International Nuclear Fuel Cycle Fact Book

I. W. Leigh

May 1992

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

**Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute**

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INTERNATIONAL NUCLEAR
FUEL CYCLE FACT BOOK

I. W. Leigh

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under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Richland, Washington 99352

MASTER

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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 exists for a ready source of information concerning foreign fuel cycle programs, facilities, and personnel. This Fact Book has been 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; and proceedings of conferences and workshops. The data listed typically do not reflect any 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 of the Fact Book, limit the listed information to data primarily pertaining to the nuclear fuel cycle.

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 contents 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.

International Program Support Office
Pacific Northwest Laboratory
P.O. Box 999
Richland, WA 99352
Tel: 509-375-6552
Fax: 509-375-6417

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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 on 23 countries, including the U.S., four multi-national agencies, and 21 nuclear societies.

The Fact Book is organized as follows:

- **National summaries**--a section for each country which summarizes nuclear policy, describes organizational relationships, and provides addresses and names of key personnel and information on facilities.
- **International agencies**--a section for each of the international agencies which has significant fuel cycle involvement and a listing of nuclear societies.
- **Glossary**--a list of abbreviations/acronyms of organizations, facilities, technical and other terms.

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 U.S. to foreign countries, complete telephone numbers are listed, including country and city codes. Outside the U.S., 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 U.S., 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. Regional holidays are not included though they may, no doubt, 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 circled and some of the smaller towns are listed to assist as a reference when consulting a large-scale map.

PASSPORT/VISA

Requirements listed are those applicable to U.S. citizens.

SOURCES

Electric power capacity and production figures given for some countries were obtained from Energy Balances of OECD Countries 1980-1989, OECD/International Energy Agency, Paris, 1991, and Nuclear Energy Data, OECD/Nuclear Energy Agency, Paris, 1991.

Nuclear power capacity figures were obtained from NUKEM Market Report, 12/91, NUKEM GmbH, Alzenau, Germany.

Reactor Mix figures were obtained from "World List of Nuclear Power Plants as of 12/91", Nuclear News, 2/92.

TIME

The hours listed are the standard time difference between the country and Washington, D.C. A specific reference area/town is identified if more than one time zone exists in a given country. Please note, the stated time difference may be affected by applicable daylight saving time. Also, in some countries (where the seasons are reversed) the standard time period is listed instead of the time during which daylight saving time is effective.

VISITS TO U.S. DOE FACILITIES

Foreign visitors to U.S. DOE facilities must complete and submit a form LA-473 (OMB 1910-2100) "Request for Foreign National Unclassified Visit or Assignment" to the DOE facility they wish to visit, 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.

NATIONAL SUMMARIES

ARGENTINA

ARGENTINA

MAJOR PUBLIC HOLIDAYS (1992)

Jan 1	New Year	Jun 24	Flag Day
Jan 6	Epiphany	Jul 9	Independence Day
Mar 1-3	Carnival	Aug 15	Assumption
Apr 16	Holy Thursday	Aug 17	Gen. San Martin
Apr 17	Good Friday	Oct 12	Columbus Day
May 1	Labor Day	Nov 1	All Saints
May 25	Revolution Anniv.	Dec 8	Immaculate Conception
May 30	Corpus Christi	Dec 25	Christmas
Jun 10	Sovereignty		

TIME

Standard Time Washington D.C. (Buenos Aires)

+ 2 hours

Standard Time Period:

03/01 - 10/23/92

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S. 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. \$ = .99 Peso

per Wall Street Journal, 01/31/92. 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. EMBASSY - BUENOS AIRES

American Embassy
4300 Colombia
1425 Buenos Aires
Argentina

Tel: 54-1-774-7611
Fax: 54-1-775-4205

Science Counselor

Paul Maxwell

Population	1990	32 million
------------	------	------------

ENERGY

Electric Power Capacity	1990	12.7 GWe
		7% nuclear

Electric Power Production	1990	66 TWh
		~45% hydro/geoth.
		~35% oil/coal
		20% 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.

Nuclear Power Capacity	1991	0.9 GWe
	1995	1.6 GWe
	2000	1.6 GWe

Reactor Mix	1991	HWR	2 (1974/84)
			1 (1996)

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 SF Arisings (HWR)	1990	1,900 tU
	2000	5,800 tU

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 Milestones

- Ezeiza reprocessing pilot plant (hot startup) 1994
- HLW geologic repository (Patagonia, area of Gastre) 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 nuclear 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: 54-1-701-2431

President

Manuel A. Mondino

EZEIZA ATOMIC CENTRE

Ezeiza Atomic Center
1802 Buenos Aires, Argentina

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

Regulatory Authority,
SF Storage/Reprocessing
Radioactive Waste Mgmt.

Elias Palacios
Eduardo Santos
Dr. Jaime Palissa Campá

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 (1992)

Jan 1	New Year	Apr 25	ANZAC Day
Jan 28	Australia Day	Jun 8	Queen's Birthday
Apr 17	Good Friday	Oct 7	Labor Day
Apr 20	Easter Monday	Dec 25	Christmas

TIME

Standard Time Washington D.C. (New South Wales) + 15 hours
Standard Time Period: 03/01 - 10/31/92

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S.; 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. \$ = 1.34 Australian Dollar
per Wall Street Journal, 01/31/92. 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

AUSTRALIA

AUSTRALIA

MAJOR PUBLIC HOLIDAYS (1992)

Jan 1	New Year	Apr 25	ANZAC Day
Jan 28	Australia Day	Jun 8	Queen's Birthday
Apr 17	Good Friday	Oct 7	Labor Day
Apr 20	Easter Monday	Dec 25	Christmas

TIME

Standard Time Washington D.C. (New South Wales) + 15 hours
Standard Time Period: 03/01 - 10/31/92

PASSPORT/VISA

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CURRENCY EXCHANGE RATE

1 U.S. \$ = 1.34 Australian Dollar
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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

Population	1989	16.8 million
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ENERGY

Electric Power Capacity	1989	35.0 GWe
	1990	35.5 GWe
	1995	38.7 GWe
	2000	41.1 GWe

Electric Power Production	1989	147.1 TWn
		78% coal
		10% hydro
		10% 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. Memoranda of Understanding, covering SYNROC R&D, signed with China and the USSR/China.

Bilateral safeguards agreements (controlled use of Australian-derived uranium) with Japan, Republic of Korea, Philippines, U.S., Canada, U.K., France, Switzerland, Sweden, Finland, Egypt, USSR/CIS, and Euratom (EC).

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

ORGANISATION

- **ANSTO—Australian Nuclear Science and Technology Organisation and Lucas Heights Research Laboratory**

ANSTO - LUCAS HEIGHTS

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

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

Location: Approx. 30 km SW of Sydney (taxi from Kingsford Smith International Airport).

**Executive Director
Chairman
General Manager, Scientific
Environmental Science**

**Dr. David J. Cook
Prof. Richard E. Collins
Dr. Helen Garnett
Dr. Wally Zuk
Fax: 61-2-543-9260**

**Environmental Chemistry
Environmental Physics
Ore Process./Tailings Mgmt.
ARAP**

**Dr. Richard Lowson
Dr. Ian Ritchie
Dr. Des Levins
Peter Duerden
Dr. Adam Jostons
Dr. Ken U. Snowden
Tel: 61-2-543-3265
Fax: 61-2-543-7179**

**Advanced Materials
Materials Technology**

**Advanced Ceramics/SYNROC
Operations
Materials Science
Engineering
Environmental Science
Nuclear Technology**

**Dr. Keith D. Reeve
Alan Ridal
Dr. C. J. Ball
Don. J. Mercer
Dr. John Evans
George Malosh
Fax: 61-2-543-9263
Justin M. Silver**

Nuclear Services

(cont'd next page)

ANSTO - LUCAS HEIGHTS (contd)

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

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-1992.

Design Basis: 10 kg/h SYNROC; 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/²³⁵U.

Process Scale: Hundreds of grams/batch.

History: Startup, 1984. Refurbished 1991.

- **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.

(contd next page)

ANSTO - LUCAS HEIGHTS (contd)

Facilities (contd)

- **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

Hon. J. M. Macrossan

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

BELGIUM

BELGIUM

MAJOR PUBLIC HOLIDAYS (1992)

Jan 1	New Year	Aug 15	Assumption
Apr 20	Easter	Nov 1	All Saints
May 1	Labor Day	Nov 15	Dynasty Day
May 28	Ascension	Dec 25	Christmas
Jun 8	Pentecost	Dec 26	Boxing Day
Jul 22	National Day		

TIME

Standard Time Washington D.C.

+ 6 hours

Daylight Saving Time Period:

03/29 - 09/26/92

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S. 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. \$ = 32.22 Franc

per Wall Street Journal, 01/31/92. 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

Population	1989	9.7	million
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ENERGY

Electric Power Capacity	1989	14.0	GWe
		39%	nuclear
	1990	14.0	GWe
		40%	nuclear
	1995	15.0	GWe
		36%	nuclear
	2000	16.0	GWe
		34%	nuclear

Electric Power Production	1989	66.8	TWh
		62%	nuclear
		27%	coal
		8%	gas
		3%	oil
	1990	60%	nuclear
	1995	58%	nuclear
	2000	51%	nuclear

NUCLEAR POWER

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

Nuclear Power Capacity	1991	5.5	GWe
	1995	5.5	GWe
	2000	5.5	GWe

Reactor Mix	1991	PWR	7 (1975-85)
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INDUSTRIAL FUEL CYCLE

Policy: Well-rounded capability—uranium enrichment (share in Eurodif); MOX and UO_2 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 SF Arisings (LWR)	1990	1,290 tU
	2000	3,000 tU

Major Milestones

- Selection/characterization of site for LLW disposal facility 1990-94
- Storage facility for waste from Belgian fuel reprocessed abroad 1993
- Safety assessment/feasibility report for demonstration of HLW disposal 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 on technology information exchange.

Member of EC, IAEA, OECD/NEA; partnership in Eurodif uranium enrichment plant (France); Belgian URL at Mol is cosponsored by CEC.

ORGANIZATION

BELGONUCLEAIRE

Belgonucleaire S.A.
Avenue Ariane 2-4
1200 Brussels, Belgium

Tel: 32-2-774-0511
Fax: 32-2-774-0547

General Director

G. Cornet

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

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

Facilities

- 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
Operations
Decommissioning
Safety

J. Claes
Paul Laryckx
L. Teunckens
J. P. Minon

Activities: Maintenance/dismantling of ex-Eurochemic facilities; medium-level waste conditioning; interim waste storage; operation of CEN/SCK waste treatment facility; with WAK/FRG, joint operation of PAMILA pilot plant (Mol) which vitrified liquid HLW and is now closed down (D&D status).

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.
- **Eurovalit** (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** HLW Vitrification Plant (built by FRO [see under WAK in GE Section] and operated by WAK/Belgoprocess team now shut down, in process of being dismantled)

(cont'd next page)

BELGOPROCESS (cont'd)

Facilities (cont'd)

- 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, 1962; now shut down.

CEN/SCK (Nuclear Energy Research Center)

Centre d'Étude de l'Énergie
Nucéaire/Studiecentrum
voor Kernenergie

Laboratory of the CEN/SCK

Boeretang 200
2400 Mol, Belgium

Tel: 32-14-33-2111
Fax: 32-14-31-8936

Chairman of the Board
General Manager
Geological Disposal Research

Prof. R. Van Gern
Carl M. Malbrain
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.

(cont'd next page)

CEN/SCK (contd)**Facilities**

- **HERMES Pilot Plant (Head-End Research facility on Mockup Engineering Scale)**
Mission: Develop head-end treatment technology for reprocessing of LWR fuels.
Design Basis: Chop-leach; silver zeolite and cryogenic treatment of off-gas.
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 selected non-combustible 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 t/h liquid LLW or 100 kg/h dried sludge.
History: Startup, 1964 (liquids), 1970 (solids).

(contd next page)

CEN/SCK (contd)• **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, 36
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****Chairman, Board of Directors****Chair., Perm. Tech. Committee****General Manager****M. Poncelet****F. Deconinck****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: 32-2-505-0711
Fax: 32-2-513-10-76

Chairman, Board of Directors
Managing Director
General Manager
Fuel Reprocessing Service

F. Aerts
J. Laurant
Pierre Goldschmidt
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 (1992)

Jan 1	New Year	Sep 7	Independence
Mar 1-3	Carnival	Oct 12	N.S. Aparecida
Apr 17	Good Friday	Nov 2	All Souls
Apr 21	Labor Day	Nov 15	Republic Proclamation
Jun 18	Corpus Christi	Dec 25	Christmas

TIME

Standard Time Washington D.C. (Brasilia)

+ 2 hours

Standard Time Period:

03/01 - 10/23/92

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S.; 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. \$ = 1320.00 Cruzeiros (Cz\$)

per Wall Street Journal, 01/31/92. 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

Population	1990	150 million
------------	------	-------------

ENERGY

Electric Power Capacity	1988	49 GWe
		1% nuclear

Electric Power Production	1990	210 TWh
		~92% hydro
		~7% thermal
		1% 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 Capacity	1991	0.6 GWe
	1995	0.6 GWe
	2000	1.9 GWe

Reactor Mix	1991	PWR	1 (1984)
			2 (1997/01)

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

INDUSTRIAL FUEL CYCLE

Policy: Development of full commercial capability for closed fuel cycle—U mining and milling; conversion of U_3O_8 to UF_6 ; enrichment; UO_2 fuel fabrication; fuel reprocessing.

Waste Management Strategy: Not yet defined.

Cumulative SF Arisings (LWR)	1990	48 tU
	1995	162 tU
	2000	~412 tU

Demonstration/Production Activities

- Uranium mining and milling: 300 tU₃O₈/a—in operation.
- U₃O₈ to UF₆ conversion: (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 Analogue Studies - Pocos de Caldas Project
Joint study by Sweden, Switzerland, U.K., and U.S. of migration of radionuclides from uranium ore deposits in Brazil.

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 Elétricas 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.**
- **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****Belo Horizonte, MG, Brazil****Tel: 55-31-441-5422****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

Rio de Janeiro, RJ, Brazil

Tel: 55-21-295-2232

Fax: 55-21-295-6098

President

Director, Nuclear Safety

Head, Waste Disposal

Rex Nazare Alves

Luiz Arrieta

H. R. Franzen

Functions: Regulation, financing and licensing of nuclear reactors, fuel cycle facilities and radiation-emitting installations; promotion of nuclear technology R&D and technology transfer to private industry; promotion and 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, Brazil

Tel: 55-21-280-3113

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 Universitaria

Caixa Postal 11.049

Pinheiros, CEP 01000,

São Paulo, Brazil

Tel: 55-11-211-6011

Fax:

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.

Facilities

- U_3O_8 - UF_6 conversion plant at Iperó (90 tU/a)
- Small experimental gas centrifuge (uranium enrichment)
- Low-power PWR reactor
- SF reprocessing laboratory
- 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****A. 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.

Facilities

- Brazilian Secondary Standards Dosimetry Laboratory

CANADA

CANADA

MAJOR PUBLIC HOLIDAYS (1992)

Jan 1	New Year	Sep 7	Labor Day
Apr 17	Good Friday	Oct 12	Thanksgiving
Apr 20	Easter Monday	Nov 11	Remembrance Day
May 18	Victoria Day	Dec 25	Christmas
Jul 1	Canada Day	Dec 26	Boxing Day

TIME

Time zones correspond to those in the United States.

Daylight Saving Time period:

04/26 - 10/25/92

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. \$ = 1.17 Canadian Dollar

per Wall Street Journal, 01/31/92. 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 three-digit area code plus seven-digit local number.

U.S. EMBASSY - OTTAWA

American Embassy
100 Wellington Street
Ottawa K1P 5T1
Canada

Tel: 613-238-5335
Fax: 613-238-5720

Science Counselor

Thomas J. Wajda

Population	1990	27.2	million
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ENERGY

Electric Power Capacity	1990	104.1	GWe
		13%	nuclear
	1995	115.8	GWe
		14%	nuclear
	2000	145.2	GWe
		11%	nuclear
Electric Power Production	1990	465.0	TWh
		63%	hydro/geoth.
		17%	coal
		15%	nuclear
		3%	oil
		2%	gas
	1995	19%	nuclear
	2000	17%	nuclear

NUCLEAR POWER

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

Nuclear Power Capacity	1991	13.7	GWe
	1995	15.4	GWe
	2000	15.4	GWe

Reactor Mix	1991	PHWR	19 (1971-90)
			3 (1992-93)

INDUSTRIAL FUEL CYCLE

Policy: Interim storage of used fuel for decades, pending an environmental assessment and review of a concept for the disposal of nuclear fuel waste (review process of concept has started).

Waste Management Strategy: Geologic disposal of nuclear fuel waste and spent CANDU fuel in a crystalline rock repository. Disposal of LLW in engineered, shallow-ground facility.

Cumulative Used Fuel (PHWR)	1990	14,300 tU
	2000	27,000 tU

Major Milestone

- Public hearings by review panel on Nuclear Fuel Waste Management Disposal Concept (AECL-prepared EIS) 1994

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

DOE/AECL Subsidiary Agreement # 2

Term: 09-30-91 to 09-29-96

Scope: Joint project to study the preparation/packaging of radioactive wastes/disposal in geologic formation. Fundamental materials investigations; in-situ stress determination; SF dissolution model development; large block tracer test; laboratory and field tests of in-situ hydrochemical tool; Cigar lake analogue study; actinide/fission product geochemistry; performance assessment technology exchange; multiple-well hydraulic test and field tracer test development.

Member of IAEA and OECD/NEA - Exchange agreements with the following agencies and countries: DOE/U.S.; SKB/Sweden; UKAEA/U.K.; PNC, JAERI/Japan; KAERI/Korea; TVO, IVO/Finland; CEA, ANDRA/France; ONDRAF/Belgium; ENRESA/Spain.

ORGANIZATION

- **AECEB (Atomic Energy Control Board)**--federal agency, answers to Parliament, responsible for health/safety regulation, compliance/licensing.
- **AECL (Atomic Energy of Canada Limited)**--Crown Corporation, owned by the federal government. 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, approx. 13,000 MWe total capacity; two more, totaling 1,800 MWe, under construction; responsible for developing interim fuel storage/transport technologies.
- **HQ (Hydro Quebec)**--provincial public utility. Owns/operates Gentilly 2, a 600 MWe CANDU station.
- **NBEPSC (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, Compliance
- Atomic Energy of Canada, Limited (AECL)
 - CANDU Operations
 - Reactor Design, Engineering, Export, proprietary rights on CANDU Nuclear Steam Supply Systems
 - AECL Research (see CA-4)
- Department of Energy, Mines and Resources (EMR)
 - Geological Survey of Canada (GSC)
 - Information/Services Branch
 - Minerals/Continental Geoscience Branch
 - Sedimentary/Cordilleran Geoscience Branch
 - Geophysics/Marine Science Branch
 - Mineral/Energy Technology (MET)
- Canadian Centre for Mineral/Energy Technology (CANMET)
 - Mining Research Laboratories
 - Sudbury Laboratory
 - Elliot Lake Laboratory
 - Canadian Mining Technology Laboratory
 - Mineral Sciences Laboratories
 - Radionuclide Recovery from Thorium Mill Tailings
 - Metals Technology Laboratories

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

AECL RESEARCH

- **Whiteshell Laboratories (WL)**
 - **Environmental Sciences/Waste Management Program**
 - **Disposal Technology**
 - **Applied Geoscience**
 - **Environmental/Safety Assessment**
 - **Geotechnical Science/Engineering**
 - **Underground Research Laboratory**
 - **Environmental Technology**
 - **Environmental Science**
 - **Geochemistry Research**
 - **Fuel Waste Technology**
- **Chalk River Laboratories (CRL)**
 - **Waste Management Systems**
 - **Storage/Disposal**
 - **Waste Processing Technology**
 - **Health Sciences**
 - **Radiation Biology**
 - **Dosimetry Research**
 - **Environmental Research**
- **Head Office, Ottawa**
 - **Low-Level Radioactive Waste Management Office**
(operated by AECL Research on behalf of EMR)

AECEB

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
 Director General,
 Fuel Cycle/Materials Regulations
 Wastes/Impacts Div.
 Compliance Serv./Laboratory Div.
 Radiolotopes/Transportation Div.
 Uranium Facilities Div.
 Director, Research/Safeguards
 Safeguards/Security Div.
 Director, Analysis/Assessment
 Safety Evaluation (Analysis) Div.
 Safety Evaluation (Engineering) Div.

