV	Robert D. Martin	817-860-8225
San Fran. - Region V	John B. Martin	415-943-3707

Function: Issuance of regulations, licenses, and enforcement for commercial nuclear activities and disposal of spent fuel and HLW, in compliance with general environmental standards issued by the EPA.

NWTRB

U.S. Nuclear Waste Technical	Tel:	703-235-4473
Review Board	FTS:	703-235-4473
1100 Wilson Boulevard, Suite 910	Fax:	-4495
Arlington, VA 22209	Verif:	-4473

Chairman	Don U. Deere
Executive Director	William D. Barnard
Dir., External Affairs	Paula N. Alford

Function: Established by the U.S. Congress in the Nuclear Waste Policy Amendments Act of 1987 to provide independent review of the U.S. Department of Energy's technical and scientific program for the disposal of commercial spent nuclear fuel and defense high-level waste. At full complement, eleven members will be appointed by the President to serve on the Board. Currently, nine members have been appointed to four year terms.

ONWN

Office of the U.S. Nuclear Waste Negotiator Headquarters Boise, Idaho 83777	Tel: 208-334-9876 FIS: 584-9876 Fax: 208-334-9880 Verif: -9876
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Negotiator Chief of Staff	David H. Leroy Chuck B. Lempesis
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Function: Established by the Nuclear Waste Policy Amendments Act of 1987 as an independent executive agency of the federal government to identify a State or Indian Tribe willing to host a Monitored Retrievable Storage facility or permanent repository for high-level waste. Authorized to negotiate with interested potential hosts to determine the terms and conditions under which they would agree to serve as host.

ONWN Washington Liaison Office 1823 Jefferson Place, N.W. Washington, D.C. 20036	Tel: 202-634-6244 FIS: 202-634-6244 Fax: -6251 Verif: -6244
--	--

Counsel Executive Assistant	Robert M. Mussler Laura M. Anthony
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USGS

U.S. Geological Survey 410 National Center 12201 Sunrise Valley Drive Reston, VA 22092	Tel: 703-648-4000 FIS: 959-4000 Fax: -5295 Verif: -5235
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Director Asst. Dir./Eng. Geology Nuclear Waste Hydrology High-Level Waste Low-Level Waste Toxic Waste	Dallas L. Peck James F. Devine Newell J. Trask Peter R. Stevens Gail Mallard	-7411 -4423 -5719 -5721 -6872
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Yucca Mountain Project (Denver Office) Technical Proj. Officer	Larry R. Hayes	303-776-0516
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USGS (contd)**Fuel Cycle and Waste Management Activities:**

Basic/applied research on hydrogeologic processes relevant to radioactive and toxic waste disposal - site characterization - geologic/hydrologic investigations to determine suitability of potential HLW repository site at Yucca Mountain - site investigations/research - consultant for EPA, DOE, DOD, Dept. of Agriculture, Bureaus of Land Mgmt, of Mines, of Reclamation, and state agencies.

INTERNATIONAL AGENCIES

CEC

Commission of the European
Communities
200 Rue de la Loi
1049 Brussels, Belgium

Tel: 32-2-235-1111
Fax: 32-2-236-2006

Vice-President for Telecom-
munications, Information Tech-
nologies, Research/Science,
Joint Research Centres
Director-General, Science/R&D
Director, Nuclear R&D

Filippo Naria Pandolfi

Division, Fuel Cycle

Paolo Fasella
Sergio Finzi
32-2-235-9177
Serge Orłowski
32-2-235-4063

Geological Disposal R&D
Safety Studies
Waste Form R&D
Division, Nuclear Plant Safety
Division, Radiological Protection
Director, Nuclear Safety, Industry/
Environment, Civil Protection

H. von Maravic
N. Cadelli
K. Schaller
Emilio L. Menchero
Georg Gerber

Division, Radiation Protection
Division, Envir. Monitoring
Director, Euratom Safeguards

Edward Bennett
32-2-235-4049
H. Eriskat
F. Luykx
Wilhelm Gmelin
32-2-352-4301-2211

Dir. Gen., Euratom Supply Agency

Michael Goppel
32-2-235-7894

Director-General, JRCs

Jean-Pierre Contzen

**MEMBER STATES - EUROPEAN ECONOMIC COMMUNITY
(EEC)**

Belgium
Denmark
France
Germany (FRG)

Greece
Italy
Ireland
Luxembourg

Netherlands
Portugal
Spain
United Kingdom

CEC (contd)**FUNCTION**

Executive body for the European Communities (combined Euratom, Coal and Steel, Common Market).

FUEL CYCLE PROGRAM ADMINISTRATION**R&D Programs:**

- **Direct action**--fully funded by CEC (through tax on Member States), conducted by Joint Research Centre establishments at Ispra (Italy) and Karlsruhe (FRG).
- **Shared-cost action**--coordinated by Brussels, partly (50%) funded by CEC under cost-sharing contracts, conducted by research centers, universities, and industries in the Member States:
 - Decommissioning of Nuclear Installations
 - Radioactive Protection
 - Remote Handling in Hazardous Nuclear Environment - Robotics

Cooperation Programs:

Participation/support in joint project with various nations and/or other international organizations.

**DOE/CEC AGREEMENT FOR WASTE MANAGEMENT
TECHNOLOGY EXCHANGE**

Term: 10-6-82 to 10-6-92.

Scope: Characterization of waste forms; disposal in geologic formations.

Emphasis: R&D.

CEC-JRC: ISPRA

CEC Joint Research Center
Ispra Establishment
21020 Ispra (Varese)
Italy

Tel: 39-332-789-111
Fax: 39-332-789-001

Location: Northern Italy; may be reached by air travel to Milan, ground transport to Ispra, about 50 km.

WM Research/Safety Technology
Environment

H. Holtbecker
F. Geiss

Waste Management R&D: R&D in treatment and storage of radioactive waste. TRU wastes--volume reduction and actinide separation; waste disposal--risk analysis, nuclide migration, and waste form properties.

CEC-JRC: KARLSRUHE

Karlsruhe Joint Research Centre
(European Institute for
Transuranium Elements)
Postfach 2266
7500 Karlsruhe
Federal Republic of Germany

Tel: 49-7247-841
Fax: 49-7247-4046

Director

Jacobus van Geel

Location: On the site of the German Nuclear Research Center KfK in Linckenheim, near Karlsruhe.