Dr. René J. A. Lévesque

John W. Beare
 George C. Jack
 Cait Maloney
 Ross Brown
 Tom Viglasky
 Jim Harvie
 John R. Coady
 John Waddington
 Peter Wigfull
 Kurt Asmis

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
 Director, LLW Management

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

Facilities

- Harbour Test Cell Facility - LLW 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 1J0
Canada****Tel: 613-584-3311****Fax: 613-589-4024****Health Sciences****Radiation Biology****Waste Management Systems****Director, Public Affairs****Dr. Richard V. Osborne****Dr. Norm E. Gentner****Dr. Don J. Cameron****John MacPherson****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, and solidification in bitumen.

- **IRUS (Intrusion Resistant Underground Structure)**

Mission: LLW/ILW repository consisting of prototype vault. At capacity of 2,000 m³ radwaste in drums or bales, to be covered with backfill, roofed with concrete, and mounded with earth. Waste can be retrieved from the IRUS vault until concrete cap is emplaced.

Milestone: Construction start, 1993.

- **IST (Improved Sand Trench)**

Mission: Enhanced shallow-ground concept for lowest class of LLW. Currently in conceptual design stage, scheduled for operation in 1995.

AECL-WL**AECL Research**

Whiteshell Laboratories
Pinawa, Manitoba ROE 1L0
Canada

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

Underground Research Laboratory

Tel: 204-345-8625
Fax: 204-345-8868

V.P., Environmental Sciences,

Waste Management
Disposal Technology
Applied Geoscience
Environmental/Safety Assessment
URL, Mgr.
Environmental Technology
Environmental Science
Geochemistry Research
Fuel Waste Technology
Environmental Review Office, Dir.
Government/Public Affairs Coord.

Dr. Collin J. Allan
Dr. Ken W. Dormuth
Dr. Cliff Davison
Dr. Alf Wikjord
Doug Peters
Dr. Keith Nuttal
Dr. Reto Zach
Dr. Peter Sargent
Lawrence Johnson
Heiki Tamm
Mary Greber

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; shutdown, 1987.
- **HPFR (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.
History: Hot operation, 1980; shutdown, 1985.

(contd next page)

AECL-WL (contd)• **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.

• **URL (Underground Research Laboratory)**, located about 20 km northeast of WL in the Lac du Bonnet granite batholith.

Mission: Operate facility ensuring compliance with regulatory standards and high level of safety/quality control; design and implement in-situ and laboratory experiments/engineering demonstrations to investigate relevant issues.

Design Basis: Access shaft and ventilation raise to 430 m depth 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 is in progress on the 240- and 420-m levels and in the surrounding rock mass.

History: Underground access development complete in 1990; major experiments in solute transport, rock mass response, characterization method, and engineered sealing systems began in 1988.

• **IFTF (Immobilized Fuel Test Facility)**

Mission: Test the effects of water, heat, and pressure on used fuels, container materials, buffer, and rock in the presence of a radiation field.

Design Basis: A high-level radiation source is used in heated concrete canisters to provide a gamma radiation source. Pressure vessels adjacent to the source contain the material to be studied.

Adjacent "warm cells" are available for experiments involving moderate levels of radiation.

History: First canister loaded, August 1984.

ABCL-WL (contd)

- **LBMMF (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; 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 (tracer dye), ^{131}I , and ^{137}Cs , has been completed and results published. Second experiment, using uranine, ^3H , ^{85}Sr , ^{90}Sr , ^{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 , has been carried out for PNC, Japan; colloid migration experiments are under way; migration experiments in fractures with simple, uniform geometries are planned in cooperation with LANL (U.S).

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

Electricity Branch, Dir. General
Radioactive Waste/Radiation, Dir.

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: 613-995-4194

Fax: 613-996-9673

Policy Planning/Services, Dir. Gen.

J. Ferron

Mineral Technology

Dr. J. T. Ubb

Waste Mgmt., Elliot Lake

T. Mottahed

Mining Research Laboratory

J. E. Udd

EMR-GBC**EMR-Geological Survey of Canada**

601 Booth Street

Ottawa, Ontario K1A 0E8

Canada

Tel: 613-992-5910

Fax: 613-995-3082

Assistant Deputy Minister

Dr. E. A. Babcock

Chief Scientist

Dr. Robin Riddihough

OH

Ontario Hydro

700 University Avenue

Toronto, Ontario M5G 1X6

Canada

Tel: 416-592-5782

Fax: 416-592-4485

Fuels Division, Director

D. Smith

Design/Development Div., Director

Hugh S. Irvine

Nuclear Engineering

Don W. Souther

Radioactive Mtl. Management

Peter Stevens-Gullie

Radioactive Mtl. Storage

P. J. Armstrong

(contd next page)

OH (contd)**RWOS (Radioactive Waste Operations Site)****Bruce Nuclear Power Development****Box 1540****Tiverton, Ontario, NOG 2T0****Tel: 519-368-7031****ext. 3383****Canada****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.
- **LLW Storage Facilities**
 - 5 above-ground warehouse-type buildings; waste with a radiation field of $<1\text{ R/h}$ at 30 cm is stored in stackable containers with a storage capacity of 8000 m^3 each.
 - 15 trenches; reinforced concrete structures ~3 m below ground; designed for waste with radiation fields $>1\text{ R/h}$ but $<15\text{ R/h}$; storage capacity ranges from 360 to 680 m^3 each.
 - 15 quadricells; above-ground, reinforced concrete structures; sufficient shielding for storage of waste with radiation fields of $>15\text{ R/h}$, e.g., ion exchange resins, filters and reactor core components; storage capacity is 24 m^3 each.

(contd next page)

OH (cont'd)

- 304 in-ground containers; welded steel liners concreted into augered holes; designed for storage of waste with radiation fields $> 15 \text{ R/h}$, e.g., ion exchange resins, filters and reactor core components; storage capacity ranges from 1 to 18 m^3 .
- Paved area 4700 m^2 for storage of contaminated tooling in 6.1-m-long marine cargo containers stacked two high.
- 23 in-ground containers with varying diameters/depths containing scrap heat exchangers; augered holes with crushed limestone backfill.

CHINA (People's Republic of China)

CHINA

MAJOR PUBLIC HOLIDAYS (1992)

Jan 1-2	New Year
Feb 4-5	Spring Festival
Mar 6	Women's Day
May 1	Labor Day
Jun 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:

04/12 - 09/12/92

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S.; 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. \$ = 5.45 Renminbi

per Wall Street Journal, 01/31/92. 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
People's Republic of China

Tel: 86-1-532-3831
Fax: 86-1-532-3178

Science Attaché

Andres Onate

Population	1991	1.2 billion
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ENERGY

Electric Power Capacity	1991	149 GWe
-------------------------	------	---------

Electric Power Production	1991	675 TWh
		~70% coal
		~12% oil
		~18% hydro

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 Capacity	1991	0.3 GWe
	1995	2.1 GWe
	2000	2.1 GWe

Reactor Mix	1991	PWR	3 (1992-93)
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Reactor Development	BWR, HTR, FBR
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INDUSTRIAL FUEL CYCLE

Policy: 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 for 5-8 years if <1,000 tU, in transport/storage casks if >1,000 tU; interim storage, reprocessing, vitrification, and disposal all to be at one site, to be selected in the Gobi Desert; final disposal in deep geologic formation; 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
 - **CIAE (China 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.

BINE

Beijing Institute of
Nuclear Engineering
P.O. Box 840
Beijing 100840, PRC

Tel: 86-1-842-3311
Fax: 86-1-841-5067

Director
Director, Nuclear Waste Mgmt.

Lin Guoming
Liji Yang

CNEIC

China Nuclear Energy
Industry Corporation
P.O. Box 2139
Beijing 100045, PRC

Tel: 86-1-801-2395
Fax: 86-1-801-2393

President

Zhang Xindu

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 100622, PRC

Tel: 86-1-801-2211
Fax: 86-1-801-2211
ext.3267

General Manager
Nuclear Fuel Department
Waste Management

Jiang Xingxiong
Wang Xiaoli
Hualing Zheng

GENERAL MACHINERY RESEARCH INSTITUTE

General Machinery Research
Institute
Shu Shan Road, Hefei City
Province Anhui, PRC

Tel: 86-3-1337
Fax:

Contact

Schou Gang

CIAE

China Institute of Atomic Energy
Academia Sinica
P.O. Box 275
Beijing 102413, PRC

Tel: 86-1-868-221
Fax:

Director
Honorary Director

Sun Zixun
Dai Guanzheng

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 102201, PRC

Tel: 86-1-283-731
Fax: 86-1-256-4177

Director
Dep. Dir., Radiochem. Technology

Prof. Wang Dazhong
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 Sanlibe Rd.
Beijing 10862, PRC

Tel: 86-1-801-2630
Fax: 86-1-801-2637

Director General
Chief Engineer
Dep. Chief Engineer
Dep. Div. Chief
Dep. Div. Chief

Zhou Ping
Lin Chengge
Dong Bonian
Xu Wanjin
Li Zhiyu

Function: Responsible for standards/regulations, construction permits/ operating licenses; monitoring plant operations; joint safety research with other nations.

NFC

**Nuclear Fuel Complex
P.O. Box 345
Chengdu 61002, PRC**

**Tel:
Fax:**

**Nuclear Fuel Complex
P.O. Box 508
Lanzhou 732850, PRC**

**Tel: 86-567-2545
Fax:**

NFF

**Nuclear Fuel Fabrication
Yibin
Sichuan, PRC**

**Tel:
Fax:**

**Function: Production of fuel for the 300 MWe PWR being built at
Qinshan (near Shanghai); facility to be upgraded to supply the two
900 MWe PWRs under construction at Daya Bay (near Hong Kong).**

FINLAND

FINLAND

MAJOR PUBLIC HOLIDAYS (1992)

Jan	1	New Year
Apr	17	Good Friday
Apr	19-20	Easter
May	1	May Day
May	28	Ascension
Jun	20	Midsummer Eve
Dec	6	Independence Day
Dec	24-26	Christmas

TIME

Standard Time Washington D.C.

+ 7 hours

Daylight Saving Time Period:

03/29 - 09/26/92

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S. 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. \$ = 4.395 Markka (FIM)

per Wall Street Journal, 01/31/92. 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
Itäainen Puistotie 14A
00140 Helsinki
Finland

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

Population	1989	5.0	million
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ENERGY

Electric Power Capacity	1989	12.1	GWe
		19%	nuclear
	1990	12.6	GWe
		18%	nuclear
	1995	13.5	GWe
		17%	nuclear
	2000	16.0	GWe
		14%	nuclear

Electric Power Production	1989	53.7	TWh
		36%	nuclear
		24%	hydro/geoth.
		17%	coal
		13%	solids
		7%	gas
		3%	oil
	1990	35%	nuclear
	1995	24%	nuclear
	2000	18%	nuclear

NUCLEAR POWER

Nuclear Power Capacity	1991	2.3	GWe
	1995	2.3	GWe
	2000	3.3	GWe

Reactor Mix	1991	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 has been returned to USSR/CIS but future disposition is uncertain).

Waste Management Strategy: Spent fuel (from TVO's power plants) will be stored for 40 years, then placed in granitic bedrock; IVO has been returning spent fuel from its Soviet-built reactors to CIS, but future returns are uncertain; operating wastes are conditioned and stored above ground at the nuclear power station sites; operating and decommissioning wastes will be disposed of in granitic bedrock.

Cumulative SF Arwings (LWR), tU

	<u>TVO</u>	<u>IVO</u>
1990	450	270
2000	880	500

Major Milestones

- Complete LLW/ILW repository (TVO) ~1997
- Complete SF repository site selection (TVO) 2000
- Complete SF repository (TVO) 2020

INTERNATIONAL RELATIONSHIPS

Member of IAEA and OECD/NEA; collaboration with Sweden, Canada, Denmark, Norway, and Switzerland in waste management studies. Purchase of fuel cycle services: uranium from Canada, Australia, Niger, China and CIS; uranium conversion/enrichment from France, Canada, CIS, and Germany, U.K., and CIS, respectively; fuel element fabrication from Sweden, Germany and CIS; disposal of spent fuel from CIS (for IVO).

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 PWRs.
- TVO (power company)--operates two Swedish-built BWRs.
- KTM (Ministry of Trade and Industry)--Energy Department, formulates energy policy, grants licenses.
- VTT (Technical Research Center)--nuclear research, including waste management R&D.
- STUK (Finnish Centre for Radiation and Nuclear Safety)--regulatory authority that 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.
- Helsinki University of Technology--basic research.

ADVISORY COMMITTEE ON NUCLEAR SAFETY

Advisory Committee on Nuclear Safety

Kumpulantie 7
00520 Helsinki
Finland

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

Chairman
Secretary-General

Prof. Jari Forsén
Hannu 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
Betoniintiehenkaja 4
02150 Espoo, Finland

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

Director
Nuclear Waste Disposal

Prof. Velikko Lappalainen
Pauvo Vuorela

Function: Geological studies for waste disposal in granitic bedrock.

IVO (National Power Company)

Imatran Voima Oy (IVO)
Rajatorpantie 8
01600 Vantaa, Finland

Tel: 358-0-508-1
Fax: 358-0-563-6823

Director
Director, Research
Nuclear Waste

Dr. Kalevi Numminen
Prof. Pekka Salminen
Juoni-Pekka Palmu

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

Owner: Government.

NUCLEAR ENERGY COMMISSION

Nuclear Energy Commission
Pohjoisen Mäkelininkatu 6
00130 Helsinki
Finland

Tel: 358-0-160-5222
Fax: 358-0-160-2695

Chairman
Secretary-General

Prof. Jorma Rouhi
Sakari Luomaonen

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

STUK

**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 Safety Department

Nuclear Fuel Cycle

Nuclear Waste

Prof. Antti Vuorinen

Jukka Laaksonen

Olli Vilkanen

Esko Ruokola

Functions: Regulatory enforcement and inspection authority;
research related to transport of radionuclides in biosphere.

TVO (Industrial Power Company)

Tööliseuden Voima Oy (TVO)

Annankatu 42C

00100 Helsinki, Finland

Tel: 358-0-6180-1

Fax: 358-0-6180-2570

Director

Director, Development

Nuclear Fuel

Nuclear Waste

Magnus von Bonsdorff

Arni Rastus

Ilkka Mikkola

Veijo Ryhänen

Functions: Operate two nuclear power plants (Swedish-built BWRs)
at Olkiluoto in Eurajoki, southwestern Finland; manage fuel
procurement and TVO-produced wastes.

Owners: 57% private, 43% public utilities/government-owned
companies.

Facilities

- **KPA-STORE** (Interim storage facility for spent nuclear fuel) -
located at reactor site; three pools with total capacity of 1200 tU;
construction completed November 1987.

(contd next page)

TVO (contd)

- **VLJ Repository** (Final repository for TVO's ILW/LLW) - located at reactor site; LLW and ILW packaged in metal drums/containers will be buried in two silos 70-100 m deep; ILW silo has reinforced 0.6-m thick concrete liner; capacity 8400 m³; construction completed 12/1991.

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

Teknikantie 4
02150 Espoo, Finland

Tel: 358-0-456-1
Fax: 358-0-456-5000

Director
Reactor Physics

Dr. Lasse Mattila
Ma. Riitta Kurki-
Rajamäki

Nuclear Waste Management

Dr. Seppo Vuori

R&D Activities: Reactor physics/safety. Safety analysis of final disposal in bedrock.

VTT Reactor Laboratory

Otakaari 3A
02150 Espoo, Finland

Tel: 358-0-456-1
Fax: 358-0-456-6390

Director
Nuclear Waste Management

Prof. Pekka Hiismäki
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 Electrical/Automation**Engineering Laboratory**

P.O. Box 34
02151 Espoo, Finland

Tel: 358-0-456-6400
Fax: 358-0-456-6475

(contd next page)

VTT (contd)

Director
Reliability Technology
Automation Technology

Prof. Björn Wahlström
Dr. Kari Laakso
Pentti Haapanen

R&D Activities: Automation engineering, including control room design; man-machine interfaces and operator support systems. Safety/reliability engineering, including PSAs; raining simulators.

VTT Metals Laboratory
Kemistintie 3
02150 Espoo, Finland

Tel: 358-0-456-1
Fax: 358-0-456-7002

Director
Nuc. Fuel Mat. Research

Dr. Kari Törönen
Esa Vitikainen

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

**VTT Road, Traffic and
Geotechnical Laboratory**
Lämpömiehenkuja 2A
02150 Espoo, Finland

Tel: 358-0-456-1
Fax: 358-0-453-251

Director
Waste Disposal

Dr. Esko Kankare
Juha Kärkkäinen

R&D activities: Geophysics, groundwater chemistry/movements in bedrock, mineralogy and bedrock formation.

UNIVERSITY OF HELSINKI

University of Helsinki
Department of Radiochemistry
Unioninkatu 35
00170 Helsinki, Finland

Tel: 358-0-191-1
Fax: 358-0-191-7814

Director

Prof. T. Jaakkola

R&D Activities: Waste treatment processes, migration of radionuclides, and radiochemical analysis.

FINLAND

PNL-3594, Rev. 12

HELSINKI UNIVERSITY OF TECHNOLOGY

**Helsinki University
of Technology
Otakaari 3A
02150 Espoo, Finland**

**Tel: 358-0-451-1
Fax: 358-0-465-077**

**Nuclear Energy/
Advanced Energy Systems**

**Prof. Rainer Salonen
Tel: 358-0-451-3199
Fax: 358-0-451-3195**

FRANCE

FRANCE

MAJOR PUBLIC HOLIDAYS (1992)

Jan 1	New Year	Jul 14	Bastille Day
Apr 20	Easter Monday	Aug 15	Assumption
May 1	Labor Day	Nov 1	All Saints
May 28	Ascension	Nov 11	Veterans Day
Jun 8	Pentecost	Dec 25	Christmas

TIME

Standard Time Washington D.C.
Daylight Saving Time Period:

+ 6 hours
03/29 - 09/26/92

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S.; in addition, a visa is currently only required when traveling on an 'official' passport to France but not when 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. \$ = 5.50 Franc

per Wall Street Journal, 01/31/92. 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

Dr. Michael A. Michaud

Population	1989	56 million
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ENERGY

Electric Power Capacity	1989	100.3 GWe	
		53%	nuclear
	1990	103.2 GWe	
		54%	nuclear
	1995	103.8 GWe	
		56%	nuclear
	2000	108.2 GWe	
		59%	nuclear
Electric Power Production	1989	403.0 TWh	
		76%	nuclear
		12%	hydro/geoth.
		9%	coal
		3%	oil
		1%	gas
	1990	75%	nuclear
	1995	76%	nuclear
2000	75%	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 Capacity	1991	56.6 GWe
	1995	59.7 GWe
	2000	64.1 GWe

Reactor Mix	1991	GCR	2	(1971/72)
		PWR	52	(1967-91)
			5	(1992/97)
		LMFBR	2	(1974) ^(a)

^(a) Initial criticality for SuperPhenix in 1985, commercial start pending completion of remedial work.