Function: Basic research in the transuranium elements, especially plutonium, reactor fuels development.

Fuel Cycle R&D: Plutonium conversion and plutonium fuels.

Waste Management R&D: Characterization of vitreous HL waste forms and SF when considered as waste.

Safeguards: Fissile material solution analyses.

CMEA

Council for Mutual Economic Assistance
 Prospekt Kalinina 56
 121205 Moscow, USSR

MEMBER STATES

Bulgaria	Hungary	USSR
Cuba	Mongolia	Yugoslavia
Czechoslovakia	Poland	Vietnam
	Rumania	

FUNCTION

Promote economic and industrial cooperation among the Member States with centrally-controlled economies.

ORGANIZATION

- **Standing Commission on the Use of Atomic Energy for Peaceful Purposes**--reviews national waste management R&D programs and defines areas for additional cooperation.

IAEA

International Atomic Energy
 Agency
 P.O. Box 200
 1400 Vienna, Austria

Tel: 43-222-2360
 Fax: 43-1-2345-64

Director-General
 Dep. Dir.-Gen., Nuc.Energy/Safety
 Dir., Nuc. Fuel Cycle/Waste Mgmt.
 Head, Waste Management
 Waste Mgmt. U.S. Staff

Hans Blix
 Boris Semenov
 Jia-Luo Zhu
 Donald E. Saire
 Michael J. Bell
 Dave J. Squires
 43-1-2360-2663

Head, Nuc. Mtls./Fuel Cycle Tech.
 Dep. Dir.-Gen., Safeguards
 Dep. Dir.-Gen., Tech. Cooperation
 Dep. Dir.-Gen., Research/Isotopes
 Dep. Dir.-Gen., Administration

Norubu Oi
 Jon Jennekens
 bin Muslim Noramly
 Suco Machi
 William J. Dirks

IAEA (contd)**MEMBER STATES**

112 nations (U.N. members, including the U.S.).

FUNCTION

Develop the peaceful use of atomic energy: safeguards, nuclear safety and standards, information exchange, and technical cooperation and assistance, ensuring that provided assistance is not used to further any military purpose. Establish/administer safeguards for nuclear materials against diversion from its intended use in civilian nuclear programs; establish/adopt health and safety standards.

Intergovernmental organization, established 1957, directed by a Board of Governors (composed of representatives from 34 member states) and a General Conference (consisting of the entire membership).

WASTE MANAGEMENT ACTIVITIES

- Collection, preparation, review and dissemination of technical and scientific information in the areas of:
 - handling, treatment, storage, and conditioning of waste, including uranium mill tailings
 - decontamination and decommissioning of nuclear facilities
 - disposal of waste
 - assessment of the radiological and environmental consequences of waste disposal
 - management of spent radiation sources.
- Development of internationally acceptable guidelines, standards, and codes of practice for use by national authorities.
- Protection of the environment by fulfilling responsibilities under international conventions.
- Promotion and sponsorship of research work and development of data and technology.

IAEA (contd)

- Technical cooperation, assistance, and training to Member States upon request including:
 - Waste Management Advisory Program (WAMAP).
 - International peer review (WATRP) to developed Member States.

U.S. Mission to IAEA (UNVIE)
Obersteingasse 11
1190 Vienna
Austria

Tel: 43-222-36-3152
Fax: 43-1-364-1585

Nuclear Energy, WM

Dr. Maurice Katz

ICRP

International Commission
on Radiological Protection
Clifton Avenue
Sutton, Surrey SM2 5PU
United Kingdom

Tel: 44-1-642-4680
Fax:

Chairman, Main Commission
Scientific Secretary

Dr. D. Beninson
Dr. Hyton Smith

FUNCTION

Provide principles of radiation protection as a basis for each country to use in establishing technical codes of practice.

OECD

Organisation for Economic
Co-Operation and Development
2, Rue André-Pascal
F-75775 Paris Cedex 16
France

Tel: 33-1-45-24-82-00
Fax: 33-1-45-24-85-00

Secretary General
Dep. Secretary General
Dep. Secretary General

Jean Claude Paye
Robert A. Cornell
Pierre Vinde

U.S. OECD Mission
19 rue Franqueville
75016 Paris, France

Tel: 33-1-45-24-74-77
Fax: 33-1-45-24-74-80

DOE Representative

Peter Paul Jodoin
33-1-45-24-74-24

OECD/NEA

OECD Nuclear Energy Agency
38 Boulevard Suchet
75016 Paris, France

Tel: 33-1-45-24-82-00
Fax: 33-1-45-24-96-24

Director General

Kunihiko Uematsu
33-1-45-24-96-60

Deputy Director General

Pierre Strohl
33-1-45-24-96-50

Deputy Dir., Safety/Regulation

Klaus Stadie
33-1-45-24-96-54

Radiation Protection/Waste Mgmt.

Jean-Pierre Olivier
33-1-45-24-96-95

Deputy Dir., Science/Info Proc.

Johnny Rosen
33-1-45-24-96-62

NEA Data Bank
Bâtiment 445
91191 Gif-sur-Yvette Cedex
France

Tel: 33-1-69-08-49-12
Fax: 33-1-69-41-39-65

OECD/NEA (contd)**MEMBER STATES**

Australia	France	Japan	Sweden
Austria	Germany/FR	Luxembourg	Switzerland
Belgium	Greece	Netherlands	Turkey
Canada	Iceland	Norway	United Kingdom
Denmark	Ireland	Portugal	United States
Finland	Italy	Spain	

FUNCTION

Promote orderly development of peaceful uses of nuclear energy through cooperation among Member States. Initiate, encourage, and coordinate cooperative work in the following areas: reactor and nuclear fuel cycle studies, radiation protection and waste management, nuclear safety, regulatory matters, and nuclear data collection.

ACTIVITIES

- Workshops, technical meetings, symposia, and publications.
- Joint R&D programs.
- Data Bank.

U.S. PARTICIPATION IN WASTE MANAGEMENT ACTIVITIES

- Radioactive Waste Management Committee (RWMC)
Established in 1975. Composed of senior experts and government representatives from Member Countries, responsible for national policy, regulation, and program development/implementation. Information exchange and discussion forum on waste management policy, regulatory, technical and scientific issues. Participation of CEC and IAEA.
- **Performance Assessment Advisory Group (PAAG):**
Initiated in 1985 to provide a broad forum for discussion of performance assessment and to advise the RWMC on technical aspects of system performance assessments.