INDUSTRIAL FUEL CYCLE

Policy: Maintain full domestic fuel cycle capability and 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) SF Arisings, tU	<u>1985</u> 2,900	<u>1990</u> 7,300	<u>2000</u> 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): 2,500 (1991)
- Uranium enrichment (kSWU/a)
 - Pierrelatte, gaseous diffusion: 600
 - Eurodif, gaseous diffusion: 10,800
- Fuel fabrication (tHM/a)
 - UO₂: 1,500
 - MOX: 50 (LWR fuels)
- Spent fuel reprocessing (t/a)
 - Marcoule: 400 (U metal fuels)
 - La Hague: 1,000 (UO₂ LWR fuels)

Major Milestones

- LLW disposal facility (Centre de l'Aube) 1992
- T7 vitrification plant (La Hague) 1993
- UP2-800 reprocessing plant (La Hague) 1994
- Melox (MOX fuel fabrication plant-Marcoule) 1994
- TRU disposal facility 2000
- HLW (glass) disposal facility 2010
- 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: Preparation/packaging, D&D, waste/spent fuel storage, geologic disposal, transportation requirements; 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 Nuclear Transport, Ltd. (Transnucléaire).

ORGANIZATION

- **CEA (Atomic Energy Commission)**—controls practically all nuclear R&D.

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%), FRAGEM (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.
- **ANDRA (National Waste Management Agency)**—controls long-term waste management, disposal included.
- **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).

Minister of Industry, Telecommunication and Tourism

- **ANDRA - Henri-Edme Wallard**

- **CEA CHAIRMAN - Philippe Rouvillain**

- **HIGH COMMISSIONER - Jean Tellier**

CEA OPERATIONS UNITS

- **DAM - Military Applications - Roger Baleras**
- **IPSN - Institut de Protection/de Sécurité Nucléaire -
Philippe Veaseron**
- **DSM - Direction des Sciences de la Matière -
Robert Aymar**
- **DSV - Direction des Sciences du Vivant - Michel Suscillon**
- **DRN - Direction des Réacteurs Nucléaires
Jacques Bouchard**
- **DCC - Direction du Cycle du Combustible -
Jean-Yves Barre**
- **DTA - Direction des Techniques Avancées -
Yannick d'Escatha**

RESEARCH CENTERS

- **CEN**

COGEMA

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

CEA

RESEARCH CENTERS (CEN)

- Cadarache - Gérard 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 DeCoul, Director
- Saclay - Jean Bazin, Director
 - MOX Fuel Fabrication
 - TRU Waste and LLW/ILW Treatment
 - Engineered Barriers
- Valrho - Claude Vergne, Director
 - APM - Reprocessing (Metal)
 - Fast Fuel Cycle
 - Reprocessing
 - ILW
 - TRU Waste and LLW/ILW R&D

ANDRA (National Agency for Radioactive Waste Management)

Agence Nationale pour la Gestion
des Déchets Radioactifs
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
Armand Faussat
Yves Marque

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

Four possible sites (in clay, granite, schist and salt) selected for characterization of underground HLW disposal. Site characterization moratorium during 1990; HLW disposal program under reevaluation; TPU waste disposal facility--2000; HLW glass disposal facility--2010.

Facilities

- Centre de la Manche
B.P. 808

50448 Beaumont-Hague

Tel: 33-16-33-52-78-65

Mission: Disposal of ILW and LLW; capacity: 480,000 m³ (1988: 350,000 m³ in place; full and shut down in 1992, to be closed permanently in 1994).

- Centre de l'Aube
B.P. 7

10200 Soullaines-Dhuys

Tel: 33-16-25-92-33-00

Mission: Replace La Manche site as disposal facility for ILW/LLW; located 120 miles east of Paris, in the province Aube; covers about 250 acres and will accommodate 1,000,000 m³ of ILW/LLW over a period of 30 years.

BREGM (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. Peaudecerf

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 Trillat

Function: Responsible for R&D related to all areas of the nuclear fuel cycle through activities of several operational units (scientific directorates), research centers, and wholly/partially owned industrial concerns.

CEA-IPSN (Institute for Nuclear Safety)

Institute 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

Dir., Nuc. Security Research

Dir., Safety

Safety Analysis

Dir., Safeguards

Health/Dosimetry

Environment/Installation

Research

Nuclear Materials

Philippe Vesseron

Michel Livolant

Daniel Quenlart

Christian Devillers

Annie Sugier

R. Coulon (A)

Alain L'homme

A. Chalot

G. Déan

Function: Research and development in environmental
safeguards/security.

CEA/CEN-CA (Cadarache Nuclear Research Center)

Centre d'Etudes Nucléaires
de Cadarache

B.P. 1

13108 Saint Paul Lez Durance
France

Tel: 33-42-25-24-68

Fax: 33-42-25-45-45

Director

Gérard Vial

Location: 65 km from Marseille-Marignane Airport (by car).

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

CEA/CEN-CA (cont'd)**Facilities**

- **Solid Waste Treatment Pilot Plant (Prolize, Elise)**
Mission: TRU solid waste reduction by cryogenic crushing; Pu recovery by acid leaching.
Design Capacity: Eight 100-liter drums/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

Facilities

- Waste Resin Embedding Facility

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)

WM/Reproc. Program Coord.

Jean Bazin

Jean-Yves Barré

Guy Baudin

Facilities

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

CEA/CEN-VRH (Valrho Nuclear Research Center)

Centre d'Etudes Nucléaires
de la Vallée du Rhône

B.P. 171

30205 Bagnols-sur-Cèze Cedex

Marcoule, France

Tel: 33-66-79-60-00

Fax: 33-66-79-66-17

(contd next page)

CEA/CEN-VRH (contd)

Director	Claude Vergne
Mgr., Reprocessing/HLW	Michele Viala
Deputy Mgr.	Claude Sombret 33-66-79-63-62
Manager, HLW	Jean-Pierre Moncouryoux 33-66-79-63-78
Decommissioning (DERD/VOIN)	Claude Lafaille

Facilities

- **APM (Cogema-operated demonstration reprocessing plant for FBR, MOX and high-burnup fuels)**
Mission: Develop technology for FBR, MOX and high-burnup 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.
History: Decommissioned, then dismantled in 1991.
- **PIVER II - Vitrification of HLW from APM. (Delayed)**
- **Hull Fusion Non-Radioactive Prototype - Startup, 1984.**
- **Hull Fusion Radioactive Facility in APM - Startup, 1993.**
- **PEV Prototype (full-scale, non-radioactive R7/T7 vitrification process) - Startup, 1984.**

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, Maryland 20814-3416****Tel: 301-986-8585****Fax: 301-652-5690****President, CEO****V.P.-Market Development****Michael McMurphy****Frank A. Shallo****NUMATEC, Inc.****7401 Wisconsin Ave.****Bethesda, Maryland 20814-3416****Tel: 301-986-8585****Fax: 301-652-5690****President****William Gallagher****Subsidiary of and in same location/address as Cogema, Inc.**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****(contd next page)**

COGEMA-LA HAGUE (contd)

Fuel Cycle Program: Spent fuel reprocessing and HLW vitrification. 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.

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 12/91 total HAO throughput was 3,513 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 flow-sheet, 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, 1994; R7 startup, 1989, 1,000 glass canisters poured at the end of 1991. (UP2-400 HLW backlog).

(contd next page)

COGEMA-LA HAGUE (contd)• **UP3 (Fuel Reprocessing Plant)**

Mission: Reprocess LWR fuels.

Design Basis: Cnup-leach head-end; PUREX flow-sheet; AVM vitrification process (T7 plant: identical to R7 vitrification plant).

Capacity: 800 MTU/a.

History: Startup, 09/90. Throughput of 603 t as of 12/91.

• **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, 1989. 4,452 drums as of 07/91.

COGEMA-MARCOULE

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

Location: Approx. 70 km from Marseille-Marignane Airport (by train or car), near Avignon.

Director

Reprocessing Plant

AVM Manager

Jean Charlade

Maurice Mellano

Jean-Claude

Batailles-Lannea

Facilities• **UP1 (Reprocessing Plant)**

Mission: Reprocess magnesium-clad natural uranium metal fuels from military 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.

(contd next page)

COGEMA-MARCOULE (contd)

- **AVM (Ateliers de Vitrification de Marcoule)**
Mission: Demonstrate AVM process: vitrify Marcoule UP1 wastes.
Design Basis: Rotary calciner feeding an induction- heated metallic melter; nominal 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 01/01/92, 1,521 m³ of HLW had been vitrified (1,939 canisters, including 681 t borosilicate glass).
- **Incinerator**
- **Bituminization Facility**
- **Melox: MOX fuel fabrication (120 t/a); 1994.**

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

ENSM (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

(contd next page)

ENSM (contd)

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

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 UO_2 fuels for power reactors.
Design Capacity: 600 t/a.
- **Fuel Fabrication Plant (Pierrelatte, France)**
Mission: Fabricate UO_2 fuels.
Design Capacity: 450 t/a.
- **Fuel Fabrication Plant (Dessel Belgium)**
Mission: Fabricate UO_2 fuels.
Design Capacity: 450 t/a.

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**

**Vice President
Technical Director**

**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

As of October 3, 1990, the Federal Republic of Germany (FRG) includes the former German Democratic Republic (GDR) and all of Berlin.

Since the reunification, agencies and fuel cycle activities have been restructured and organizational responsibilities reassigned; conditions continue to be in some state of flux. Thus, data on the following pages still pertain primarily to the former West Germany. Fuel cycle facts relating to the entire country, as they are made available, will be included in future issues.

The map of Germany depicts the unified geographical area.

Please note that city identification numbers (zip codes) have not yet been revamped, thus the same number may apply to two cities. Where appropriate, we have used the "O" for Ost (East) along with the number and the "D" for Deutschland (Germany); you may use "W" (for West), along with the "D" for Germany, for all other addresses given if you wish to ensure possibly speedier mail delivery.

With regard to the country code for direct dialed telephone calls to locations in the former East Germany, it may be advisable to consult your telephone company's operator. The code "37," currently used for the former East Germany, is expected to be replaced in July 1992, when code "49" will become applicable for all of Germany. However, the changeover may not be accomplished all at once and may include other changes as well for the affected numbers.

GERMANY

MAJOR PUBLIC HOLIDAYS (1992)

Jan 1	New Year	May 28	Ascension
Apr 17	Good Friday	Jun 8	Pentecost Monday
Apr 20	Easter Monday	Oct 3	Day of Unity
May 1	May Day	Dec 25	Christmas
		Dec 26	Christmas

TIME

Standard Time Washington D.C.

+ 6 hours

Daylight Saving Time Period:

03/29 - 09/26/92

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S. 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. \$ = 1.61 Mark (DM)

per Wall Street Journal, 01/31/92. 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 (however, for the former East Germany it is still 37 at this time); listed local numbers include city code.

U.S. EMBASSY - BONN

American Embassy

Deichmannsae

5300 Bonn 2

Federal Republic of Germany

Tel: 49-228-339-1

Fax: 49-228-339-2125

Science Counselor

Francis M. Kinnelly

GERMANY

PNL-3594, Rev. 12

Population	1990	79 million
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ENERGY

Electric Power Capacity	1990	118.5 GWe
		19% nuclear
	1995	121.0 GWe
		19% nuclear
	2000	126.2 GWe
		22% nuclear
Electric Power Production	1989	428.8 TWh
		51% coal
		34% nuclear
		8% oil
		4% hydro/geoth.
		2% gas
		1% solids
	1990	28% nuclear
	1995	27% nuclear
	2000	26% nuclear

NUCLEAR POWER

Nuclear Power Capacity	1991	22.5 GWe
	1995	22.5 GWe
	2000	22.5 GWe
Reactor Mix	1991	PWR: 14 (1972-89)
		BWR: 7 (1975-85)

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 future salt-dome repository; interim storage of ILW/LLW wastes; future disposal of reactor and decommissioning wastes in abandoned iron mine or salt repository.

GERMANY

PNL-3594, Rev. 12

Cumulative Spent Fuel Arisings (LWR)	1990	3,800 tU
	2000	8,950 tU
Cumulative LLW/ILW Arisings	2000	196,300 m ³ conditioned, radioactive waste with negligible heat production
Cumulative Heat-Producing Waste Arisings	2000	5,800 m ³ conditioned, radioactive waste with heat production

Industrial-Scale Activities

- Fuel fabrication capacity
 - 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 capacity
 - 1,500 t, dry storage (Gorleben).
 - 1,500 t, dry storage (Ahaus).

Major Milestones

- Acceptance of HLW from Cogema/La Hague and BNFL/Sellafield 1994
- 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 LLW/ILW storage and disposal; transportation. **Emphasis on:** Waste treatment technology (design/operation of HLW vitrification pilot plants, conditioning of LLW/TRU wastes, waste form characterization), waste package development; collaboration with in-situ tests at 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/off-gas 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
- Construct/operate radioactive waste disposal facilities
- Establish licensing requirements.

• 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 transport and 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/IT

- **Geologic Waste Disposal R&D**
- **Supporting Lab Work - Salt Properties**
- **Asse Studies**

KfK

- **LWR Fuel Cycle Waste Treatment/Packaging R&D**
- **LWR SF Management Alternatives - R&D**
- **HLW Vitrification R&D**
- **Support Work - Geological/Direct Disposal of Waste**

KFA

- **Waste Treatment**
- **Support Work - LLW/ILW Disposal, including HTGR-Fuel
Elements**

**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/Transp./Disposal of Rad. Wastes
- Supervision of State Licensing Procedures
- Nuclear Safety/Radiation Protection

RSK (Reactor Safety Commission)**SSK (Radiation Protection Commission)****BfS**

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

DBE

- Construction/Operation (Repositories)
- Gorleben and Konrad Projects
- Morsleben LLW Disposal Facility (ERAM)

LÄNDER (State Governments)

- Licensing of Nuclear Installations

NMU (Lower Saxony Ministry of Environment)

- Licensing of Final Repositories
- Gorleben and Konrad Projects
- Morsleben LLW Disposal Facility (ERAM)

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

- KEWA (DWK Subsidiary)
- WAK (DWK Subsidiary)

NUKEM - Owned by RWE

- LLW/TRU waste treatment R&D facility design
- R&D-SF 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 SF/LLW Storage Facilities
- BZA (GNS Subsidiary)
 - Operation of Ahaus SF Interim Storage Project

NCS - Nuclear Cargo Service

- Transportation of radioactive materials

SBH - 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

Federal Republic of Germany

Tel: 49-30-8104-1

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 Salzgitter 1

Federal Republic of Germany

Tel: 49-5341-188-0

Fax: 49-5341-188-188

Chief Executive

Prof. Dr. Alexander Kaul

Department

Nuclear Waste Disposal/

Transport (Braunschweig)

Tel: 49-531-592-7600

Fax: 49-531-592-7614

Director

Prof. Dr. Helmut

Röthemeyer

Mining Safety

Gert Wosnik

Dir., Project Mgmt.

Henning Rösel

Dir., Waste Disposal/Safety

Vacant

Radioactive Waste

Vacant

Geoscience

Dr. Gerhard Stier-Friedland

Radiology/Radiation Protection

Dr. Dietrich Ehrlich

System Analysis

Dr. Heinrich Illi

Dir., Transport/Storage

Prof. Dr. Wilhelm

of Radioactive Materials

Collins

(contd next page)

BfS (contd)

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

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 Braunachweig.
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, Engineering,
Geology/Geotechniques
Rock Mechanics
Engineering Seismology
Salt Mechanics
Mining Rock Mechanics
Salt Geology
Numerical Modeling
Hydrogeology
Groundwater Geophysics

Prof. Dr. Michael Langer
Prof. Dr. A. Pahl
Dr. R. Lüdelling
Dr. H. Albrecht
Dr. D. Meister
Dr. W. Jaritz
Dr. Manfred Wallner
Dr. H. Vierhuff
Dr. W. Giesel

Function: Responsible to BMWI for all geological/geotechnical aspects related to planning, construction/operation of a final repository for radioactive wastes; conduct 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. Josef Rembser
Dr. Eckhard Lübbert
Dr. Klaus Komorowski
49-228-59-3759

Waste Mgmt./D&D/Fuel

Dr. Bernd Schillert
49-228-59-3757

U Enrichment/Safeguards

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

Waste Disposal

Dr. Diethard
Lummerzheim
49-228-59-3762

Direct Disposal

Dr. Hans G. Riotte
49-228-59-3761

Geological Disposal

W. Busch
49-223-59-3764

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

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

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

Tel: 49-228-305-0
Fax: 49-228-305-2999

Minister
Dir. Gen., Nuc. Installation
Safety/Radiation Protection/
Nuclear Fuel Cycle
Dir., Nuc. Installation Safety

Prof. Dr. Klaus Töpfer
Walter Hohlefelder

Director, Radiation Protection

Dr. Gant
49-228-305-2805

Director, Fuel Cycle

Dr. von Oertzen
49-228-305-2905
Dr. Arnolf Matting
49-228-305-2950

Policy

Dr. Bröcking
49-228-305-2930

International Relations

Dr. Ch. Brient
49-228-305-2800

Fuel Supply

Arno Ehret
49-228-305-2831

Reprocessing/Conditioning

Armin Hagen
49-228-305-2821

Treatment/Storage/Transp.

Herbert Drehsvogt
49-228-305-2721

Final Repository

Dr. Manfred Blosner
49-228-305-2951

Chairman, Reactor Safety
Commission (RSK)

Prof. Dr. Kessler

Chairman, Radiation Protection
Commission (SSK)

Prof. Jacobi

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/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 Flori

Dr. Hans-Jürgen Krug

Project Gorieben, Mgr.

Wolfgang Schulz

49-5171-43-250

Project Konrad, Mgr.

Rüdiger Putzer

49-5171-43-310

Project-Related R&D, Mgr.

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 and post-operational phases; design/construction of engineered barriers.

DWK (German Fuel Reprocessing Company)

Deutsche Gesellschaft für Wiederaufarbeitung
von Kernbrennstoffen mbH

Baringstrasse 6

3000 Hannover 1

Federal Republic of Germany

Tel: 49-511-3668-0

Fax: 49-511-3668-207

Managers

Bernd Zur Nedden

Dietrich Schütz

Function: Support KEWA and WAK; resolve issues from consequences of cancellation of reprocessing plant Wackerndorf and resulting transfer of site from "nuclear" to "industrial;" plan for decommissioning/dismantling of WAK pilot-scale reprocessing plant.

ERAM (LLW Repository)

Endlager für Radioaktive
Abfälle Morsleben
Am Schacht 105
O-3241 Morsleben
Federal Republic Germany

Tel: 49-39050-8-0
Fax: 49-39050-300

Manager

Dr. Klaus Ebel
49-39050-8-200

Function: Final repository for LLW of the former East Germany,
now operated by DBE under contract to BfS.

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.

GNS (contd)**Facilities**

- **AFR Spent Fuel Storage Facilities** (Gorleben and Ahaus sites, operated by GNS subsidiaries, BLO, and BZA respectively)
Design Basis: Dry storage in CASTOR casks - 400 casks (in 600-ft x 125-ft x 62-ft high building).
Capacity: 1500 t each facility.
History: Startup of AFR at Gorleben and Ahaus has been delayed due to litigation.
- **PKA Pilot Fuel Conditioning Plant** (Gorleben)
Mission: Demonstration of SF conditioning and encapsulation 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.