OECD/NEA (contd)RWMC (contd)

- **Coordinating Group on Site Evaluation and Design of Experiments for Radioactive Waste Disposal (SEDE):** Established in 1990, after disbanding the Advisory Group on In-Situ Research and Investigations for Geological Disposal (ISAG).
- **Probabilistic System Assessment Group (PSAG):** Initiated in 1985, it provides a broad forum for discussion and development of probabilistic safety assessment codes, sponsors code intercomparison exercises (PSAG), and reports to the RWMC on the technical aspects of such codes.
- **Joint Technical Committee of the Stripa Project (Stripa Mine test program)**
Participants: Canada, Finland, Japan, Sweden, Switzerland, United Kingdom, United States.
Term: 05-01-80 to 01-01-87 for Phases 1 & 2; 07-01-86 to 12-31-91 for Phase 3.
Scope: In-situ investigations in fractured hard rock in Sweden.
- **Liaison Committee for Co-operative Program on Decommissioning**
Participants: Belgium, Canada, France, Germany, Italy, Japan, Spain, Sweden, United Kingdom, United States.
Term: 1990-1995 (Phase 2).
Scope: Exchange of scientific and technical information concerning nuclear installation decommissioning projects.
- **Joint Technical Committee of the Alligator Rivers Analogue Project**
Participants: Australia, Japan, Sweden, United Kingdom, United States.
Term: 09-01-87 to 09-01-92.
Scope: Research on natural analogues in uranium ore bodies in Australia for long-term prediction of radionuclide transport.

OECD/NEA (contd)

- Committee on Radiation Protection and Public Health (CRPPH)
 - Exec. Group: **Coordinated Research and Environmental Surveillance Programme (CRESP)** related to sea disposal of radioactive waste.
Participants: Belgium, Canada, Denmark, France, FRG, Italy, Japan, Netherlands, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States, IAEA. IMO is an associate member.
Term: 1981-1990.
Scope: Investigations into the oceanographic and biological characteristics of the northeast Atlantic disposal site and related scientific work. Extended to cover land-based discharges as of 1987.
- Committee for Tech./Econ. Studies on Nuclear Energy Development and Fuel Cycle (NDC, previously FCC)
 - Assess, review and evaluate technical and economic implications related to the nuclear fuel cycle.
Participants: Open to NEA members, IEA, IAEA, CEC.
Term: 10-26-77 - unspecified
Scope: Provide governments and scientific communities with competent and reliable information, based on a very wide field of expertise and matured in international debate, to assist in policy discussions.

NEA ORGANIZATION

Director General
Kunihiko Uematsu

Dep. Dir. General
Pierre Strohl

--Legal Affairs
P. Reyners

--Safety and Regulation
Klaus Stadie

Committees

- CRPPH - Radiation Protection/Public Health
- RWMC - Radioactive Waste Management
- CSNI - Safety of Nuclear Installations

--Radiation Protection/Waste Mgmt

Jean-Pierre Olivier
Oswaldo Ilari
Bertrand Ruegger
Christer Wiktorsson

--Nuclear Safety
G. Donald McPherson

--Nuclear Development
G. Stevens

- NDC - Committee for Tech./Econ. Studies
on Nucl. Ener. Devel. and Fuel Cycle (FCC)

--Science and Information Processing
J. Rosen

| -- (Data Bank)

- NEACRP - Reactor Physics
- NEANDC - Nuclear Data

NUCLEAR SOCIETIES**AUSTRALIA**

Australian Nuclear Association
P.O. Box 445
Sutherland, N.S.W. 2232
Australia

Tel: 61-2-528-8529
Fax: 61-2-543-9263

BELGIUM

Forum Nucléaire Belge (ASBL)
Avenue Lloyd George 7
1050 Bruxelles
Belgium

Tel: 32-2-645-25-21
Fax: 32-2-645-25-20

Belgian Nuclear Society (BNS)
Ravensteinstreet 3
1000 Brussels
Belgium

Tel: 32-2-513-97-00

CANADA

Canadian Nuclear Association (CNA)
111 Elizabeth Street
Toronto, Ontario M5G 1P7
Canada

Tel: 416-977-6152
Fax: 416-979-8356

Canadian Nuclear Society (CNS)
111 Elizabeth Street
Toronto, Ontario M5G 1P7
Canada

Tel: 416-977-7620
Fax: 416-979-8356

CHINA/PR

Chinese Nuclear Society (CNS)
P.O. Box 2125
Beijing 100822
China

Tel: 86-1-7188
Fax: 86-1-2393

DENMARK

Danish Nuclear Society (DKS)
Vester Farimagsgade 31
1606 Copenhagen V
Denmark

Tel: 45-33-15-65-65
Fax: 45-33-93-71-71

EUROPE

European Nuclear Society (ENS)
P.O. Box 5032
3001 Berne
Switzerland

Tel: 41-31-21-61-11
Fax: 41-31-22-92-03

Forum Atomique Europeen (FORATOM)
22 Buckingham Gate
London SW1E 6LB
United Kingdom

Tel: 44-1-828--116
Fax: 44-1-828-0110

FINLAND

Finnish Nuclear Society (ATS)
Suomen Atomiteknillinen Seura-
Atomtekniska Sällskapet i Finland r.y.
c/o Technical Research Centre of
Finland Nuclear Eng. Laboratory
P.O. Box 169
00181 Helsinki 18
Finland

Tel: 358-0-648-931
Fax: 358-0-603-626

FRANCE

Forum Atomique Français
48 Rue de la Procession
75715 Paris
France

Tel: 33-1-45-67-07-70
Fax: 33-1-40-65-92-29

Section Française de l'ANS
c/o Framatome
Tour Fiat, Cedex 16
92084 Paris la Défense
France

Tel: 33-1-47-96-04-78
Fax:

FRANCE (contd)

Société Française d'Énergie
Nucléaire (SFEN)
48 Rue de la Procession
75724 Paris
France

Tel: 33-1-45-67-07-70
Fax: 33-1-40-65-92-29

World Association of Nuclear Operators
(WANO)
35 Avenue de Friedland
75008 Paris
France