**GSI/IFT (Research Center for Environmental Sciences/
Institute for Underground Disposal)**

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

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

Dir./IFT, Head/Disposal
Technology
Engineering Development
Geotechnology
Test Fields
Geophysics
Dir./IFT, Head/Disposal Safety

Prof. Dr. Klaus Kühn
49-531-8012-231

Alfred Beinlich
Manfred W. Schmidt
Tilmann Rothfuchs
Dr. Dieter Flach
Dr. Werni Brewitz
49-531-8012-239

Safety Analysis
Chemical Waste
Geochemistry
Geology/Hydrogeology
Data Processing

Dr. Richard Storck
Dr. Thomas Brasser
Dr. Hermann J. Gies
Dr. Konrad Klarr
Gert Ohme

Dir./Project Management

Dr. Rolf Stippeler
49-531-8012-220

ILW/HLW Projects
Direct Disposal Project
Asse Projects
Konrad/Gorleben Work
Test Dam Project
Long-Term Safety Projects
Administration/Infrastructure
Public Relations

Dr. Ingo Möller-Lyda
Jürgen Kunze
Vacant
Dr. Wolfgang Bode
Dr. Helmut Flock
Dr. Peter Faber
Erwin Sölter
Rainer Gömmel
Klaus Dürr

Head/Mine Operations

49-531-8012-211

Technical Planning

Helmut Kolditz

GSF/LT (contd)

Waste Management R&D: Development/testing of techniques for safe, final geologic disposal of radioactive and chemical-toxic wastes; acquisition of data for planning, construction and operation of underground repositories. Safety analyses of long-term performance 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

Volker Schauermann

Herbert Meyer

Dr. Gerd Hensel

Facilities

- **Asse 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

Baringstr. 6

3000 Hannover 1

Federal Republic of Germany

Tel: 49-511-3668-0

Fax: 49-511-3668-203

Tech./Managing Director

Ernst Robinson

49-511-3668-240

Function: Consulting/design services in 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

Federal Republic of Germany

Tel: 49-2461-61-0

Fax: 49-2461-61-5327

Director, Institute of
Chemical Technology (ICT)Prof. Dr. Erich R. Merz
49-2461-61-3114Director, Institute of
Reactor Materials (IRW)
ILW/SF/HTGR Fuel DisposalProf. Dr. H. Nickel
49-2461-61-3058Dr. Heiner Brücher
49-2461-61-6409

Waste Treatment (ZFK-DE)

Dr. S. R. Hainzovich
49-2461-61-5288

Quality Assurance (PKS)

Dr. Reinhard Odoj
49-2461-61-6190

Hot Cell Facility (GHZ)

Günter Pott
49-2461-61-3196**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.

KfK (Karlsruhe Nuclear Research Center)

Kernforschungszentrum Karlsruhe GmbH

Postfach 3649

7500 Karlsruhe 1

Federal Republic of Germany

Tel: 49-7247-82-1

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 Kroebe

Tel: 49-7247-82-2032

Fax: 49-7247-82-4315

WAK Decommissioning

Wolfgang Pfeifer

49-7247-82-4050

Program Management

Dr. Klaus-Detlef Closs

"Entsorgung" (PT E)

49-7247-82-5790

Director, Inst. for Hot Chem.

Prof. Klaus Ebert

49-7247-82-2400

Director, Institute for Nuc.

Prof. Dr. Kim

Waste Tech. (INE)

Final Disposal

Dr. R. Koester

49-7247-82-2302

Chemistry

Dr. Werner Lütze

49-7247-82-4457

Process Engineering

Dr. S. Weisenburger

49-7247-82-4288

Director, Institute for

Prof. Ache

Radiochemistry (IRCh)

49-7247-82-3200

Director, Ctrl. Eng. Dept. (IT)

Dr. Hermann Rininsland

49-7247-82-3000

Remote Handling

G. Boehme

49-7247-82-2600

(contd next page)

KfK (contd)**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.

NM: 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

(contd next page)

NMU (cont'd)

Minister
Dir., Nucl. Energy/Rad. Protection
Final Repositories

Monika Griefahn
Klaus-Dieter Becherer
Dr. Klaus-Arno Beckers
49-511-104-3550
Dr. Dietmar A. Kopp
49-511-104-3429

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

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
L. Aumüller, H. Pirk
Process Engineering
Fuel Cycle Services
Non-Destructive Testing
Environmental Technology
System Manufacturing
Solar Energy Technology

Bernd Jobst Breloer
H.W. Binzel
K. Schreiber
Dr. R. Gerhardt
Dr. P.G. Maurer
H. Wagner
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

Production Manager

Jürgen Krellmann

49-6181-58-4599

Chemistry/Waste Management

Dr. F.-W. Ledebrock

49-6181-58-4169

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

Facilities

• **Fuel Fabrication Plants**

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

VKTA (Nuclear Engineering/Analytics Company)

Verein für Kernverfahrenstechnik

und Analytik Rossendorf e.V.

Postfach 19

D 0-8051 Dresden

Federal Republic of Germany

Tel: 49-351-591-6

Fax: 49-351-360-69

(contd next page)

VKTA (contd)

General Manager	Prof. Dr. Wolf Häfele Tel: 49-351-591-2350 Fax: 49-351-361-74
Waste Treatment	Dr. Frank Schumann 49-351-591-3671
Research Reactor	Dr. W. Hieronymus 49-351-591-2272
Nuc. Analytics/Redevelopment	Dr. H. Steinkopf 49-351-591-2290
Radioactive Preparation	Dr. K. Jantsch 49-351-591-2220

Activities: Decommissioning nuclear facilities of the former Central Institute for Nuclear Research (ZfK Rossendorf): zero power reactors, RFR research reactor (10 MW), and special radioisotope production facilities; waste treatment/nuclear services; nuclear/chemical analyses; assessment of industrial/mining wastes; radioisotope production.

Facilities

- **ABUS (Waste treatment plant)**
Laboratory- and pilot-scale R&D of LLW/HLW treatment processes: volume reduction (evaporation, press compaction, solidification); conditioning, using novel (remote) handling techniques (2 hot cells). Completed in 1991, hot operation in 1996.
- **AMOR-II (Uranium recovery facility)**
Facility started operating in 1985 to develop technology for recovery of U from wastes.
- **SWA (Waste water processing/treatment plant)**
Treatment consisting of mechanical filtration, ion exchange for low-salt wastes, and evaporation for high-salt wastes, and wastes containing boric acid.
- **Radioisotope Production Facilities**

WAK (Fuel Reprocessing Company)

Wiederaufarbeitungsanlage Karlsruhe

Betriebsgesellschaft mbH

Postfach 1263

7514 Eggenstein-Leopoldshafen 2

Federal Republic of Germany

Tel: 49-7247-2881

Fax: 49-7247-4755

Location: WAK and the WAK plant are located on the site of the Karlsruhe Nuclear Research Center (WAK is a subsidiary of DWK).

Chief Executive

Dr. Walter Weinländer

49-7247-88-2142

Plant Manager

Dr. Martin Weishaupt

49-7247-88-2298

Decommissioning/Vitrification

Horst Wiese

49-7247-88-2117

Facilities

- **WAK Reprocessing Plant** (owned by KfK).

Mission: Reprocess UO_2 and MOX fuels; recover plutonium for recycle; test advanced technology.

Design Basis: Chop-leach head-end; PUREX process; capacity, 0.175 tHM/d.

History: On-line from 09/71 to early 1980, when it was shut down for dissolver replacement. Operation resumed 10/82. Total throughput to 12/90, approx. 210 tHM (130 tHM from LWR fuel). Shut down 12/31/90, decommissioning/dismantling plans in progress.

- **PAMELA Pilot Plant** (Mol, Belgium--ownership transferred to Belgoprocess in 1986; operated by WAK/Belgoprocess team)

Mission: Demonstrate ceramic melter and VITROMET production with stored Eurochemic HLLW.

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 August 1991: 910 m³ waste vitrified, 2,180 canisters filled; tanks now empty, plant in standby condition.

INDIA

INDIA

MAJOR PUBLIC HOLIDAYS (1992)

Jan	1	New Year	Aug	15	Independence Day
Jan	26	Republic Day	Aug	21	Jonashtami
Mar	17	Holi	Oct	2	Gandhi's Birthday
Apr	5-7	Ramadan Feast	Oct	5	Dussehra
May	16	Buddha Purnima	Oct	25	Festival of Lights
Jun	12-14	Sacrifice Feast	Nov	10	Guru Nanak's B'day
Jul	2	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 U.S.; 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. \$ = 25.94 Rupees

per Wall Street Journal, 01/31/92. 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 India are complete as listed, after dialing international access code: 011. Country code is 91; listed local numbers include city code.

U.S. EMBASSY - NEW DELHI

American Embassy
Shanti Path
Chanakyaपुरी
New Delhi, 110 021
India

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

Science Counselor

Dr. Peter L. Heydemann

Population	1990	819 million
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ENERGY

Electric Power Capacity	1990	70 GWe
		2.8% nuclear
	2000	100 GWe

Electric Power Production	1990	315 TWh
		~59% coal
		~33% hydro
		~6% oil
		2% nuclear
	2000	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 Capacity	1991	1.7 GWe
	1995	2.2 GWe
	2000	3.5 GWe

Reactor Mix	1991	BWR	2 (1969)
		HWR	4 (1973-89)
			10 (1991-2001)

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 mining and 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 geologic 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	1990	1,580 tU
Arnings (LWR/HWR)	2000	5,000 tU

Cumulative Waste Arnings	<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 planned
- Uranium mining and milling (t/a):

1985	130
1988	170
- UO₂ fuel fabrication (t/a):

1981	100
1984	210
2000	1,500
- Fuel reprocessing (t/a):

Trombay pilot plant	30 (1962--)
Thrapur plant	100 (1982--)
Kalpakkam plant	100 (1992/93)
- HLW vitrification: Thrapur (1985--)

Major Milestones

- Interim Storage Plant - Thrapur 1990
- Interim Storage/Waste Immobilization Plant - Kalpakkam 1993

INTERNATIONAL RELATIONSHIPS

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

India has not signed the 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

BARC

**Bhabha Atomic Research
Centre, Trombay
Bombay 400 085, India**

**Tel: 91-22-551-4910 or
-8700
Fax: 91-22-556-0750**

**Director
Director, Nuclear Safety Group
Waste Management Division
Central WM Facil., Kalpakkam
Radiol. Protection Division
Director, Chem. Engineering Group
Fuel Reproc. Division**

**Dr. P. K. Iyengar
V. N. Meckoni
M. T. Samuel
R. V. Amalraj
K. G. Vohra
B. K. Garg
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, and titanium; 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 decid, 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)

Tel: 91-22-202-2543 or
-6823

Fax: 91-22-204-8476

Chairman
Secretary

Dr. P. K. Iyengar
K. V. Mahadeva Rao

Atomic Energy Regulation Board (AERB)

Chairman

A. K. De
(Inst. of Technology)

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.

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

NFC**Nuclear Fuel Complex
Hyderabad, India****Facilities**

- **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.

Facilities

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

TAPS

Thrapur Atomic Power Station
Thrapur, Maharashtra, India

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

Facilities

- **PREFRE (Fuel Reprocessing Plant) - Thrapur**
Mission: Reprocess natural and low-enriched UO_2 fuels.
Design Basis: Chop-leach head-end; PUREX flowsheet; contact maintenance; capacity, 150 tHM/a.
History: Construction completed, 1975; hot operation, 12/82.
- **WIP (Waste Immobilization Plant)**
Mission: Vitrify Thrapur 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.

(contd next page)

TAPS (contd)

- **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 vitrified HLW from Tarapur and Trombay.
History: Completion, 1990.
- **HLW Bituminization Plant**
- **Polymerization Facility**
- **Pilot (hot cell-sized) Max Fuel Fabrication Facility**
(commissioned late 1990)

ITALY

ITALY

MAJOR PUBLIC HOLIDAYS (1992)

Jan	1	New Year
Jan	6	Epiphany
Apr	19-20	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.
Daylight Saving Time Period:

+ 6 hours
03/29 - 09/26/92

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S. 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. \$ = 1205.0 Lira
per Wall Street Journal, 01/31/92. 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

Population	1989	58.0 million
------------	------	--------------

ENERGY

Electric Power Capacity	1989	57.4 GWe
	1990	56.6 GWe
	1995	71.6 GWe
	2000	84.1 GWe

Electric Power Production	1989	207.3 TWh
		50% oil
		18% hydro
		16% coal
		16% gas

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.

INDUSTRIAL FUEL CYCLE

Waste Management Strategy: Spent fuel from previous nuclear power plant operations 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 SF Arisings	1990	342 tU LWR
		1,353 tU GCR

INTERNATIONAL RELATIONSHIPS

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

ORGANIZATION

- **ENEA** (Agency for New Technologies, Energy and Environment)--safety and regulatory; nuclear R&D (principally at Casaccia, Saluggia and Trissino).
- **DISP** (Directorate for Nuclear Safety and Health Protection)--safety inspection/control and health/environment protection.
- **ENI**--government-owned oil and energy holding company that 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** (Fabbricazioni Nucleari)--fuel fabrication/development.
- **ENEL**--state-owned power utility.

**ENEA (Agency for New
Technologies, Energy & Environment)**

Ente per le Nuove Tecnologie,
l'Energia e l'Ambiente
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

(contd next page)

ENEA (contd)

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 stored nuclear material. **Thema:** 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; decontamination and dismantling of plants and laboratories, including plutonium oxide fuel fabrication laboratory.

Owner: Government.

ENEL (National Electric Energy Agency)

Ente Nazionale per
l'Energia Elettrica
Casella Postale 386
Via Giovan Battista Martini 3
00198 Rome, Italy

Tel: 39-6-8509-1
Fax: 39-6-8509-3370
Tlx: 610518

Chairman

Franzo Viezzoli

Government agency, responsible for all electric power production.

FN**Fabricazioni Nucleari**

P.O. Box 16

15062 Bosco Marengo (AL)

Italy

Tel: 39-131-7571

Fax: 39-131-757250

Chairman

Dr. P. Venditti

Functions: Fabrication and development of special oxide nuclear fuels and special ceramic materials.

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

NUCLECO**Nucleco**

Via Anguillarese 351

00060 Rome

Italy

Tel: 39-6-3046-302

Fax: 39-6-3048-3081

Chairman

Ing. Silvio Cao

Functions: Treat and dispose of LLW/ILW from hospitals, laboratories, industrial establishments, and nuclear plants; eventual plans include decommissioning work on nuclear installations.

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

ST**S.T. Sistemi e Tecnologie
per l'Energia**

Via A. Bagnoli 34

00153 Rome

Italy

Tel: 39-6-589-4041

Fax: 39-6-589-9058

General Manager

Dr. Balestrieri

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

JAPAN

JAPAN

MAJOR PUBLIC HOLIDAYS (1992)

Jan 1	New Year	Sep 15	Respect for Aged
Jan 15	Adult's Day	Sep 23	Autumnal Equinox
Feb 11	Natn'l Foundation	Oct 10	Sports Day
Mar 20	Vernal Equinox	Nov 3	Culture Day
Apr 29	Greenery Day	Nov 23	Labor Thanksgiving
May 4	Constitution	Dec 23	Emperor's Birthday
May 5	Children's Day	Dec 29-	
		Jan 3	Govt. Off Season

TIME

Standard Time Washington D.C.

+ 14 hours

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S.; 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. \$ = 125.80 Yen

per Wall Street Journal, 01/31/92. 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

Edward M. Malloy

Tel: 81-3-4334-5500
Fax: 81-3-3224-5229

DOE Representative

Milton A. Eaton

Tel: 81-3-3224-5444/78
Fax: 81-3-3582-0496

Population	1989	124 million
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ENERGY

Electric Power Capacity	1989	161 GWe
		18% nuclear
	1990	167 GWe
		18% nuclear
	1995	195 GWe
		20% nuclear
	2000	219 GWe
		22% nuclear

Electric Power Production	1989	791 TWh
		32% oil
		23% nuclear
		19% gas
		15% coal
		11% hydro/geoth.
	1990	27% nuclear
	1995	31% nuclear
2000	35% 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 Capacity	1991	32.1 GWe
	1995	39.3 GWe
	2000	45.5 GWe

Reactor Mix	1990	GCR	1 (1966)
		BWR	21 (1970-90)
			7 (1993-97)
		PWR	19 (1970-91)
			4 (1993-97)
		HWR	1 (1979)
		FBR	1 (1993)

Reactor Development	HWR (ATR), LMFBR, HTGR
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INDUSTRIAL FUEL CYCLE

Policy: Obtain ownership of foreign uranium resources; develop complete fuel cycle capability (enrichment, reprocessing and waste treatment; buy 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 - dispose in engineered structures on shallow land facility and at sea, if politically feasible.

Cumulative SF Arisings (LWR)	1990	7,500 tU
	1995	12,400 tU

Industrial-Scale Activities (Capacity)

• Uranium mining and conversion (tUF ₆ /a):		200
• Uranium reconversion (tU/a):		1,028
• Uranium enrichment (tSWU/a):	1981	50
	1988	250
	2000	3,000
• Fuel fabrication		
- UO ₂ for LWR (tU/a):	1987	2,495
- MOX for FBR (t/a):	1988	6
- MOX for ATR (t/a):	1988	10
	1993	50
• Reprocessing (t/a):	1981	210
	2000	1,010

Major Milestones

- Tokai Vitrification Facility (PNC) - test operation start 1992
- MONJU LMFBR operation 1992
- Uranium enrichment plant operation (Rokkasho-mura) 1992
- LLW disposal facility operation (Rokkasho-mura) 1992
- Storage facility for vitrified HLW from COGEMA/BNFL 1995
- Fuel reprocessing plant (Rokkasho-mura) SF storage 1995
- reprocessing operation 1999
- Selection of demonstration site for in-situ test with HLW disposal package >2000
- FBR fuel reprocessing pilot plant operation >2000
- Startup of HLW disposal site >2000
- Experimental sea-dumping of LLW TBD

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 on 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 Research**
 - **Environmental Radioactivity**
 - **Radioactive Waste Management**
 - **Airborne Waste—Environmental Safety**

AEB

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

Tel: 81-3-3581-1686 or
81-3-3581-5271
Fax: 81-3-3592-1239

Director General
Deputy Director General
Director, Policy Div.
Dir., Power Reactor Dev. Div.
Dir., Nuclear Fuel Div.
Dir., Research/Internatl. Div.

Hiroto Ishida
Kinju Atarashi
Tetsuo Naito
Jiro Shibata
Tobichi Sakata
Takayuki Shirao

Function: Provide support to the Atomic Energy Commission (AEC).

AEC

Atomic Energy Commission
2-1 Kasumigaseki 2-chome
Chiyoda-ku, Tokyo 100
Japan

Tel: 81-3-3581-2585 or
81-3-3581-5271
Fax: 81-3-3581-5198

Chair (Minister of State
for Science/Technology)
Acting Chair

Kanzo Tanigawa
Dr. Akira Oyama

Function: Formulate national policy on nuclear energy R&D and utilization; advise Prime Minister.

CRIEPI

Central Research Institute
of Electric Power Industry
1-6-1, Ohtemachi
Chiyoda-ku, Tokyo 100, Japan

Tel: 81-3-3201-6601
Fax: 81-3-3287-2880

President

Susumu Yoda

(contd next page)

CRIEPI (contd)

Function: Provide R&D support for utilities.