Tel: 33-1-40-42-30-78
Fax: 33-1-40-42-92-77

GERMANY

Deutsches Atomforum e.V. (DAfF)
Heussallee 10
5300 Bonn
Federal Republic of Germany

Tel: 49-228-507-0
Fax: 49-228-507-219

Kerntechnische Gesellschaft e.V.
(KTG)
Heussallee 10
5300 Bonn
Federal Republic of Germany

Tel: 49-228-507-259
Fax: 49-228-507-219

GREECE

Hellenic Nuclear Society
NRCPS/Demokritos
15310 Aghia Paraskevi
Attiki, Greece

Tel: 30-1-651-3111
Fax: 30-1-651-9180

ITALY

ANS Sezione Locale Italiana
c/o Ansaldo S.p.A.
Pianna Carignano 2
16128 Genoa
Italy

Tel: 39-10-28551
Fax:
Tlx: 216596 ansald i

ITALY (contd)

Forum Italiano dell'Energia
Nucleare (FIEN)
Palazzo Taverna
Via di Monte Giordano 36
00186 Rome
Italy

Tel: 39-6-689-309
Tlx: 610183

Società Nucleare Italiana (SNI)
c/o FIEN
Via Paisiello 26-28
00198 Rome
Italy

JAPAN

Atomic Energy Society of Japan (AESJ)
1-1-13, Shimbashi
Minato-ku, Tokyo 105
Japan

Tel: 81-3-508-1261
Fax: 81-3-581-6128

Japan Atomic Industrial
Forum (JAIF)
6th Floor, Toshin Bldg.
1-1-13, Shimbashi
Minato-ku, Tokyo 105
Japan

Tel: 81-3-508-2411
Fax: 81-3-508-2094

World Association of Nuclear
Operators (WANO)
c/o Komae Institute
Central Research Institute of
Electric Power Industry
2-11-1 Iwato-Kita
Komae-shi, Tokyo
Japan

Tel: 81-3-480-4809
Tlx: 2422382

SOUTH KOREA

Korea Atomic Industrial
Yeouuido P.O. Box 1021
Seoul 150-610, Korea

Forum, Inc. (KAIF)
Tel: 82-2-785-2570
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**ORGANIZATIONS, FACILITIES,
TECHNICAL, AND OTHER TERMS**

GLOSSARY

ORGANIZATIONS, FACILITIES,

TECHNICAL AND OTHER TERMS

ORGANIZATIONS AND FACILITIES

	<u>Page</u>
<i>A</i>	
ADA	Acid digestion plant SZ-5
AEA	Atomic Energy Authority UK-7
AEA/D&R	AEA Decommissioning & Radwaste UK-7
AEA/E&E	AEA Environment & Energy UK-8
AEA/FS	AEA Fuel Services UK-8
AEA/IT	AEA Industrial Technology UK-10
AEA/S&R	AEA Safety & Reliability UK-10
AEA/RS	AEA Reactor Services UK-10
AEB	Atomic Energy Bureau JA-8
 KS-4
AEC	Atomic Energy Commission IN-5
 JA-8
 KS-4
 SF3
AEC	Atomic Energy Council TW-2
AECB	Atomic Energy Control Board CA-6
AECL	Atomic Energy of Canada Limited CA-6
AERB	Atomic Energy Regulation Board IN-5
AESJ	Atomic Energy Society of Japan INTL-15
AGHFC	Alpha-Gamma Hot-cell Facility US-13
AGIP	Nuclear fuel company IT-2
AMOS	Waste treatment/interim storage project . . SW-9
ANDRA	Agence Nationale pour la Gestion des Déchets Radioactifs FR-7
ANL	Argonne National Laboratory US-13
ANRE	Agency of Natural Resources & Energy . . JA-17
ANS	American Nuclear Society INTL-18
ANSTO	Australian Nuclear Science and Technology Organization AS-2
ANU	Australian National University AS-4
APM	Reprocessing plant FR-11
ARAP	Alligator Rivers Analogue Project AS-1
ASBL	Forum Nucléaire Belge INTL-12
ASSE	Salt dome repository GE-15
ATS	Finnish Nuclear Society INTL-13
AVH	Ateliers de Vitrification de La Hague FR-6
AVM	Ateliers de Vitrification de Marcoule FR-14
AWRE	Atomic Weapons Research Establishment . . UK-11

B		
B205	Reprocessing facility	UK-14
BAM	Bundesanstalt für Materialforschung und -prüfung	GE-8
BARC	Bhabha Atomic Research Centre	IN-4
BEATE	Reprocessing facility	GE-18
BEL	British Engineering Ltd.	UK-12
BES	Waste materials studies	US-16
BEW	Bundesamt für Energiewirtschaft	SZ-3
BFS	Bundesamt für Strahlenschutz	GE-8
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe	GE-9
BGS	British Geological Survey	UK-11
BITF	Borehole Instrumentation Test Facility	CA-8
BMFT	Bundesministerium für Forschung und Technologie	GE-10
BMU	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit	GE-10
BNES	British Nuclear Energy Society	INTL-17
BNF	British Nuclear Forum	INTL-17
BNFL	British Nuclear Fuels plc	UK-12
BNL	Brookhaven National Laboratory	US-14
BNS	Belgian Nuclear Society	INTL-12
BRE	Building Research Establishment	UK-16
BRGM	Bureau de Recherches Géologiques et Minières	FR-8
C		
CAMECO	Canadian Mining & Energy Corp.	CA-10
CANMET	Canadian Center for Mineral & Energy Technology	CA-11
Casaccia	ENEA nuclear research center	IT-3
CDTN	Centro de Desenvolvimento de Tecnologia Nuclear de Nuclebras	BR-3
CEA	Commissariat à l'Énergie Atomique	FR-8
CEC	Commission of the European Communities	INTL-1
CECE	Combined Electrolysis Catalytic Exchange System	US-17
Cedra	Société coopérative nationale pour l'entreposage de déchets radioactifs	SZ-4
CEN	Nuclear research center	FR-9

CEN-CA	Centre d'Études Nucléaires de Cadarache	FR-9
CEN-FaR	Centre d'Études Nucléaires de Fontenay-aux-Roses	FR-10
CEN-G	Centre d'Études Nucléaires de Grenoble	FR-10
CEN-VRH	Centre d'Études Nucléaires de la Vallée du Rhône	FR-10
CEN-S	Centre d'Études Nucléaires de Saclay . . .	FR-11
CEN/SCK	Centre d'Études de l'Énergie Nucléaire/ Studiecentrum voor Kernenergie	BE-5
CHALMERS	Chalmers Technical University	SW-4
CIEMAT	Centro de Investigaciones Energeticas, Medio Ambientales y Tecnologicas	SP-3
Cisra	Società cooperativa nazionale per l'immagazzinamento di scorie radioattive	SZ-4
CIPE	Interministerial Council for Economic Planning	IT-2
CLAB	Central storage for spent fuel	SW-6
CLIMAX	Spent fuel test facility	US-16
CMEA	Council for Mutual Economic Assistance	INTL-4
CNA	Canadian Nuclear Association	INTL-12
CNEA	Comision Nacional de Energia Atomica . .	AR-2
CNNC	China National Nuclear Corporation	CH-3
CNEC	China Nuclear Energy Corporation	CH-2
CNEIC	Chinese Nuclear Energy Industry Corporation	CH-3
CNEN	Comissão Nacional de Energia Nuclear . .	BR-3
CNS	Canadian Nuclear Society	INTL-12
CNS	Chinese Nuclear Society	INTL-12
CNS	Council for Nuclear Safety	S-F4
CNS	Center for Nuclear Studies	PK-3
COGEMA	Compagnie Generale des Matières Nucléaires	FR-12
COMMOX	COGEMA subsidiary	FR-4
COMURHEX	Uranium conversion company	FR-4
COVRA	Centrale Organisatie Voor Radioactief Afval	NL-2
CPF	Chemical Processing Facility	JA-22
CRÉSP	Coordinated Research and Environmental Surveillance Program (NEA)	INTL-10
CRIEPI	Central Research Institute of Electric Power Industry	JA-8
CRL	Chalk River Laboratories	CA-7

CRPPH	Committee on Radiation Protection and Public Health (NEA)	INTL-11
CSN	Consejo de Seguridad Nuclear	SP-3
CSNI	Committee, Safety of Nuclear Installations	INTL-11
CSPN	Superior Council for Nuclear Policy	BR-3

D

DAE	Department of Atomic Energy	IN-5
DAM	Direction des Applications Militaires	FR-15
DAiF	Deutsches Atomforum e.V.	INTL-14
DBE	Deutsche Gesellschaft zum Bau und Betrieb von Endlagern für Abfallstoffe mbH	GE-11
DEN	Department of Energy	UK-5
DES	Department of Education and Science	UK-5
DISP	Directorate for Nuclear Safety and Health Protection	IT-2
DKS	Danish Nuclear Society	INTL-13
DOE	Department of Energy	US-7
DoE	Department of the Environment	UK-16
DOI	Department of Interior	US-4
DOT	Department of Transportation	US-4
DP	DOE-Defense Programs	US-3
Drigg	Waste disposal facility	UK-14
DWPF	Defense Waste Processing Facility	US-22
DWK	Deutsche Gesellschaft für Wiederaufarbeitung von Kernbrennstoffen mbH	GE-12

E

EARP	Enhanced Actinide Removal Plant	UK-15
EBES	Belgian utility	BE-8
EBR-II	Experimental Breeder Reactor No. 2	US-13
ECN	Stichting Energieonderzoek Centrum Nederland	NL-3
EdF	Electricité de France	FR-44
EDF	Engineering Demonstration Facility	JA-19
EEC	European Economic Community	INTL-1
Electrobas	Construction/operation company	BR-2
EM	DOE Environmental Restoration & Waste Management	US-4
EMR	Energy, Mines and Resources	CA-10

EMSL	Environmental and Molecular Sciences Laboratory	US-11
ENEA	Energia Nucleare e Delle Energie Alternative	IT-2
ENEL	Ente Nazionale per l'Energia Elettrica	IT-4
ENI	Ente Nazionale Idrocarburi	IT-2
ENRESA	Empresa Nacional de Residuos Radioactivos	SP-4
ENS	European Nuclear Society	INTL-13
ENUSA	Empresa Nacional del Uranio S.A.	SP-4
EP-1, 2	Waste treatment facilities	UK-15
EPA	Environmental Protection Agency	US-26
EPB	Electric Power Bureau	KS-4
EPRI	Electric Power Research Institute	US-26
ERS	Effluent Recovery System	US-17
ESKOM	South African company	SF-4
ETEC	Energy Technology & Engineering Cntr	US-20
ETF	Engineering Test Facility	JA-19
EUREX	Fuel reprocessing pilot plant	IT-3
Eurobitum	Bituminization plant	BE-4
EURODIF	Commercial enrichment company	FR-4
Eurowatt	Solvent treatment hot pilot plant	BE-4
Euro-wetcomb	Acid digestion hot pilot plant	BE-5
Ezeiza	Argentine atomic center	AR-3

F

FBFC	Société Franco-Belge de Fabrication de Combustibles (Belgium and France)	BE-7 FR-15
FCP	Fuel Cycle Plant	US-24
FEPC	Federation of Electric Power Companies	JA-3
FFTF	Fast Flux Test Facility	US-24
FIEN	Forum Italiano dell'Energia Nucleare	INTL-15
FIPS	Closed HLLW vitrification facility	GE-16
FLK	Radioactive slagging incinerator	BE-6
FMEF	Fuels Materials Examination Facility	US-24
FN	Fabbricazioni Nuclear	IT-2
EO.	DOE Field/Operations offices	US-4
FORATOM	Forum Atomique Europeen	INTL-13
FRAGEMA	COGEMA subsidiary	FR-4
FRG	Federal Republic of Germany	GE-1
FURNAS	Regional subsidiary	BR-2
FUSRAP	Remedial action program	US-13

G		
GA	General Atomics	US-15
GIRIO	Govt. Indus. Research Inst., Osaka	JA-9
GNS	Gesellschaft für Nuklear-Service mbH	GE-12
Gorleben	Repository site	GE-9
Gouriqua	Research site	SF-2
GPA	Governmental and Public Affairs	US-6
GRS	Gesellschaft für Reaktorsicherheit mbH.	GE-14
GSC	Geological Survey of Canada	CA-11
GSF/IfT	Gesellschaft für Strahlen- und Umweltfor- schung mbH/Institut für Tieflagerung	GE-14