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

Energy and Environmental
Research Laboratory for
Energy and Electric Power

2-11-1, Iwato-kita
Komae-shi, Tokyo 201, Japan

Tel: 81-3-3480-2111

Fax: 81-3-3488-6697

GIRIO

Government Industrial Research
Institute, Osaka

1-8-31 Midorigaoka, Ikeda-shi
Osaka 563, Japan

Tel: 81-727-51-8351

Fax: 81-727-51-6945

Director, 4th Department
Nuclear Waste Program

Dr. Ryoze Hayami
Dr. Ryohei Terai

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

HITACHI

Hitachi, Ltd.

6, Kanda-surugadai, 4-chome
Chiyoda-ku, Tokyo 101, Japan

Tel: 81-3-3258-1111

Fax: 81-3-3258-6218

President
Gen. Mgr., Nuc. Power Systems Div.
Sr. Chief Engineer
Nuclear Power Development

Tsutomu Kanai
Shigemi Sugino
Yoshiaki Korei
Hiromasa Kobayashi

(contd next page)

HITACHI (cont'd)

Waste Management R&D: Development of volume reduction systems 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

Japan

Tel: 81-294-24-1111

Fax: 81-294-22-8987

Nuc. Power Plant Construction

Nuc. Fuel Project

Nuc. Fuel Cycle Project

Kiyoshi Shimizu

Yasuo Hirose

Sadatoshi Inoue

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

IHI

Ishikawajima-Harima

Heavy Industries Co., Ltd.

Shin-Ohtemachi Bldg.

2-1, Ohtemachi 2-chome

Chiyoda-ku, Tokyo 100, Japan

Tel: 81-3-3244-5111

Fax: 81-3-3286-2440

President

Gen. Mgr., Nucl. Power Sales

Executive Vice President

Kousaku Inaba

Masahiro Ogywa

Makio Amano

IHI Research Institute

Yokohama Branch

1, Shin-nakaharacho, Isogo-ku

Yokohama 235, Japan

Tel: 81-45-751-1231

Fax: 81-45-753-9564

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

JAERI

Japan Atomic Energy
Research Institute
2-2, Uchisaiwai-cho, 2-chome
Chiyoda-ku, Tokyo 100
Japan

Tel: 81-3-3592-2111
Fax: 81-3-3580-6107

President
Vice President
Vice President
Exec. Director, International

Shozo Shimomura
Ryojiro Fuketa
Eiichi Tsuji
Harumitsu Yoshimura

Location: JAERI headquarters and Radiotope 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, northeast of Tokyo, near the ocean; these sites can be reached by train from Tokyo to the city of Mito, then by taxi; The 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
Hitagashi-Ibaraki-gun
Ibaraki-ken Pref. 311-13, Japan

Tel: 81-292-67-4111
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
Japan

Tel: 81-292-82-5111
Fax: 81-292-82-0528

Director General
Deputy Director General
Deputy Director General
Deputy Director General

Dr. Takumi Asaka
Dr. Shojiro Matsuura
Tetsuya Onodera
Dr. Hiroshi Iizumi

Facilities

- **WASTE** (glove box and hot cell facilities)
Mission: HLW Safety evaluations.
History: Startup: cold, 1981; hot, 1982.
- **STEM** (Simulation Test for Environmental Radionuclide Migration)
Mission: Safety evaluation for land disposal of LLW.
History: Startup, 1983.

JGC

JGC Corporation
Nuclear and Advanced Technology
New Ohtemachi Bldg.
2-1 Ohtemachi 2-chome
Chiyoda-ku, Tokyo 100, Japan

Tel: 81-3-3279-5441
Fax: 81-3-3273-8050

President
Exec. Vice President
General Manager, Director
Deputy General Manager

Dr. Eiji Watanabe
Dr. Takao Nakajima
Dr. Hiroshi Kuribayashi
Shigemi Morikawa

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

(contd next page)

JGC (contd)

JGC Nuclear Research Center
2205 Narita-cho, Oarai-machi
Hitachi-Ibaraki-gun
Ibaraki Pref. 311-13
Japan

Tel: 81-292-66-3311
Fax: 81-292-66-8810

Nuc. & Adv. Tech. Proj. Div.

Yasuhiro Moriya

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

Facilities

- **Demonstration Incineration Plant**
Mission: Simultaneously melt combustible and noncombustible wastes.
Design Basis: 100 kg/h at 1500°C. LLW combustion technology licensed from Belgonucleaire SA.
- **Contaminated Liquid Waste Recycle Plant**
Mission: Recovery of clean water for re-use from LLLW.
Design Basis: 75 liter/min.; filtration; reverse osmosis; active-carbon bed adsorption; chelate resin adsorption; ion-exchange adsorption; evaporation.

JNFI^(a)

Japan Nuclear Fuel Industries Co., Inc.

Daiichi Seimei Bldg.

2-10 Hirakawa-cho 1-chome

Chiyoda-ku, Tokyo, Japan

Tel: 81-3-3239-6521

Fax: 81-3-3239-6479

President

Satoshi Yamori

Vice President

Hiroshi Takashina

Vice President

Hideto Kamegawa

Functions: Construct/operate facilities for uranium enrichment and for LLW disposal in the Oishitai area of Rokkasho-mura.

Owner: Japanese utilities (10); announced merger with JNFS (6/1992), to be known as Japan Nuclear Fuel Ltd. (JNFL).

Aomori Head Office

Thryo Seimei Bldg.

25-1 Nagakahima 2-chome

Aomori-Shi, Aomori-Ken

Japan

Tel: 81-177-73-7171

Fax:

Rokkasho Works Construction Office

504-22 Aza Notsuke, Oaza Obuchi

Rokkasho-mura, Kamikita-gun

Aomori-ken, Japan

Tel: 81-175-72-3311

Fax:

(contd next page)

(a) Effective 6/92, JNFI will merge with JNFS to be known as Japan Nuclear Fuel Ltd. (JNFL).

JNFI^(a) (contd)**Facilities**

- **Uranium Enrichment Plant** (located in Oishitai area of Rokkasho-mura).
Mission: Enrich uranium for Japanese utilities to establish indigenous nuclear fuel cycle (cost: U.S. \$1.38 billion).
Capacity: 150 tSWU/a initially; 1500 tSWU/a final capacity.
Milestone: Initial startup, 1992; 1500 tSWU/a ~2000.
- **LLW Disposal Facility** (located in Oishitai area of Rokkasho-mura).
Mission: Dispose of Japanese utilities-generated LLW; (cost: U.S. \$1.23 billion).
Capacity: Approximately 1 million drums initially, final capacity equivalent to 3 million drums.
Milestone: Startup, 12/1992.

JNFS^(a)

Japan Nuclear Fuel
Service Co., Ltd.

2-2, 2-chome, Uchisaiwaicho
Chiyoda-ku, Tokyo 100, Japan

Tel: 81-3-3580-6911
Fax: 81-3-3591-8723

President
Vice President
Vice President

Masatoshi Toyoda
Tetsuo Hirasawa
Kiyoshi Fuseya

(contd next page)

(a) Effective 6/92, JNFS will merge with JNFI to be known as Japan Nuclear Fuel Limited (JNFL).

JNFS^(a) (contd)**Fa. Files**

- **Fuel Reprocessing Plant** (located in Iyasaki area of Rokkasho-mura).
Mission: Reprocess Japanese fuel.
Design Basis: 800 tHM/a; 3000 tU storage pool; HLW vitrification/storage. Cost: 840 billion yen; partially designed by SGN, France.
Milestones: SF storage, 1995; FRP startup, 1999.

KOBE STEEL**Kobe Steel, Ltd.**No. 3-18, Wakino Hamacho
1-chome

Chuoh-ku, Kobe 651, Japan

Tel: 81-78-251-1551

Fax: 81-232-3459

General Manager, Mechanical
Eng. Research Lab. (MERL)
Nuclear Engineering

Toru Abe

Fumiaki Komatsu

Kobe Steel, Ltd.

Tekko Building

No. 8-2, Marunouchi 1-chome
Chiyoda-ku, Tokyo 100, Japan

Tel: 81-3-218-7111

Fax: 81-3-218-6425

General Manager, Nuc. Eng.
Deputy Gen. Mgr., Nuc. Eng.
Gen. Mgr., Nuc. R&D Plng.

Norio Mitsushima

Kiyoshi Asahina

Shoji Tsuchibuchi

Function: Manufacture SF transportation/storage casks; waste treatment equipment/systems; LLW/HLW handling/storage.

(a) Effective 6/92, JNFS will merge with JNFI to be known as Japan Nuclear Fuel Limited (JNFL).

MITI

Ministry of International
Trade and Industry
3-1, Kasumigaeseki 1-chome
Chiyoda-ku, Tokyo 100, Japan

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

Minister
V. Min., Internatl. Affairs

Kozo Watansabe
Noboru Hatakeyama

MITI/ANRE

Agency of Natural Resources
and Energy

Ministry of International
Trade and Industry
3-1, Kasumigaeseki 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., Nucl. Energy
Dir., Nuclear Industry
Dir., Internatl. Nuc. Affairs

Teiichi Yamamoto
Naoki Kuroda
Junichiro Mukai
Yuichi Okumura
Hideki Ogawa

MMC

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

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

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

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

(contd next page)

MMC (contd)

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 Kasumigasacki 2-chome
Chiyoda-ku, Tokyo 100, Japan

Tel: 81-3-3580-3311
Fax: 81-3-3581-9470

Director, Nuclear Energy
Deputy Director

Yoshiyuki Sadaoka
Yutaka Yoshizawa

NIRS

National Institute of
Radiological Sciences
9-1, Anagawa 4-chome
Chiba-shi, Chiba Pref. 260, Japan

Tel: 81-472-51-2111
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, Kasumigasacki 2-chome
Chiyoda-ku, Tokyo 100, Japan

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

(contd next page)

NSB (contd)

Director-General	Fujio Sakauchi
Deputy Director-General	Hiroshi Tani
Dir., Nuc. Mtl. Reg. Div.	Katsuyoshi Omori
Dir., Nuc. Safety Policy Div.	Katsuhiko Sokabe
Dir., Reactor Reg. Div.	Ryo Kimura
Dir., Safeguards Division	Hisaharu Dosho
Dir., Radiation Protec. Div.	Joichi Takagi
Dir., Nuc. Safety Policy Res.	Haruo Suzuki

Function: Provide support to the Nuclear Safety Commission.

NSC

Nuclear Safety Commission
2-1, Kasumigasacki 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 for safety and security of nuclear energy, its utilization, and related R&D; 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
Exec. Vice Presidents**

**Takao Ishiwatari
Mitsuru Sata, Hiroshi
Ohishi**

**Exec. Dir., Nuc. Fuel/Reprocess.
Exec. Dir., WM
Exec. Dir., Sr. Dir., WM
Deputy Dir., WM
Coordination
Conditioning Research
Isolat'n Syst. Research
International Project
Geoscience Research
Dir., Fuel Cycle Develop.
Dir., Fuel Cycle Engineering
Dir., International Dept.
Deputy Dir., International
International Cooperation**

**Hiroyoshi Kurihara
Yoshikazu Hashimoto
Masao Yamamoto
Aiji Yamato
Kouichi Tasurumaki
Tadashi Mano
Sumio Masuda
Hideki Sakuma
Minoru Yamakawa
Hidechiyo Kashiwara
Naomi Tsunoda
Tadatomo Yamaguchi
Takao Yagi
Dr. Takashi Kano**

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, D.C. 20037**

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

Manager

Masayori Tsubsumi

PNC: OARAI

PNC Oarai Engineering Center
Oarai-machi, Higashi Ibaraki-gun
Ibaraki Pref. 311-13, Japan

Tel: 81-292-67-4141
Fax: 81-292-67-7147

Director
Waste Management Mgr.
Director, Fuels/Materials

Makoto Toba
Hidehiko Miyao
Masami Katsuragawa

Facilities

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

PNC: TOKAI

PNC Tokai Works
Muramatsu 3371,
Tokai-mura, Naka-gun
Ibaraki-ken 319-11, Japan

Tel: 81-292-82-1111
Fax: 81-292-82-1469
-1845, -9398

(contd next page)

PNC: TOKAI (contd)

Director	Tanehiko Yamanouchi
Deputy Directors	K. Matsumoto, N. Saseo K. Miyahara
Dir., Reprocessing Plant	O. Yamamura
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 Tech. Devel.	Nobuyuki Saseo

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.

(contd next page)

PNC: TOKAI (contd)

- **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: Startup, 02/80.
- **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; operation, 04/88.
- **Bitumization Demonstration Facility**
Mission: Immobilize LLLW concentrate.
Design Basis: 200 liter/h.

(contd next page)

PNC: TOKAI (contd)

- **Incinerator**
Mission: Burn solid LLW.
Design Basis: 600 kg/d.
- **PWTW (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.
- **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 HLW/d.
History: Construction started 4/88.
Milestone: Startup, 1992.
- **Recycle Equipment Test Facility**
Mission: Demonstrate FBR fuel reprocessing equipment and process technology.
Design Basis: 10 kg/a
Milestone: Startup, 1994.
- **FBR Fuel Reprocessing Pilot Plant (reprocessing and HLW treatment)**
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 LLW disposal.
Owners: Japanese Industry, MITI and STA.

STA

Science and Technology Agency
2-1 Kasumigaeseki, 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
Dep. Director-General, AEB
Dir., Policy Division, AEB
Director-General, NSB
Dep. Director-General, NSB

Kanzo Tanigawa
Mitsugu Ishizuka
Takayuki Hirano
Hiroyo Ishida
Kinju Akarashi
Tetsuo Naito
Fujio Sakaguchi
Hiroshi Tani

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 (SOUTH)

KOREA

MAJOR PUBLIC HOLIDAYS (1992)

Jan	1-3	New Year
Mar	1	Independence Movement
Apr	5	Arbor Day
May	5	Children's Day
May	10	Buddha's Birthday
Jun	6	Memorial Day
Jul	17	Constitution Day
Aug	15	National Day
Sep	10-12	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 U.S.; 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. \$ = 764.10 Won (W)

per Wall Street Journal, 01/31/92. 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
Republic of Korea

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

Science Counselor

Kenneth D. Cohen

KOREA (SOUTH)

KOREA

MAJOR PUBLIC HOLIDAYS (1992)

Jan	1-3	New Year
Mar	1	Independence Movement
Apr	5	Arbor Day
May	5	Children's Day
May	10	Buddha's Birthday
Jun	6	Memorial Day
Jul	17	Constitution Day
Aug	15	National Day
Sep	10-12	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 U.S.; 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. \$ = 764.10 Won (W)

per Wall Street Journal, 01/31/92. 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
Republic of Korea

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

Science Counselor

Kenneth D. Cohen

Population	1990	44 million
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ENERGY

Electric Power Capacity	1988	19.9 GWe
		36% nuclear

Electric Power Production	1990	107 TWh
		49% 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 Capacity	1991	7.2 GWe
	1995	7.2 GWe
	2000	9.7 GWe

Reactor Mix	1991	PWR	8 (1978-89)
			4 (1995-99)
		HWR	1 (1983)
			1 (1997)

Reactor Development (feasibility studies): Advanced PWR

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" on reprocessing and recycle of Pu for FBR, CANDU and LWR.

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 is pending; utility surcharge of 2 mil/kWh to fund waste management; extended storage (~60 years) of SF planned, in AR and AFR facilities; no decision has been made on reprocessing or disposal of SF/HLW.

Cumulative Spent Fuel	1990	1,500 tU
Arisings	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 (KPOEC)

— 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 Office (AEO)

— Nuclear Policy Division

— Nuclear Reactor Division

— Nuclear Energy R&D Division

— Nuclear Safety Office

— Nuclear Inspection Division

— Nuclear License Division

— Korea Advanced Institute of Science/Technology (KAIST)

— Korea Atomic Energy Res. Institute (KAERI)

— Korea Institute of Nuclear Safety (KINS)

AEO

**Atomic Energy Office
Asst. Ministry for Atomic Energy
Ministry of Science and Tech.
Gwacheon 171-11
Republic of Korea**

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

**Asst. Minister for Atomic Energy
Director-General
Director, R&D Division
Director, Nuclear Policy
Director, Nuclear Reactor
Director, Internl. Cooperation
Director, Nuclear Inspection
Director, Nuclear Licensing**

**Young Sung Han
Je Ho Kim
Man Ki Lee
Yoo Hyun Moon
Sang Hoon Choi
Chung Won Cho
Song Bin Hong
Jae Wook Chang**

**Function: License nuclear power plants and fuel cycle facilities;
manage nuclear waste fund; sponsor nuclear R&D.**

AEC

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

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

Chairman: Deputy Prime Minister

Gak Gyoo Choi

**Function: Decision-making body for policies regarding nuclear
energy; R&D plan for nuclear fuel and nuclear energy applications;
always chaired by 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

The Jon Kim

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

KAERI

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

Tel: 82-42-868-2000
Fax: 82-42-868-2702

President

Dr. Chang Sang Rhim
82-42-868-2121

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

Byung Ku Kim
Sung Ki Chae
Hun Hwee Park
Seung Gi Ro
Sung Ki Chae
Hyun Soo Park

Function: Develop 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
373-1 Kusong-dong, Yusong-gu
Thejon 305-701, ROK**

**Tel: 82-42-869-2114
Fax: 82-42-869-2210 or
-2220**

**President
Nuclear Engineering**

**Dr. Soun Soon Chun
Prof. Kun Jai 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
Gen. Mgr., Nuc. Safety/Tech.**

**Ahn Byong Wha
Chang Saeng Shim**

Function: Develop power resources; generate/transmit 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, Thejon
Republic of Korea**

**Tel: 82-42-868-9700
Fax: 82-42-868-9734**

President

Dr. Jung Moo Oh

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-1

Republic of Korea

Tel: 82-42-868-2000

Fax: 82-42-868-2702

President

Sang-Hoon Lee

Vice President

Yong Kyu Lim

Director, Safety Review

Sung Nyun Kim

Director, Safety Inspection

Young Soo Eun

Director, Standards Development

Wook Jong Yoo

Function: Independent regulatory organization (established 1990) to develop technical standards for nuclear safety.

KNFC

Korea Nuclear Fuel Company, Ltd.

150 Tukjin-dong, Chung-gu

Taejon

Republic of Korea

Tel: 82-42-868-9441

Fax: 82-42-868-1000

President

Dr. Dong Hoon Kim

Function: Develop domestic nuclear fuel fabrication.

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

Facilities

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

KOPEC

Korea Power Engineering Co., Inc.
87 Samsong-dong, Kangnam-gu
Seoul, Republic of Korea

Tel: 82-2-540-7701
Fax: 82-2-540-4184

President

Jong Hoon Lee

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

MER

Ministry of Energy and Resources
1, Chungang-dong
Kwachon, Kyonggi-do
Republic of Korea

Tel: 82-2-503-9641
Fax: 82-2-503-9649

Minister
Vice Minister
Dir. General, Electric Power

Nyum Gin
Se Hyung Kim
Tae Jon Kim

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

MOST

Ministry of Science and Technology
1, Chungang-dong
Kwacheon, Kyonggi-do
Republic of Korea

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

Minister
Vice Minister
Dir. Gen./Atomic Energy Office
Dir. Gen./Nuclear Safety
Assessment Officer
Director, Nuclear Reactors
Director, Nuclear Policy
Director, Energy R&D
Director, Nuclear Cooperation
Director, Nuclear Inspection
Director, Nuclear Licensing

Jin I-hyun Kim
Jung Wook Suh
Je Ho Kim
Soong Ku Lee
Sang Hoon Choi
Yoo Hyun Moon
Man Ki Lee
Chung Won Cho
Song Bin Hong
Jae Wook Chung

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

NETHERLANDS

NETHERLANDS

MAJOR PUBLIC HOLIDAYS (1992)

Jan	1	New Year
Apr	17	Good Friday
Apr	19-20	Easter
Apr	30	Queen's Birthday
May	5	Liberation Day
May	28	Ascension
Jun	8	Pentecost
Dec	25-26	Christmas

TIME

Standard Time Washington, D.C.
Daylight Saving Time Period:

+ 6 hours
03/29 - 09/26/92

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S. 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. \$ = 1.82 Guilder (Fl.)

per Wall Street Journal, 01/31/92. 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 B The Hague
Netherlands

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

Population	1989	15 million
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ENERGY

Electric Power Capacity	1989	17.8 GWe	
		3% nuclear	
	1990	17.4 GWe	
		3% nuclear	
	1995	18.8 GWe	
		3% nuclear	
	2000	19.3 GWe	
		2% nuclear	

Electric Power Production	1989	73.0 TWh		
		55% gas		
		34% coal		
		6% nuclear		
		4% oil		
	1990	1% solids		
		5% nuclear		
		1995	5% nuclear	
		2000	4% nuclear	

NUCLEAR POWER

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

Nuclear Power Capacity	1991	0.5 GWe
	1995	0.5 GWe
	2000	0.4 GWe

Reactor Mix	1991	BWR	1 (1969)
		PWR	1 (1973)

INDUSTRIAL FUEL CYCLE

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

Waste Management Strategy: Utilize single centralized waste collection service; extend interim storage of all wastes (50-100 years) until decisions are made regarding disposal; 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 SF Arisings (LWR)	1990	228 tU
	2000	369 tU

INTERNATIONAL RELATIONSHIPS

Member of EC, IAEA, and OECD/NEA.

ORGANIZATION

- **Government--Ministries of Economic Affairs; Housing, Physical Planning/Environment; and Social Affairs/Employment** 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.

Major Milestone

- Interim Storage Center 1994

COVRA (Central Organization for Radioactive Waste)

Centrale Organisatie Voor

Radioactief Afval

Spanjeweg 1, P.O. Box 34

4453 ZG s'-Heerenhoek

Netherlands

Tel: 31-1196-13900

Fax: 31-1196-13950

Director

Radiation Protection

Waste Storage/Transportation

Dr. Jan Vrijen

Dr. H.D.K. Codec

U. Bakema

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

Facilities

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

ECN (Netherlands Energy Research Center)

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).

(contd next page)

ECN (contd)**Research Center****Managing Director**Prof. Dr. H. H. van den
Kroonenberg**Nuclear Energy Research**

Dr. A. M. Versteegh

Nuc. Waste/Geologic Disposal

L. H. Voss

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 in salt dome repositories (conceptual design; thermo-mechanical; safety; and radionuclide migration studies); seabed disposal; actinide burning, and decontamination study of large components.

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

C. Staudt

Deep Subsurface Dept.

Dr. H. M. van Montfrans

**KEMA (Research/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

(contd next page)

KEMA (contd)

R&D Division	Dr. A. H. M.
Verkooijen	
Nuc. Research Program	J. B. W. Kanij
Quality Assurance	Dr. H. A. W.
Cornelissen	
High-Level Waste	Dr. F. J. J. G. Janssen
Aqueous Waste Mgmt.	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

H.F.G. Geyzers
31-70-3796471

Radioactive Waste

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

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

Radioactive Waste

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 Milieuhygiëne

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. P. Glasbergen
31-30-743397

PAKISTAN

PAKISTAN

MAJOR PUBLIC HOLIDAYS (1992)

Jan	1	New Year	Aug	14	Independence
Mar	5	Start of Ramadan	Sep	6	Defense of Pakistan
Mar	23	Pakistan Day	Sep	11	Death of Quaid-i-Azam
Apr	5-7	Ramadan	Sep	22	Prophet's Birthday
May	1	May Day	Nov	9	Iqbal Day
Jun	12-14	Sacrifice Feast	Dec	25	Quaid-i-Azam Birthday
Jul	6	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 U.S.; 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. \$ = 24.55 Rupees

per Wall Street Journal, 01/31/92. 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

Population	1990	100	million
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ENERGY

Electric Power Capacity	1990	~ 11	GWe
		~1.5%	nuclear
	2000	13.8	GWe
		<1%	nuclear

Electric Power Production	1990	~36.0	TWh
		~ 65%	hydro
		~ 29%	gas
		~ 5%	coal
		1.1%	nuclear

NUCLEAR POWER

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

Nuclear Power Capacity	1991	0.1	GWe
	1995	0.1	GWe
	2000	0.1	GWe

Reactor Mix	1991	HWR	1 (1972)
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INDUSTRIAL FUEL CYCLE

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

Cumulative SF Arisings	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 laboratory-scale reprocessing.

PAEC

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

Tel: 92-51-81-9030-9
Fax: 92-51-82-4908

Chairman
Secretary
Waste Management

Ishfaq Ahmad
Muhammad Azfal
Raze ur-Rehman

Function: Advocate increased nuclear energy generation to overcome serious energy shortages in a country substantially lacking in natural energy 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.

(contd next page)

PAEC (contd)**Facilities^(a)**

- **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.
- **Centrifuge Enrichment Plant at Kahuta** - 1000 centrifuges operational at startup, 1984, with potential of additional 2000-3000 units; facility not under international safeguards.

PINSTECH

Pakistan Institute of
Science & Technology
P.O. Nilore
Islamabad, Pakistan

Tel: 92-51-84-7601-9
Fax:

Director

I. H. Qureshi

Function: Fuel cycle R&D activities; including 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.

(contd next page)

(a) 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)**Facilities^(a)**

- **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.

(a) 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 as Kahuta, Rawalpindi or Islamabad which are in relative proximity to each other.

SOUTH AFRICA

SOUTH AFRICA

MAJOR PUBLIC HOLIDAYS (1992)

Jan 1	New Year	May 31	Republic Day
Apr 1	Family Day	Oct 1	Kruger Day
Apr 6	Founder's Day	Dec 16	Day of the Vow
Apr 17	Good Friday	Dec 25	Christmas
May 1	Worker's Day	Dec 26	Day of Goodwill
May 28	Ascension		

TIME

Standard Time Washington, D.C.

+ 7 hours

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S.; 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. \$ = 2.80 Rand

per Wall Street Journal, 01/31/92. 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

Population	1989	37 million
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ENERGY

Electric Power Capacity	1989	34 GWe
		6% nuclear
	1995	34 GWe
		5% nuclear
	1998	38 GWe
		5% nuclear

Electric Power Production	1989	146 TWh	
		88% coal	
		0% nuclear	
		2% other	
	1995	2% hydro	
		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 Capacity	1991	1.8 GWe
	2000	1.8 GWe

Reactor Mix	1991	PWR	2 (1984/85)
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INDUSTRIAL FUEL CYCLE

Waste Management Strategy: Interim storage of reactor 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 SF Arisings (LWR)	1990	254 tU
	2000	714 tU

Major Milestones

- Dry SF storage facility (Vaalputs) 1994

INTERNATIONAL RELATIONSHIPS

Member of IAEA.

ORGANIZATION

Ministry of Mineral and Energy Affairs

- Atomic Energy Corporation (AEC)
 - Potlindaba 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
Senior General Managers:**

Nucl. Fuel Production
Technology Development
Engineering
Business Development
Sr. Mgr., Nuc. Waste Tech.

Dr. Waldo E. Stumpf

Dr. J. J. Wannenburg
K. F. Fouche
L. S. Snyders
Dr. A. G. M. Jackson
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; fuel fabrication.

Facilities

- **Pelindaba National Nuclear
Research Center**

P.O. Box 582
Pretoria 0001, South Africa

Tel: 27-12-316-4111
Fax: 27-12-323-7731

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

- **Vaalputs National LLW
Disposal Facility**

Private Bag X7
Springbok 8240, South Africa

Tel: 27-251-22822
Fax: 27-251-81220

Mission: Operate LLW/ILW shallow-land disposal facilities; perform site characterization and environmental studies.
Design Basis: 1,470 m³/a LLW/ILW disposal.

(contd next page)

AEC (contd)• **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 - 700 tU/a conversion.

CNS

Council for Nuclear Safety

P.O.B. 7106

Hennopsmoor 0046

South Africa

Tel: 27-12-663-5500

Fax: 27-12-663-5513

Chairman

Vice-Chairman

Exec. Officer

Dep. Gen. Mgr., Licensing

Prof. J. B. Martin

L. D. Hobbs

B. C. Winkler

J. Leaver

Function: Independent regulatory/licensing agency for construction and operation of nuclear installations (established by the 1988 Nuclear Energy Amendment Act).

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 (1992)

Jan 1	New Year	May 1	Labor Day
Jan 6	Epiphany	Oct 12	Columbus Day
Mar 19	St. Joseph	Dec 7	Constitution Day
Apr 16	Holy Thursday	Dec 8	Immaculate Conception
Apr 17	Good Friday	Dec 25	Christmas

TIME

Standard Time Washington, D.C.
Daylight Saving Time Period:

+ 6 hours
03/29 - 09/27/92

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S.; 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. \$ = 101.45 Peseta

per Wall Street Journal, 01/31/92. 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
28006 Madrid, Spain

Tel: 34-1-577-4000
Fax: 34-1-577-5735

Science Attaché

Robert G. Morris

Population	1990	39 million
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ENERGY

Electric Power Capacity	1990	43.6 GWe
		17% nuclear
	1995	49.1 GWe
		15% nuclear
	2000	50.4 GWe
		15% nuclear

Electric Power Production	1990	145 TWh
		47% coal
		35% nuclear
		17% hydro
		1% other
	1991	35% nuclear
	1995	33% nuclear
	2000	30% 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 (confirmed 1991).

Nuclear Power Capacity	1991	7.0 GWe
	2000	7.0 GWe

Reactor Mix	1991	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 in some reactor pools and dry storage in dual-purpose casks planned to provide additional capacity until geologic repository is ready to receive HLW (SF); granite, salt and clay are being considered as host rock for repository; shallow-land burial of LLW in fully engineered structures is planned; some LLW are currently placed in a temporary storage facility (bays) at El Cabril (province of Córdoba).

Cumulative SF Arisings (LWR)	1990	950 tU
	1995	1,800 tU
	2000	2,800 tU

Industrial-Scale Activities (Capacity)

- Uranium mining and milling: 270 tU/a.
- Uranium enrichment: 11.1% interest in Eurodif.
- Fuel fabrication: 200 tU/a.
- Intermediate spent fuel storage: 3,000 tU.

INTERNATIONAL RELATIONSHIPS

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: 34-1-34660-00/01

Fax: 34-1-34660-05

President

General Director

Director

Nuclear Technology

Waste Management

Ramón Pérez Simarro

José Angel Azuara Solís

Manuel Montes

Ponce de León

Armando Uriarte

Function: Organized into four research institutes: nuclear technology (R&D on nuclear fuel cycle, decommissioning, material sciences and safety analyses); fundamental research; radiological protection and environment; renewable energies.

Facilities

- Juan Vigón 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

E. Echávarri Lozano

F. Sarmiento Almeida

R. Caro Manso

E. González Gómez

Function: Independent body, responsible to Parliament, with regulatory 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 López García
34-1-279-28-58

Director, Engineering
International Relations

Aurelio M. Ulibarri
Valentía González
34-1-519-5314

Functions: Provide waste management services and disposal facilities to all Spanish nuclear companies and radioactive producers; responsible to the Ministry of Industry and Energy; funded by CIEMAT (80%) and the National Institute of Industry (20%).

Facilities

- LLW Surface Storage Facility, El Cabril, Córdoba

ENUSA (National Fuel Cycle Company)

Empresa Nacional
del Uranio S.A.

Santiago Rusinol 12
28040 Madrid, Spain

Tel: 34-1-347-4200
Fax: 34-1-347-4215

President

Alfredo Llorente Legaz

Function: Supply fuel cycle services except waste management and disposal (uranium mining and milling, fuel fabrication) to Spanish nuclear power plants.

Facilities

- LWR Fuel Fabrication Plant
Commissioned late 1985.
Capacity: 200 tU/a, can be expanded to 500 tU/a.

MINISTRY OF INDUSTRY AND ENERGY

Minister

José Claudio Aranzadi
Martínez

Secretary General,
Energy/Mineral Resources
Director General, Energy

Ramón Pérez Sainza
María Luisa Juidobro y
Arriba

SWEDEN

SWEDEN

MAJOR PUBLIC HOLIDAYS (1992)

Jan	1	New Year
Jan	6	Epiphany
Apr	17	Good Friday
Apr	19-20	Easter
May	1	Labor Day
May	28	Ascension
Jun	7-8	Pentecost
Jun	19-20	Midsummer
Nov	1	All Saints
Dec	24-26	Christmas

TIME

Standard Time Washington, D.C.

+ 6 hours

Daylight Saving Time Period:

03/29 - 09/26/91

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S. 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. \$ = 5.86 Krona (SEK)

per Wall Street Journal, 01/31/92. 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

Population	1989	8.5 million
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ENERGY

Electric Power Capacity	1989	32.9 GWe
		30% nuclear
	1990	33.2 GWe
		30% nuclear
	1995	33.5 GWe
		30% nuclear
	2000	33.5 GWe
		30% nuclear

Electric Power Production	1989	143.7 TWh
		46% nuclear
		50% hydro
		2% solids
		1% coal
		1% oil
	1990	46% nuclear
	1995	47% nuclear
2000	48% nuclear	

NUCLEAR POWER

Policy: Phase out all nuclear plants at the latest by the year 2010; changing this policy will require a new decision by Parliament.

Nuclear Power Capacity	1991	9.9 GWe
	2000	9.9 GWe

Reactor Mix	1991	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 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	1990	2,360 tU
Arisings (LWR)	2010	7,800 tU
Cumulative Waste Arisings	2020	
(conditioned and		
encapsulated -	SF	5,600 canisters
ready for disposal)	TRU	6,000 m ³
	Reactor waste	95,000 m ³
	" core comp.	19,000 m ³
	D&D	113,000 m ³

Industrial-Scale Activities

- LWR fuel fabrication: 400 tU/a.

Major Milestones (SF 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. 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, EC, 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. Most of SKN's functions will be absorbed 7/1/92 by SKI.
- **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 Göteborg
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
Piperogatan 27
112 28 Stockholm
Sweden

Tel: 46-8-654-06-80
Fax: 46-8-652-16-07

Manager

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

Ivona 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**Kärnkraftsäkerhet 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****Hydrogeology****Leif Carlsson**

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 Anal.****Tönis Papp****46-8-665-2832****Geoscience****Lars Olof Ericsson****46-8-665-2801****Chemistry****Fred Karlsson****46-8-665-2830****Design & Engineered Barriers****Christer Svemar****46-8-665-2811****Material Sciences****Lars Werme****46-8-665-2825****International Relations****Torsten Eng****46-8-665-2833****Systems/Facilities, Director****Hans Forsström****46-8-665-2838****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 SF and other long-lived wastes can be disposed of safely and permanently; provide transportation of SF outside reactor sites.

Owners: Utilities.

SKB (contd)**Facilities**

- **CLAB** (Central Storage for Spent Fuel, located at Simpevarp adjacent to Oskarshamn Power Station)
Mission: AFR storage facility.
Design Capacity: Initially, 3000 t; being upgraded to 5000 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 the most radioactive ILW; conventional tunnel rooms for LLW; the least radioactive ILW is in concrete-walled "hot-cells" in tunnels; 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.
- **Äspö Hard Rock Laboratory**

SKB R&D/Äspö Hard Rock Laboratory

Project Office

Box 5864

10248 Stockholm

Sweden

Tel: 46-8-665-2831

Fax: 46-8-665-5719

Project Manager

Göran Bäckblom

SKB Äspö Hard Rock Laboratory

Site Office, PI 300

570 93 Figeholm

Sweden

Tel: 46-491-82000

Fax: 46-491-82005

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: 46-8-665-44-00****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 Kärnbränslenämnd****Box 27824****115 93 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 SF and decommissioning of nuclear power plants; administer the Swedish nuclear waste financing system; provide information to the public on spent fuel management and disposal. Most of the functions are expected to be absorbed by SKI on 7/1/92.

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 RADWASTE AB

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
Claus 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.

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); funded by the Ministry of Industry.

SWITZERLAND

SWITZERLAND

MAJOR PUBLIC HOLIDAYS (1992)

Jan	1	New Year
Apr	17	Good Friday
Apr	19-20	Easter
May	1	Labor Day
May	28	Ascension
Jun	7-8	Pentecost
Jun	18	Corpus Christi
Aug	1	National Day
Dec	25-26	Christmas

TIME

Standard Time Washington, D.C.

+ 6 hours

Daylight Saving Time Period:

03/29 - 09/27/92

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S. 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. \$ = 1.43 Franc

per Wall Street Journal, 01/31/92. 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
3001 Bern
Switzerland

Tel: 41-31-43-70-11
Fax: 41-31-43-73-44

Population	1989	6.5 million
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ENERGY

Electric Power Capacity	1989	15.3 GWe
		20% nuclear
	1990	15.5 GWe
		19% nuclear
	1995	15.7 GWe
		19% nuclear
	2000	16.8 GWe
		18% nuclear
Electric Power Production	1989	53.8 TWh
		55% hydro/geoth.
		42% nuclear
		3% other
	1990	43% 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 Capacity	1991	2.9 GWe
	2000	2.9 GWe

Reactor Mix	1991	BWR	2 (1972/84)
		PWR	3 (1969-79)

INDUSTRIAL FUEL CYCLE

Policy: Purchase most services from other countries, including reprocessing of spent fuels; recycle Pu to either LWRs or FBRs in the future.

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 SF elements and alpha wastes; interim storage of all waste at common center until repositories available; sea-dumping of LLW discontinued in 1982.

Cumulative SF Arisings
(LWR)

1950	1,090 tU
2000	2,000 tU

Cumulative Waste Arisings
(Planning basis:
after 40-yr operation
at 4 GWe)

LLW/D&D W	95,000 m ³
LLW/ILW	80,000 m ³
HLW glass	750 m ³ or
SF	2,500 m ³

Major Milestones

- Initial receipt of HLW glass from COGEMA (France) > 1996
- Intermediate-depth repository for LLW/ILW > 2003
- Geologic repository for HLW or SF and alpha wastes > 2020

INTERNATIONAL RELATIONSHIPS

DOE/NAGRA Agreement for Cooperation in Radioactive
Waste Management

Term: 04-19-85 to 09-22-96

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; 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 (renewal in progress)

Scope: Experimental/analytical studies relating to safety research.
General information exchange.

Member of IAEA and OECD/NEA; cooperative agreements with
SKB/Sweden, CEA/France, Euratom/EC, ONDRAF/Belgium,
PNC/Japan, BfS, BMFT, GSF, and BGR/Germany, 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 Institut--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)
5232 Villigen
Switzerland

Tel: 41-56-98-28-53
Fax: 41-56-99-39-07

Waste Management Section

Dr. Auguste Zurkinden

Functions: 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
Director, Science/Technology
Geology
Field Operations/Testing
Engineering
Nuclear Technology
Director, Repository Projects

Dr. Hans Isler
Dr. Charles McCombie
Dr. Marc F. Thury
Dr. Ch. Sprecher
Andreas L. Nold
Dr. Piet Zuidema
Dr. Emil Kowalski

Function: Provide for safe disposal of radioactive wastes produced
by the Swiss nuclear industry. Funded by utilities and government.