H		
HADES	Underground research laboratory	BE-6
HERMES	Head-End Research Facility on Mockup Engineering Scale	BE-5
HFEF	Hot Fuel Examination Facility	US-13
HISS	Hydrogen Isotope Separation System	US-17
HITACHI	Hitachi, Ltd	JA-9
HMIP	H.M. Inspectorate of Pollution	UK-5
HQ	DOE-Headquarters	US-3
HSE	Health and Safety Executive	UK-5
HTA/HBK	HTGR fuel cycle project	GE-16
HTF	Hydrostatic Test Facility	CA-9

I		
IAE	Institute of Atomic Energy	CH-3
IAEA	International Atomic Energy Agency	INTL-4
ICPP	Idaho Chemical Processing Plant	US-24
ICRP	International Commission on Radiological Protection	INTL-6
ICT	Institute of Chemical Technology	GE-16
IE	DOE-Intl. Affairs/Energy Emergencies	US-4
IEN	Instituto de Engenharia Nuclear	BR-4
IFTF	Immobilized Fuel Test Facility	CA-9
IGCAR	Indira Ghandi Centre for Atomic Research	IN-5
IHI	Ishikawajima-Harima Heavy Industries	JA-10
IMO	Intl. Maritime Organization	INTL-10
INB	Industrias Nucleares do Brasil	BR-3
INE	Institute for Nucl. Waste Technology	GE-17
INE	Institution of for Nucl. Engineers	INTL-17
INEL	Idaho National Engineering Laboratory	US-15

INER	Institute of Nuclear Energy Research	TW-2
INET	Institute of Nuclear Energy Technology . .	CH-4
INFL	International Nuclear Fuels	UK-12
INTERCOM	Belgian utility	BE-8
IOS	Institute of Oceanographic Sciences	UK-17
IPEN	Instituto de Pesquisas Energeticas e Nucleares	BR-4
IPSN	CEA-Institut de Protection et de Sûreté Nucléaire	FR-8
IRCh	Institute for Radiochemistry	GE-17
IRD	Instituto de Radioproteção e Dosimetria .	BR-5
IRUS	Intrusion Resistant Underground Structure	CA-7
IRW	Institute of Reactor Materials	GE-16
ISAG	In-Situ Research/Investigations for Geologic Disposal Advisory Group . . .	INTL-9
ISF	Interim Storage Facility	IN-7
IST	Improved Sand Trench	CA-7
IVO	Imatran Voima Oy	FI-3

J

JAERI	Japan Atomic Energy Research Institute .	JA-10
JAIF	Japan Atomic Industrial Forum	INTL-15
JET	Joint European Torus	UK-9
JGC	JGC Corporation	JA-12
JNFI	Japan Nuclear Fuel Industries Company . .	JA-13
JNFS	Japan Nuclear Fuel Service Co., Ltd. . . .	JA-14
JPDR	Japan Power Demonstration Reactor	JA-7
JRC	Joint Research Center (CEC)	INTL-3

K

KAERI	Korea Atomic Energy Research Institute	KS-5
KAIF	Korea Atomic Industrial Forum	INTL-16
KAIST	Korea Advanced Institute of Science/Tech .	KS-5
KALPAKKAM	Fuel reprocessing plant	IN-6
KANUPP	Karachi Nuclear Power Plant	PK-3
KEMA	N.V. Tot Keuring van Electrotechnische Materialen Arnhem	NL-4
KEMAKTA	Kemakta Konsult AB	SW-4
KEPCO	Korea Electric Power Corporation	KS-6
KEWA	Kernbrennstoff Wiederaufar- beitungstechnik GmbH	GE-15

KFA	Kernforschungsanlage Jülich	GE-16
KfK	Kernforschungszentrum Karlsruhe	GE-17
KIER	Korea Institute of Energy and Resources	KS-5
KNFC	Korea Nuclear Fuel Co., Ltd	KS-7
KNS	Korean Nuclear Society	INTL-16
KOBE	Kobe Steel, Ltd.	JA-14
KOLAR	Waste disposal research station	IN-6
Konrad	Iron mine repository	GE-9
KOPEC	Korea Power Engineering Co., Inc.	KS-7
KPA-STORE	Spent nuclear fuel storage facility	FI-5
KRF	Krypton recovery pilot plant	JA-20
KTG	Kerntechnische Gesellschaft e.V.	INTL-14
KTH	Royal Institute of Technology	SW-4

L

LA HAGUE	COGEMA, Centre de la Hague	FR-12
LANL	Los Alamos National Laboratory	US-16
LBRMF	Large Block Radionuclide Migr. Facility	CA-10
LLNL	Lawrence Livermore National Lab	US-16

M

MAFF	Ministry of Agriculture, Fish. and Food	UK-17
MAPS	Madras Atomic Power Station	IN-6
MER	Ministry of Energy and Resources	KS-7
MERL	Mechanical Engineering Research Laboratory	JA-14
MIO	Materials Integration Office	US-9
MITI	Ministry of Intl. Trade & Industry	JA-15
MMC	Mitsubishi Metal Corporation	JA-15
MOD	Ministry of Defense	UK-5
MOFA	Ministry of Foreign Affairs	JA-16
MOST	Ministry of Science and Technology	KS-8
MRS	Monitored Retrievable Storage	US-2
MTR	Materials Test Reactor	US-15

N

Nagra	Nationale Genossenschaft für die Lagerung Radioaktiver Abfälle	SZ-4
NCS	Nuclear Science Center	IN-7
NDC	NEA Technical/Economic study	INTL-11
NE	DOE-Nuclear Energy	US-4
NEA	Nuclear Energy Agency (OECD)	INTL-7
NEACRP	NEA-Committee on Reactor Physics	INTL-11