Facilities

- URL at Grimsel Pass--operational since 1984 (tests/experiments
in crystalline rock).

PSI

Paul Scherrer Institut
Würenlingen/Villigen
5232 Villigen, Switzerland

Tel: 41-56-99-2111
Fax: 41-56-98-2327

Director
Manager, Waste Mgmt. Proj.

Prof. Meinrad Eberle
Dr. J. Hadermann

(contd next page)

PSI (contd)

Function: Federal (Department of Interior) institute for reactor and nuclear R&D.

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 analogue studies; hydrological studies; sorption constants on different rocks; immobilization of LLW/ILW in cement; leaching rates on LLW/ILW forms; and long-term corrosion tests on waste package materials.

Facilities

- Hot Cells, Radioactive Laboratories, Incinerator.
- ADA (Acid Digestion Plant) for TRU wastes.
Design Basis: Carbonization/digestion in H_2SO_4/HNO_3 at $150^\circ C$; 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

Dr. H. Lutz

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 (startup in 1992) and to cost ca. U.S. \$4.8 million; organization is a consortium of Swiss nuclear utilities.

TAIWAN

TAIWAN

MAJOR PUBLIC HOLIDAYS (1992)

Jan 1-2	Commemoration Day	Oct 10	National Day
Feb 4-6	Lunar New Year	Oct 25	Retrocession Day
Mar 29	Youth Day	Oct 31	Ch. Kai-Shek's Birth
Apr 4	Women/Children's Day	Nov 12	Sun Yat-Sen's Birth
Apr 5	Tomb Sweeping Day	Dec 25	Constitution Day
May 6	Dragon Boat Fest		
Sep 28	Confucius Birth		

TIME

Standard Time Washington, D.C.

+ 13 hours

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S.; 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. \$ = 25.00 Taiwan Dollar
per Wall Street Journal, 01/31/92. 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, Taiwan

Tel: 886-2-709-2000
Fax: 886-2-702-7675

Science Officer

Matt Mathews

Population	1991	20 million
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ENERGY

Electric Power Capacity	1991	18.4 GWe
		28% nuclear
Electric Power Production	1991	89.7 TWh
		38% nuclear
		27% coal
		26% oil
		6% hydro

NUCLEAR POWER

Policy: Plan for nuclear power to meet rapidly growing demand for electric energy; continue with nuclear power at about 1/3 of total electricity.

Nuclear Power Capacity	1991	4.9 GWe
	1995	4.9 GWe
	2000	6.7 GWe

Reactor Mix	1991	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 pellet preparation; fuel hardware fabrication; fuel assembly.

Waste Management Strategy: Evaluating spent fuel/HLW interim storage options; may reprocess (in other countries); maximize existing SF pool storage capacity by reracking; build MRS facility at existing reactor site for interim storage until final disposal in geologic repository; LLW stored in National Waste Storage Facility on nearby Orchid Island; LLW/ILW will eventually be disposed of on the sea floor, if internationally acceptable, or in a shallow land facility.

Cumulative SF Arisings (LWR)	1990	1,140 tU
	2000	2,600 tU

MAJOR MILESTONES

LLW Disposal Facility

- Selection of site/method 1994
- Site characterization, engineering, design and licensing 1998
- Completion, start of operation 2002

HLW Disposal Facilities

- Commission MRS at Chinshan reactor site 1999
- Geologic repository site selection 2016
- Commission final repository 2032

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

Tel: 886-2-363-4180

Fax: 886-2-363-5377

Chairman

Dr. Y. Y. Hsu

Secretary General

Prof. Thomas K.C. Liu

Director, Radwaste Admin.

Dr. Chao-Ming Thai

Tel: 886-2-363-4342

Fax: 886-2-363-5448

Director, Planning Div.

Dr. M. C. Wang

886-2-362-8567

Director, Rad. Protection Div.

Dr. Yi-Ching Yang

886-2-362-6189

Director, Nuc. Regulatory Div.

S. T. Chiou

886-2-362-8571

INER**Institute of Nuclear Energy
Research****P.O. Box 3
Lung-Tan, Taiwan 325****Tel: 886-2-356-1717
Fax: 886-2-741-1064****Director
Deputy Directors****Dr. Ter-Yu Hsia
Dr. Wei-Ko Wang
Dr. Song-Feng Wang
Dr. Yi-Bin Chen
Dr. Yuan-Ching Chou
Dr. Ging-Shung Yu
Dr. Li-Fu Lin
Dr. Wei-Li Chen****Nuc. Engineering
Nuc. Instrumentation
Nuc. Fuel/Matls. Research
Health Physics Division****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****Tel: 886-2-365-1234
Fax: 886-2-396-8593****President
Director, Nuclear Engineering****S. M. Chang
Y.S. Yeh
886-2-367-9009
Peng-Chang Chen****Deputy Dir., Nuc. Engineering**

UNITED KINGDOM

UNITED KINGDOM

MAJOR PUBLIC HOLIDAYS (1992)

Jan 1	New Year	Jun 9	Queen's Birthday
Apr 17	Good Friday	Aug 31	Summer Holiday
Apr 20	Easter Monday	Dec 25	Christmas
May 4	Bank Holiday	Dec 26	Boxing Day
May 25	Spring Holiday		

TIME

Standard Time Washington, D.C.

+ 5 hours

Daylight Saving Time Period:

03/29 - 10/24/92

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S. 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. \$ = 0.56 Pound

per Wall Street Journal, 01/31/92. 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

Population	1990	58 million
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ENERGY

Electric Power Capacity	1990	74.9 GWe
		15% nuclear
	1995	76.9 GWe
		13% nuclear
	2000	82.4 GWe
		11% nuclear

Electric Power Production	1989	310.7 TWh
		65% coal
		23% nuclear
		10% oil
		2% hydro/gas
	1990	20% nuclear
	1995	17% nuclear
	2000	15% nuclear

NUCLEAR POWER

Policy: Continue nuclear power as a significant element of total electricity production; substantially based, to date, on gas-cooled reactors, but now diversifying to PWRs; eventual active FBR pursuit expected.

Nuclear Power Capacity	1991	11.6 GWe
	1995	12.0 GWe
	2000	10.5 GWe

Reactor Mix	1991	GCR	22 (1956-72)
		AGR	14 (1976-89)
		PWR	1 (1994)
		FBR	1 (1976)

Reactor Development	PWRs; future LMFBR development.
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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/AGR 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 50 years before disposal; shallow-land burial of LLW currently; future deep-land disposal of LLW and ILW.

Cumulative SF Arisings (AGR)	1990	1,300 tU
	2000	3,250 tU

Industrial-Scale Activities (Capacity)

- Uranium conversion (Springfields)
 - UF₆ production: 9,000 t/a
 - UO₂ conversion: 10,000 t/a
- Uranium enrichment (Capenhurst)
 - centrifuge plant: 800 tSWU/a
- Fuel fabrication
 - Springfields
 - U metal (Magnox): 1,300 tU/a
 - AGR/LWR fuels: 300 t/a
 - Sellafield
 - MOX fuels capacity, 1992: 6 t/a (LWR)
- Fuel reprocessing
 - Magnox fuels (Sellafield): up to 1500 t/a
 - UO₂ fuels (THORP, Sellafield): 1200 t/a (1992)
 - FBR fuels (PFR, Dounreay): 30 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, disposal methods, and costs for wastes arising from the decommissioning operations; emphasis on exchange of technical information, specialists, samples, materials, instruments, and testing equipment.

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; geologic disposal; transportation; storage; environment/safety and public acceptance issues; performance assessment; packaging; emphasis on 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, Springfield, 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"/government-owned 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.
- **NEPB (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/WASTE MANAGEMENT ORGANIZATION

National Government

- Department of Environment (DoE)
 - H.M. Inspectorate of Pollution (HMIP)
 - Radioactive WM 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 Res. 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
- UO_2 Production
- Uranium Conversion

— Capenhurst

- Uranium Enrichment

— AEA Technology

- Decommissioning and Radwaste
- Environment & Energy
- Fuel Services
- Fusion
- Industrial Technology
- Safety & Reliability
- Reactor Services

— 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
Chief Technologist, Nuclear

John Maltby
Brian L. Eyre
Dr. Derek Pooley
R. Stuart Nelson
Graeme G. E. Low
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: 44-305-20-2500

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.

Facilities

- **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 1/3-scale unit 1982-84; startup, (full scale) 1986.

AEA FS

AEA Fuel Services
AEA Technology Dounreay
Caithness KW14 7TZ

Tel: 44-847-6-2121
Ext. 674

United Kingdom

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 equipment and safeguards.

(contd next page)

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
United Kingdom**

**Tel: 44-235-43-2138
Fax: 44-235-43-2064**

**Chief Executive
Head, Business Development**

**Dr. Chris Wright
Dr. Steve J. Curl**

Function: Provide advanced technology to the process, manufacture, electronics, defense, and aerospace industries; process technology and plant design; instrumentation and control; materials technology and manufacture; structural assessments; advanced computing; laser applications; and computational fluid dynamics.

AEA RS

**AEA Reactor Services
Risley, Warrington
Cheshire WA3 6AS
United Kingdom**

**Tel: 44-925-25-3019
Fax: 44-925-25-2196**

**Chief Executive
Head, Business Development**

**Dr. Tony Broomfield
Dr. Neil M. Irvine**

Activities: Fast/thermal reactor technology; management of FR program and participation in international FR programs, especially the European FR; design and operational techniques for thermal reactors aimed at improving economies of existing plants and design of new plants.

AEA S&R

AEA Safety and Reliability
Wighaw Lane, Culcheth
Warrington WA3 6AT
United Kingdom

Tel: 44-925-25-4241
Fax: 44-925-25-4535

Chief Executive
Head, Business Development

Dr. Geoff Ballard
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.

AWRE

Atomic Weapons Research
Establishment
Aldermaston, Reading RG7 4PR
United Kingdom

Tel: 44-73-56-4111
Fax:

Waste Management

S. Hunter

BGS

British Geological Survey
Nicker Hill, Keyworth
Nottingham, NG12 5GG
United Kingdom

Tel: 44-60-77-6111
Fax: 44-60-77-6602

Director

Dr. P. J. Cook

BNFL

British Nuclear Fuels plc
Risley, Warrington
Cheshire WA3 6AS
United Kingdom

Tel: 44-925-83-2502
Fax: 44-925-82-2711
Ver: 44-925-83-2369

Location: 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

John Guinness
44-925-83-5000

Chief Exec. Officer

N. L. Chamberlain
44-925-83-5006

Dir., Engineering Group
Dir., U.K. Group
Dir., International Group

Peter F. P. Roberts
Dr. Greg G. Butler
Ken G. Jackson

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

Location: From London-Euston Station to Carlisle Station by train ca. 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 ca. 3 hours.

Dir., Magnox Reprocessing

Grahame K. Smith
44-9402-74245

Dir., THORP Division

Dave Bonser

Dir., Waste Mgmt./Decom. Div.

Stuart Donn

Dir., Reactor Division

A. D. Evans

Function: Provide spent fuel management services, including storage, reprocessing and waste management; transport of SF/wastes and complete fuel cycle services.

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 shut down after a contamination release incident.

- **Magnox Fuel Handling Plant**

- Storage/decanning of Magnox fuel.
- Storage/dismantling of AGR fuel.

(contd next page)

BNFL: SELLAFIELD (contd)

- **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.
History: Startup, 2/1992.
- **Drigg Waste Disposal Facility** (300-acre site, 4 miles from Sellafield)
Mission: LLW disposal.
Design Basis: Shallow-land disposal, clay-based trenches and recently in concrete vaults.
Capacity: 650,000 m³ LLW disposed of through 1989.
- **MOX Fuel Fabrication Facilities**
 - Pilot plant, capacity—6 t/a
 - Production plants, capacity—100 t/a; startup, 1995.
- **Vitrification Plant**
Mission: Solidify Sellafield HLW.
Design Basis: AVM process; product, borosilicate glass blocks.
Capacity: 250-300 t/a glass.
History: Startup, 1990.
- **WTC (Waste Treatment Complex)**
Mission: Prepare TRU waste for disposal.
Milestone: Startup, 1992
- **EP-1 and EP-2**
Mission: Encapsulate ILW in cement matrix in 500-liter drums.
Capacity: 13 500-liter 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. R. Smith

Function: Supply fuel for U.K. reactors; UF_6 conversion to UO_2 powder/pellets production; PWR fuel fabrication; provide 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: 44-927-894040
Fax:

Ast. Dir., Geotech./Struc. Eng.
Seabed Disposal
Continental Disposal
Geotech. Division

Dr. J. B. Menzies
T. Freeman
Ms. C. M. Cooling
R. M. C. Driscoll

Waste Management R&D: Emplacement engineering and related activities; rock mechanics.

HMIP

H.M. Inspectorate of Pollution
Department of the Environment
Romney House, 43 Marsham Street
London SW1 3PY
United Kingdom

Tel: 44-71-276-8083
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, and NRPB; regulate discharge of radioactive materials to the environment.

IOS

Institute of Oceanographic Sciences
Brook Road, Wormley, Godalming
Surrey GU8 5UB
United Kingdom

Tel: 44-42-879-4141
Fax:

Director

Dr. C. Summershayes

Function: Modeling radioactive transport in the ocean.

MAFF

**Ministry of Agriculture,
Fisheries and Food
Ergon House, Room 231
c/o Nobel House
17 Smith Square
London SW1P 3JR, U.K.**

**Tel: 44-71-238-6170
Fax: 44-71-238-6215**

Chief Inspector

J. C. Sherlock

Function: Regulate, jointly with HMIP, management of waste prior to disposal.

**MAFF Fisheries Laboratory
Pakefield Road
Lowestoft, Suffolk NR33 0HT
United Kingdom**

Tel: 44-502-562244

Director, Research

D. J. Garrod

NI

**Nuclear Installations Inspectorate
Brynards House
1 Chepstow Place
Westbourne Grove
London W1 6TF**

**Tel: 44-71-243-6000
Fax: 44-71-727-4116**

Chief Inspector/Nuc. Installations

Sam Harrison

Function: Licensing of nuclear facilities.

NIREX

U.K. Nirex Ltd.
Curie Avenue, Harwell
Didcot, Oxon OX11 0RH
United Kingdom

Tel: 44-235-83-5153 or
44-285-83-3009
Fax: 44-235-83-1239

Managing Director
Technical/Projects

P. Tom McInerney
H. Beale

Function: Commission/manage research and development to propose (to the government) a site suitable for a deep repository for LLW/ILW; construct, 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.

NRPE

National Radiological
Protection Board
Chilton Didcot
Oxfordshire OX11 0RQ
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: Independent board, established in 1970 as a result of the Radiological Protection Act, members appointed by the Health Ministry; advice to governmental/industrial organizations on radiological protection matters and standards; contract research to improve radiological protection; some technical services.

x-USSR/CIS
**(Former Union of Soviet Socialist Republics/
Commonwealth of Independent States)**

In December 1991, the Commonwealth of Independent States (CIS) was established when the Union of Soviet Socialist Republics (USSR) ceased to exist. The CIS is comprised of the following 11 countries of the former USSR:

Armenia	Azerbaijan	Belarus	Kazakhstan
Kirgizstan	Moldova	Russia	Tajikistan
Turkmenistan	Ukraine	Uzbekistan	

The status of their organizations, programs, and facilities as they relate to the nuclear fuel cycle is rapidly changing. We have incorporated new information as it has become available. However, uncertainty regarding the nuclear fuel cycle data exists due to the enormity of the changes involved.

Future issues will reflect the changes as they become known. The current map reflects the recently renamed cities, but a new map will be included as soon as possible.

x-USSR/CIS

MAJOR PUBLIC HOLIDAYS (1992)

Jan	1	New Year
Jan	7	Christmas
Mar	8	Women's Day
May	9	Victory Day
Nov	7-8	October Revolution

TIME

Standard Time Washington, D.C. (Moscow)

+ 8 hours

Daylight Saving Time Period:

03/29 .. 09/26/92

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S.; in addition, a visa is currently required for a visit to the countries of the former USSR. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

The exchange rate is unlisted. Please consult your bank or travel agent.

DIRECT DIALING

Please note, not all telephones nor all areas in the former USSR are accessible to direct dialed international calls. It is suggested that you consult with your local long distance operator. However, you may direct dial to Moscow, using international access code 011. Telephone numbers for Moscow are complete as listed.

U.S. EMBASSY - MOSCOW

American Embassy
Ulitsa Chaykovskogo 19/21/23
Moscow, Russian Federation

Tel: 7-095-252-2450/-59
Fax:

Science Attaché

Robert Clarke

Population	1990	286 million
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ENERGY

Electric Power Capacity	1990	334 GWe
		11% nuclear

Electric Power Production	1990	1727 TWh
		12% nuclear

NUCLEAR POWER

Policy: Major program to develop nuclear power, to avoid transport of fossil fuels from east of the Ural Mountains to the more densely populated western areas.

Nuclear Power Capacity	1991	36.7 GWe
	1995	36.1 GWe
	2000	42.7 GWe

Reactor Mix	1991	LGR ^(a)	11 (1974-90)
		(b)	3 (1978-82)
		PWR ^(a)	12 (1972-89)
		(b)	12 (1981-89)
		FBR ^(a)	1 (1981)
		(c)	1 (1973)

Reactor Development	LMFBRs, advanced 1000-MWe PWRs
---------------------	--------------------------------

INDUSTRIAL FUEL CYCLE

Policy: Complete domestic fuel cycle capability, including enrichment, fuel fabrication (UO₂ and MOX), and reprocessing; complete fuel cycle services, including SF storage and LLW/ILW disposal; shift to PWRs (since Chernobyl accident in 1986).

(a) Russia (b) Ukraine (c) Kazakhstan

Waste Management Strategy: Spent nuclear fuels from PWRs are stored 3-10 years, followed by reprocessing to recycle fissile materials and separate a number of other specific radionuclides for beneficial uses and different disposition; HLW is vitrified for disposal in a future geologic repository; SF from RBMK (Soviet acronym for light-water-cooled, graphite-moderated) reactors are stored, pending decision on ultimate disposition.

Liquid LLW from nuclear reactor operations is currently incorporated, incorporated into bitumen or cement and stored and/or disposed of at disposal facilities at each reactor station. About 35 other, regional facilities exist for medical, industrial, and radioactive waste disposal; the Institute of Inorganic Materials in Moscow, actively involved in the LLW management program, 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 LLW, compacted at each nuclear power station, stored/disposed of at reactor sites; regional burial facilities are being 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, vitrification, and geologic disposal of radioactive wastes.

Member of IAEA and WANO.

ORGANIZATION

Nuclear Program Control

- Russian Federation Ministry for Atomic Energy--Minatom RF (civilian and defense nuclear fuel cycle; waste management); successor to MAPI (Ministry of Atomic Power and Industry).
- Russian 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 Russian Academy of Sciences (radionuclide migration; waste form properties).
- V. G. Khlopin Radium Institute, St. Petersburg (chemical separation; fuels reprocessing; geochemistry).
- Scientific Research Institute for Inorganic Materials, Moscow (disposal of HLW; properties of solid waste forms).
- Chemical Plant Research Institute, Ekaterinburg (vitrification pilot plants).
- Kurchatov Institute, Moscow (nuclear power R&D)

CHEMICAL PLANT RESEARCH INSTITUTE

**Chemical Plant Research Institute
Ekaterinburg
Russian Federation**

Facilities^(a)

- **KS-KT-100** (cold pilot plant-HLW vitrification)
Mission: Develop waste vitrification technology.
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.