NEANDC	NEA-Nuclear Data Committee	INTL-11
NEC	National Energy Council	SF-2
NERC	National Environment Research Council	UK-5
NERSA	Groupement Centrale Nucléaire Européene à Neutrons Rapides	FR-4
NFC	Nuclear Fuel Complex	IN-7
NII	Nuclear Installations Inspectorate	UK-17
NIREX	UK Nirex Ltd.	UK-18
NIRAS	Nationale Instelling voor Radioactief Afval en Splijtstoffen	BE-7
NIRS	National Inst. of Radiological Sciences	JA-16
NMSS	Nuclear Material Safety and Safeguards	US-6
NNSA	National Nuclear Safety Administration	CH-4
NNWSI	Nevada Nucl. Waste Storage Investigation	US-16
NRC	Nuclear Regulatory Commission	US-27
NRPB	National Radiological Protection Board	UK-18
NRR	Nuclear Reactor Regulation	US-6
NSB	National Safety Board	JA-16
NSC	Nuclear Safety Commission	JA-17
NTS	Nevada Test Site	US-16
NUCLECO	Italian company	IT-4
NUKEM	Nuclear fuel services company	GE-19
NUMATEC	COGEMA Inc. subsidiary	FR-12
NWPA	Nuclear Waste Policy Act	US-2
NWPAA	Nucl. Waste Policy Amendments Act	US-2
O		
OARAI	JAERI-Oarai research establishment	JA-11
OARAI	PNC-Oarai engineering center	JA-18
OCRWM	Office of Civilian Radioactive Waste Management	US-17
OECD	Organisation for Economic Cooperation and Development	INTL-7
OH	Ontario Hydro	CA-11
OMRE	Experimental/research reactor	US-15
ONDRAF	Organisme National de Déchets Radioactifs et des Matières Fissiles	BE-7
OPLA	National research program	NL-2
ORNL	Oak Ridge National Laboratory	US-17
P		
PAAG	Performance Assessment Advisory Group	INTL-8

PAEC	Pakistan Atomic Energy Commission	PK-2
PAMELA	Vitrification pilot plant	BE-4
	GE-21
PARR-1, 2	Research reactor	PK-3
PASS	Performance Assessment Scientific Support	US-19
PASSAT	Filter test facility	GE-18
Pelindaba	National Nuclear Research Ctr	SF-2
PEV	Prototype vitrification facility	FR-11
PFR	Reprocessing plant	UK-9
PINSTECH	Institute of Science/Technology	PK-2
PIVER	Hot pilot plant - vitrification	FR-11
PIVER II	HLW vitrification facility	FR-15
PKA	Pilot fuel conditioning plant	GE-13
PKS	Quality assurance project	GE-16
PNC	Power Reactor and Nuclear Fuel Development Corporation	JA-17
PNL	Pacific Northwest Laboratory	US-19
PREPP	Processing Experimental Pilot Plant	US-15
PREFRE	Fuel reprocessing plant	IN-8
PSAG	Probabilistic System Assessment Group (NEA)	INTL-9
PSI	Paul Scherrer Institute	SZ-4
PSENTT	Professional Section of ETAN for Nuclear Technique and Technology . .	INTL-19
PWTF	Pu-contaminated Waste Treatment Facility	JA-20
PWSF	Pu-contaminated Waste Storage Facility	JA-20
R		
R7	Vitrification plant	FR-13
RES	Nuclear Regulatory Research	US-6
RFP	Rocky Flats Plant	US-20
RIVM	Rijksinstituut voor Volksgezondheid en Milieuhygiene	NL-5
RLWTF	Radioactive Liquid Waste Treatment Facility	US-13
RSK	Reaktor Sicherheitskommission	GE-6
RTP	Repository Technology Program	US-9
RW	DOE-Office of Civilian Radioactive Waste Mgmt	US-3

RWMC	Radioactive Waste Management Center . .	JA-21
RWOS	Radioactive Waste Operations Site	CA-12
RWMAC	Rad. Waste Management Advisory Committee	UK-5
RWMC	Rad. Waste Mgmt. Committee (NEA) . .	INTL-8
RWMC	Radioactive Waste Mgmt. Complex	US-15
S		
SAFO	Swedish Atomic Forum	INTL-16
SAIC	Science Applications Int'l Corp.	US-21
Saluggia	ENEA nuclear research center	IT-2
SBH	Siemens Brennelementewerk Hanau	GE-19
SEDE	Site Evaluation and Design of Experiments for Radioactive Waste Disposal (NEA)	INTL-9
SFEN	Société Française d'Énergie Nucléaire .	INTL-14
SFMP	Surplus Facilities Management Program .	US-13
SFR	Swedish Final Repository	SW-6
SGAB	Sveriges Geologiska AB	SW-5
SGN	Société Générale pour les Techniques Nouvelles	FR-16
SICN	COGEMA subsidiary	FR-4
SKB	Svensk Kärnbränslehantering AB	SW-5
SKI	Statens Kärnkraftinspektion	SW-8
SKN	Statens Kärnbränsle Nämnd	SW-8
SMC	Specific Manufacturing Capabilities	US-10
SNE	Sociedad Nuclear Española	INTL-16
SNI	Belgian utility	BE-8
SNI	Società Nucleare Italiana	INTL-15
SNL	Sandia National Laboratories	US-21
SPD	Sodium Process Demonstration Facility .	US-13
SRL	Savannah River Laboratory	US-22
SRP	Savannah River Plant	US-21
SRS	Savannah River Site	US-22
SSI	Statens Straalskyddsinstitut	SW-8
SSK	Strahlenschutzkommission	GE-6
SSSF	Solid Storage Surveillance Facility	IN-8
ST	Sistemic Technologies	IT-5
STA	Science and Technology Agency	JA-22
STE3	Liquid waste treatment facility	FR-13
STEM	Simulation Test Facility for Environmental Radionuclide Migration .	JA-12
STMI	Nuclear services company	FR-4

STRIPA	NEA project	SW-7
		INTL-9
STUDSVIK	Studsvik Energiteknik AB	SW-9
STUK	Finnish Center for Radiation and Nuclear Safety	FI-4
SVA	Schweizerische Vereinigung für Atomenergie	INTL-17
SWEPP	Stored Waste Examination Pilot Plant	US-15
SYNATOM	Belgian company	BE-8

T

T7	Vitrification plant	FR-13
TAIPOWER	Taiwan Power Company	TW-3
TAN	Test Area North	US-15
TAPS	Tarapur Atomic Power Station	IN-7
Tarapur	Atomic power station	IN-7
TECHNI-		
CATOME	Nuclear fuel cycle services company	FR-4
TEKO	Cold semi-works facility	GE-21
THORP	Thermal Oxide Reprocessing Plant	UK-14
TMI	Three Mile Island Reactor	US-15
TN	Transnucléaire	FR-17
TOKAI	JAERI-Tokai research establishment	JA-11
TOKAI	PNC-Tokai Works	JA-18
TPO	Transportation Program Office	US-9
TRANS-		
NUCLÉAIRE	Nuclear transport company	FR-4
TREAT	Transient Reactor Test Facility	US-13
Trisaia	ENEA nuclear fuel services company	IT-3
Trombay	Fuel reprocessing plant	IN-4
TRUEX	TRU waste technology	US-13
TUM	Technische Universität München	GE-20
TVF	Tokai Vitrification Facility	JA-21
TVO	Tollisuuden Voima Oy	FI-4

U

UKAEA	UK Atomic Energy Agency	UK-3
UNERG	Belgian utility	BE-8
UNVIE	U.S. Mission to IAEA	INTL-6
UP1	Fuel reprocessing plant	FR-14
UP2	Fuel reprocessing plant	FR-13
UP2-800	Fuel reprocessing plant	FR-13
UP3	Fuel reprocessing plant	FR-13

URENCO	Uranium enrichment consortium	NL-1
URL	Underground Research Laboratory	CA-9
	SZ-4
USGS	U.S. Geological Survey	US-29
USSI	COGEMA subsidiary	FR-4
USSR	Union of Soviet Socialists Republic	UR-1
V		
Vaalputs	LLW disposal facility	SF-2
Valindaba	U enrichment and conversion plants	SF-2
VLJ	LLW/ILW repository	FI-5
VTT	Technical Research Center of Finland	FI-5
W		
WAK	Wiederaufarbeitungsanlage Karlsruhe Betriebsgesellschaft mbH	GE-20
WANO	World Association of Nuclear Operators	UR-2 INTL-15, 18
WASTEF	Glove box and hot cell facilities	JA-12
WCF	Waste Calcining Facility	US-24
WDF	Waste Dismantling Facility	JA-18
WEC	Westinghouse Electric Company	US-25
WERF	Waste Environmental Reduction Facility	US-15
WHC	Westinghouse Hanford Company	US-23
WINCO	Westinghouse Idaho National Company	US-24
WIP	Waste Immobilization Plant	IN-4
WIPP	Waste Isolation Pilot Plant	US-25
WL	Whitshell Laboratories	CA-8
WRAP	Waste Receiving and Processing	US-11
WTC	Waste Treatment Center	CA-7
WVNS	West Valley Nuclear Services	US-25
WVRF	Waste Volume Reduction Facility	CA-12
Y		
YMPO	Yucca Mountain Project Office	US-8
YMSCP	Yucca Mountain Site Characterization Project	US-16
Z		
ZFK-DE	Waste treatment project	GE-16
ZPPR	Zero Power Plutonium Reactor	US-13
ZWILAG	Zwischenlager Würenlingen AG	SZ-5

TECHNICAL AND OTHER TERMS

(A)	Acting
/a	per annum
AFR	Away-From-Reactor
AGR	Advanced gas-cooled reactor
AR	At-Reactor
ATR	Advanced Thermal Reactor
BWR	Boiling water reactor
CAD	Computer aided design
CAM	Computer aided manufacturing
CANDU	Canadian deuterium uranium reactor
CEO	Chief Executive Officer
CIP	Cold Isostatic Pressing
COB	Chairman of the Board
COO	Chief Operating Officer
CTC	Computer training center
/d	per day
D&D	Decontamination and Decommissioning
DOG	Dissolver Off-Gas
FBR	Fast breeder reactor
FBTR	Fast Breeder Test Reactor
FRP	Fuel Reprocessing Plant
GCHWR	Gas-cooled, heavy water moderated reactor
GCR	Gas-cooled, graphite moderated reactor
GSP	Gel-supported precipitation
GWd	GigaWatt day
GWe	10 ⁹ watts of electricity (1000 MWe)
/h	per hour
HAO	Head-end oxide
HAWC	High Acid Waste Content
HEPA	High Efficiency Particulate Absolute
HLLW	High-Level Liquid Waste
HLW	High-Level Waste
HIP	Hot Isostatic Pressing
HTGR	High-temperature, gas-cooled reactor

HTR	High-Temperature Reactor
HWLWR	Heavy Water moderated, Light Water cooled Reactor (same as LWCHW)
HWR	Heavy-water reactor
ILW	Intermediate-Level Waste
kg/h	kilograms per hour
kgHM	kilograms Heavy Metal
kgU	kilograms Uranium
kPa	kiloPascal
kW	kiloWatt
l/h	liters per hour
LEU	Low Enriched Uranium
LGR	Light-water cooled, graphite moderated reactor
LHGW	Low Heat Generating Waste
LLLW	Low-Level Liquid Waste
LLW	Low-Level Waste
LMFBR	Liquid Metal Fast Breeder Reactor
LWCHW	Light-water-cooled heavy-water-moderated reactor (same as HWLWR)
LWR	Light Water Reactor
m	meter
MEV	Million Electron Volts
MLW	Medium-Level Waste (same as intermediate-level)
MOX	Mixed (plutonium/uranium) oxide
MTR	Materials Test Reactor
MTIHM	Metric Tons Initial Heavy Metal
MTU	Mega Tons Uranium
MW	MegaWatts
MWd/t	MegaWatt days per ton
MWe	MegaWatts electric
MWt	MegaWatts thermal
NPT	Non-Proliferation Treaty
PFR	Prototype Fast Reactor
PHWR	Pressurized heavy water reactor
PLWR	Pressurized Light Water Reactor
Pu	Plutonium
PUREX	Pu/U redox extraction process
PWR	Pressurized water reactor

QUAD	10 ¹⁵ BTU
R&D	Research and Development
SBR	Fast breeder reactor (european acronym)
SF	Spent fuel
SS	Stainless Steel
SWU	Separative Work (U enrichment)
SYNROC	Synthetic rock (for waste immobilization)
t	Metric tons
Th/U	Thorium/Uranium
tHM	Metric tons Heavy Metal
THTR	Thorium High-Temperature Reactor
TRU	Transuranic
tU	Metric tons Uranium
TWh	TeraWatt hour (million megawatt hours)
U	Uranium
UF ₆	Uranium hexafluoride
UO ₂	Uranium dioxide
VOG	Vessel Off-Gas