KHLOPIN RADIUM INSTITUTE

**V. G. Khlopin Radium Institute
Prospect Shvernicksa 28
194021 St. Petersburg
Russian Federation**

**Tel: 7-812-247-5737
Fax: 7-812-534-7752**

Director-General	Prof. Alexander I. Karelin
Deputy Director	Dr. A. A. Rimsky-Korsakov
Department Manager	Prof. Yuriy V. Kuznetsov
	Prof. Anatoli S. Krivokhatski
Laboratory Manager	Dr. Valeriy N. Romanovskiy
	7-812-247-6522
	Dr. Albert S. Aloy
Chief Scientist	Leonard N. Lasarev

(contd next page)

(a) There is still only limited and sometimes conflicting information available regarding location and details of facilities.

KHILOPIN RADIUM INSTITUTE (contd)**Facilities^(a)**

Waste Management R&D: Development of SF treatment (reprocessing, thermal decladding, meltdown of hulls), improved HLW partitioning, waste immobilization, off-gases, and ⁸⁵Kr storage.

- **Ecology Laboratory** (located 90 km from St. Petersburg in Sosnovo Bor)
Studies conducted on ecological aftermath of Chernobyl; impact of radionuclides, assessment of dose/risk; methods for monitoring of radioactivity in the environment.
- **Reprocessing Research & Development Facility**
Mission: Develop LWR fuel reprocessing technology.
Design Basis: Chop-leach head-end; PUREX flowsheet; capacity, 3 kg/d uranium.
History: Startup, 1973.

KURCHATOV INSTITUTE

Russian Kurchatov Institute
Kurchatov Square 1
123182 Moscow
Russian Federation

Tel: 7-095-194-2969
Tlx: 411594 Shuga

Director
Nuclear Safety
Yuri P. Buzulukov

Evgeniy P. Velikhov
Ilya V. Elkin

Function: Until recently, primary nuclear power research institute (formerly the I.V. Kurchatov Institute of Atomic Energy); current mission not clearly identified; R&D on LLW/ILW, plasma physics.

(a) There is still only limited and sometimes conflicting information available regarding location and details of facilities.

MAYAK**Production Association 'MAYAK'**

Leninstr. 31

454065 Chelyabinsk-65

Russian Federation

Tel:

Fax:

Director

Deputy Director

Deputy Chief Engineer

Chief Engineer, Radiochem. Plant

Victor Fetisov

Oleg Tolstikhin

Evgeniy G. Drozhko

Evgeniy G. Dzekun

Location: Near city of Kyshtym.

Function: Nuclear complex with multitude of activities and facilities, including radiochemical processing, weapon materials production reactors, special waste storage and burial sites; produced first Soviet weapons-grade plutonium.

Facilities^(a)

- **Power Reactor Fuel Reprocessing Plant**

Design Basis: Started reprocessing VVER-440 reactor fuel in 1976, with about 2000 tU reprocessed to 1989.

- **Fully Radioactive HLW Vitrification Plant**

Design Basis: Single stage joule-heated ceramic melter with a feed rate of 500-liter/h; about 160 t of HLW phosphate glass was produced from 1987-1988; melter was shut down due to electrode problems; similar melter was modified and started operation in 6/1991. As of 4/1992, 50 MCi of HLW have been incorporated into phosphate glass.

(a) There is still only limited and sometimes conflicting information available, regarding location and details of facilities.

MINATOM

Ministry for Atomic Energy
of the Russian Federation
Staromonetny per.26
109180 Moscow, Russian Federation

Tel: 7-095-233-1718
Fax: 7-095-230-2420

Minister
Vice Minister
First Deputy Minister
International Relations
Dep. Minister, Nuclear Fuel Cycle
Dep. Minister, Isotope Production
Dep. Minister, Nuc.Power Plant Equip.
Dep. Minister, Engineering
Dep. Minister, Civil Construction

Viktor Mikhailov
Viktor Sidorenko
Vitaly F. Kononov
Mikhail N. Ryzhov
Nikolai N. Yegorov
Yuri Tychkov
Alexander Meskov
Alexander Usanov
Yevgeny Rishednikov

Function: Successor of MAPI, the former USSR Ministry of Atomic Power and Industry; established 1/92 on an interim basis; manages all aspects of nuclear power industry.

NPO RADON

NPO RADON
2/14, the 7th Rostovsky per.
119121 Moscow
Russian Federation

Tel: 7-095-248-1911
Fax:

Vice-General Director
Specialist

Dr. Sergey A. Dimitriev
Dr. A. P. Kobelyev

Function: Dispose of institutional radioactive/hazardous waste; R&D on waste treatment/conditioning; engineering design/support services; environmental protection services; special accident-related emergency services/investigations.

(contd next page)

NPO RADON (contd)**Facilities^(a)**

- **Zagorsk Disposal Site** (located 75 km NE of Moscow)
Largest facility (ca. 170 acres) with capacity for 3500 m³ (including 500 m³ liquids) waste per year (capacity at 15 other facilities < 1000 m³/a each); waste from scientific, industrial, medical and other producers; waste characteristics similar to reactor waste, including spent radiation sources, liquid concentrates, combustible liquids, highly active research reactor core components (with short-lived nuclides and limited alpha emitters); treatment/conditioning of wastes is by compaction, combustion, cementation, bitumenization, vitrification, and special immobilization in metal matrix; disposal is in engineered concrete in-ground structures.

**SCIENTIFIC RESEARCH INSTITUTE
FOR INORGANIC MATERIALS**

Scientific Research Institute
for Inorganic Materials

Ferganskaya 25
109507 Moscow
Russian Federation

Tel: 7-095-377-0104
Fax: 7-095-376-8333

Director
Deputy Director

M. I. Solonin
Sergee A. Polyakov

Function: HLW management and standards for disposal.

(a) There is still only limited and sometimes conflicting information available regarding location and details of facilities.

STATE CHERNOBYL COMMITTEE

State Chernobyl Committee
Republic Belarus
ul. Krasnoarmeistraiia 11
220030 Minsk
Byelorussia

Tel: 7-172-27-3679
Fax: 7-172-26-5942 or
7-172-29-3439

Committee Member

Dr. Valeri Efremenkov

**STATE COMMITTEE FOR SUPERVISION OF SAFETY
IN INDUSTRY AND NUCLEAR POWER (CSSSINP)**

State Committee for Supervision of
Safety in Industry/Nuclear Power
34, Taganskaya
Moscow, Russian Federation

Tel: 7-095-272-4710
Fax:

Chairman
Deputy

Vadim Malyshev
Anatoly Belayev

Function: Monitoring the operational safety of technical
installations.

STATE COMMITTEE FOR NUCLEAR SAFETY SUPERVISION

Ukrainian State Committee
for Nuclear Safety Supervision

Chairman

Nikolai Shteinberg

STATE COMMITTEE FOR NUCLEAR SAFETY SUPERVISION

Russian State Committee
for Nuclear Safety Supervision

Chairman

Yuri Vishnevsky

UNITED STATES

UNITED STATES

MAJOR PUBLIC HOLIDAYS (1992)

Jan. 1	New Year	Sep. 7	Labor Day
Jan. 20	M. L. King Day	Oct. 12	Columbus Day
Feb. 21	Presidents Day	Nov. 11	Veterans Day
May 5	Memorial Day	Nov. 26	Thanksgiving
July 4	Independence	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	NE - 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 LA-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.

Population	1990	248 million
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ENERGY

Electric Power Capacity	1989	719 GWe
		14% nuclear
	1990	726 GWe
		14% nuclear
	1995	758 GWe
		14% nuclear
	2000	828 GWe
		13% nuclear

Electric Power Production	1989	2954 TWh
		56% coal
		19% nuclear
		10% gas
		9% hydro.
		6% oil
	1990	19% nuclear
	1995	16% nuclear
	2000	15% nuclear

NUCLEAR POWER

Policy: Construction and operation of nuclear power stations is by private and public utilities under close regulatory control by the Nuclear Regulatory Commission (NRC) and state Public Review Commissions; R&D emphasizes increased inherent LWR safety and small, modular reactor concepts.

Nuclear Power Capacity	1991	102 GWe
	1995	104 GWe
	2000	105 GWe

Reactor Mix	1991	PWR	79 (1961-90)
			1 (1993)
		BWR	37 (1969-90)

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; spent fuel reprocessing is determined by the nuclear industry, which has elected not to reprocess because of economic considerations; disposal of spent fuel and HLW will be implemented in the future. Mining, milling, fabrication of UO_2 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.

Waste Management Strategy: Disposal of U.S. commercial spent fuel in a geologic repository is planned, after interim storage at reactor sites and possibly after interim storage in a monitored retrievable storage (MRS) facility; small amounts of existing commercial HLW and all defense HLW will be vitrified and disposed of in the SF repository; the Nuclear Waste Policy Act (NWPA) of 1982 and its 1987 amendments (NWPAA) mandate start of spent fuel acceptance in 1998 by the government for eventual disposal; short-lived LLW is disposed of in regional near-surface disposal facilities; states and regional compacts of states are developing new commercial LLW disposal facilities; demonstration of defense transuranic (TRU) waste disposal is planned in a geologic repository in a salt formation.

Cumulative Spent Fuel Arisings	1991	23,400 tHM
	1995	31,400 tHM
	2000	40,400 tHM

Major Milestones

- Demonstration starts of disposal of defense TRU waste at Waste Isolation Pilot Plant (WIPP) 1992
- Candidate site identified for MRS facility 1992
- States/compacts must have civilian LLW disposal capability or manage their own LLW 1993
- States not having LLW disposal capability must take title to all LLW produced within their state 1996
- Startup of MRS facility with limited SF acceptance 1998
- Construction start of geologic repository for commercial SF/HLW 2004
- Startup of repository for SF/HLW 2010
- Start of study on need for second repository for SF/HLW 2007-2010
- Completion of 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 U.K; a brief outline of DOE agreements, primarily related to waste management, is provided in the appropriate section of other countries in this report. 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 HLW, SF, TRU waste, and greater-than-class-C LLW; responsible 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 following offices:
 - **RW (Office of Civilian Radioactive Waste Management)** - After-reactor interim storage, transportation, and disposal of spent nuclear fuel and HLW; development of an MRS facility.
 - **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.
 - **IE (International Affairs and Energy Emergencies)** - Coordination of DOE's international activities.
 - **FO (Field Offices)** - Implementation of HQ policy and directives at DOE sites, issuing orders to specific sites; directing efforts of DOE contractors.
 - **Contractors** - Management and operations of DOE facilities in accordance with HQ and FO guidance and orders.
- **DOI (Department of the Interior)**
 - **USGS (U.S. Geological Survey)** - Laboratory and field geologic investigations.

(contd next page)

DOE ORGANIZATION (contd)

- DOT (Department of Transportation) - Development, issuance and enforcement of safety standards, governing aspects of hazardous materials transport including radioactive materials.
- 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; through agreements with states that so desire, delegation of licensing selected types of nuclear facilities.

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 - Office of International Affairs and Energy Emergencies
- Other Offices
- Field 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
 - LINL
 - SR - Savannah River
 - WSRC

NER (NUCLEAR REGULATORY COMMISSION) PARTIAL ORGANIZATION

**Chairman
Commissioners**

DOE-Headquarters

U.S. Department of Energy	Tel:	202-586-5000
Forrestal Building	Fax:	-5049
Washington, DC 20585	Verif:	-5100

U.S. Department of Energy	Tel:	301-903-4511
Germantown	Fax:	-3888
Washington, DC 20545	Verif:	-5465

Secretary	James D. Watkins
-----------	------------------

Office of Environmental Restoration and Waste Management

EM-1	Assist. Secretary	Leo P. Duffy	202-586-7710
	Deputy	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	-7705
EM-32	Site Operations	Larry H. Harmon	903-7105
-33	Program Support	James A. Turi	-7147
-34	Waste Mgmt. Projs.	Mark W. Frei	-7201
-35	Technical Support	Joseph A. Coleman	-7105
EM-40	Envir. Restoration	R.P. (Pat) Whitfield	586-6331
EM-42	Eastern Area	James J. Fiore	903-8141
-43	Program Support	William Wisenbaker	-8105
-44	Northwestern Area	Sally A. Mann	-8161
-45	Southwestern Area	Ralph G. Lightner	-8180
EM-50	Tech. Development	Clyde W. Frank	586-6382
50.1	Transp. Mgmt.	Susan H. Denny	903-7268
EM-52	Institutional and		
	Tech. Integration	Susan M. Prestwich	-7924
-53	Program Support		
	Intl. Tech. Exch.	Donald H. Alexander	-7954
-54	Research & Devel.	Steven C.T. Lien	-7911
-55	Demon. Testing/ Evaluation	Kathleen Hain	-7917

DOE-HQ (contd)**Office of Civilian Radioactive Waste Management**

RW-1	Director	John W. Bartlett	202-586-6842
RW-2	Dep. Director	Franklin G. Peters	-6850
RW-3	Quality Assurance	Donald G. Horton	-8858
RW-4	Strategic Plng/Intl.	Thomas H. Isaacs	-1252
	Intl. Coordn.	William J. Danker	-5624
	Intl. Coordn.	Renee M. Jackson	-2283
RW-5	External Relations	Jerome D. Saltzman	-2277
RW-10	Prog/Resource Mgmt	Samuel Rouso	-9116
RW-20	Geologic Disposal	Carl P. Gertz	702-794-7920
	YMPO	(As noted below)	
RW-30	Syst. & Compliance	Dwight D. Shelor	202-586-6046
RW-40	Storage & Transp.	Ronald A. Milner	-9694

Yucca Mountain Site Characterization

Project Office (YMPO)	Tel:	702-794-7900
Phase 2, Suite 200	Fax:	-7907
101 Convention Ctr. Dr.	Verif:	-7919
Las Vegas, NV 89109		

Manager	Carl P. Gertz	702-794-7920
Dep. Proj. Mgr.	Maxwell B. Blanchard	-7939
Institutnl. Affrs.	A. C. (Ace) Robinson	-7593
Intl. Programs	Robert A. Levich	-7946
Reg./Site Evals.	J. Russell Dyer	-7586
Eng. Develop.	William B. Simecka	-7933
Proj./Oper. Cntrl.	Wendy R. Dixon	-7947
Quality Assurance	Richard E. Spencer	-7504
YM Site Office	Wynfred A. Wilson	702-295-5914

Office of International Affairs and Energy Emergencies

IE-1	Assistant Secretary	John J. Easton, Jr.	202-586-5800
IE-2	Prin. Dep. Asst. Sec.	Arlean I. Erdahl	-5858
IE-10	Deputy Asst. Sec.	Richard Williamson	-5918
IE-12	Intl. R&D Policy	Harold Jaffe	-6770

DOE FIELD OFFICES**ALBUQUERQUE FIELD OFFICE (AL)**

U.S. Department of Energy	Tel:	505-845-4154
Albuquerque Field Office	Fax:	-6058
P.O. Box 5400	Verif:	-6319
Albuquerque, NM 87115		

Manager	Bruce G. Twining	845-6049
Energy/Special Programs	James Bickel	-4829
Uranium Mill Tailings	Albert Chernoff	-4628
Waste Isolation Pilot		
Plant Project	W. John Arthur	-5985

DOE Rocky Flats Office (Denver Site)

Rocky Flats Plant	Tel:	303-966-7000
P.O. Box 464	Fax:	-4092
Golden, CO 80402-0464	Verif:	-2719

Manager	Robert M. Nelson, Jr.	966-2025
Deputy Manager	David P. Simonson	-2025
Dir. Env. Restoration	Richard Schassburger (A)	-4888

CHICAGO FIELD OFFICE (CH)

U.S. Department of Energy	Tel:	708-972-2000
Chicago Field Office	Fax:	-2343
9800 South Cass Avenue	Verif:	-2209
Argonne, IL 60439		

Manager	David T. Goldman (A)	972-2110
Waste Mgmt./Tech. Devel.	Joel C. Haugen	-2093
Envir. Restoration	Jay Hunze	-2428
Technical Support	Antanas Bindokas	-2692

IDAHO FIELD OFFICE (ID)

U.S. Department of Energy

Idaho Field Office

785 DOE Place

Idaho Falls, ID 83402

Tel: 208-526-0111

Fax: 583-1405

Verif: -1503

Manager

Augustine A. Pitrolo 526-1322

Deputy Mgr. Operations

G. C. Bowman (A) -1324

Asst. Mgr. Nuclear Programs

Robert M. Stallman -1995

Dir. Matls. 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

T. F. Burns -7655

Waste Management

W. N. Sato (A) -0577

West Valley Proj. (NY Site)

Thomas J. Roland 716-942-4312

Process Technology

W. Stephen Ketola 208-526-4314

NEVADA FIELD OFFICE (NV)

U.S. Department of Energy

Nevada Field Office

P.O. Box 98518

Las Vegas, NV 89193-8518

Tel: 701-295-1212

Fax: -1371

Verif: -1369

Manager

Nick C. Aquilina 295-3211

Environmental Protection

Don Elle -1146

OAK RIDGE FIELD OFFICE (OR)

U.S. Department of Energy

Oak Ridge Field Office

P.O. Box 2001

Oak Ridge, TN 37831

Tel: 615-576-5454

Fax: -1063

Verif: -1058

(contd next page)

OAK RIDGE FIELD OFFICE (contd)

Manager	Joe La Grone	615-576-4444
Dir. Energy Prog. Div.	Thomas Jelinek	-0710
Dep. Asst. Mgr. Energy		
Research & Dev.	Ronald Hultgren	-4523
Laboratory Operations	Connor Matthews	-1373
Fusion/Nuclear Tech.	Martha J. Rohr	-0717
Waste Oper. & Tech. Dev.	Doug Underwood	-9855
Dir. Waste Mgmt. Div.	Larry Radcliffe	-0732

RICHLAND (HANFORD) FIELD OFFICE (RL)

U.S. Department of Energy
 Richland Field Office
 825 Jadwin Avenue
 P.O. Box 550
 Richland, WA 99352

Tel: 509-376-7411
 Fax: -6540
 Verif: -7317

Manager	John D. Wagoner	509-376-7395
Principal Deputy Manager	J. Phillip Hamric	-6278
Office of Compliance	R. Pierre Saget	-2611
Tank Farms Project	Ron E. Gertou	-9106
Asst. Mgr. Operations	John R. Hunter	-7434
Waste Management	June M. Hennig	-1366
Operations Div.	James E. Mecca	-7471
Asst. Mgr. Tech. Support	John J. Keating	-7387
Technical Support Div.	Richard A. Holten	-7461
Safeguards/Security Div.	Joe W. Wiley	-7441
Deputy Mgr. Environment	Willis W. Bixby	-0024
Asst. Mgr. Envir. Mgmt	Leo E. Little	-6628
Environmental Restoration	E. (Liz) A. Bracken	-7277
Research & Development	Joe J. Sutcy	-7770
Asst. Mgr. Projects	Larry C. Williams (A)	-4131
Asst. Mgr. Tank Waste Disp.	John H. Anttonen	-7591
Treatment Projects	Robert W. Brown	-7391
Treatment Programs	Leif Erickson	-1758
Technology/Compliance	Steve T. Burnum	-8409
Program Integration	Eugene W. Higgins	-2536

SAN FRANCISCO FIELD OFFICE (SAN)

U.S. Department of Energy
San Francisco Field Office
1333 Broadway
Oakland, CA 94612

Tel: 415-273-4237
Fax: -6207
Verif: -7956

Manager	Donald Pearman	273-7111
Waste Management	Daniel Nakahara	-8394
Envir. Safety & Support	William Holman	-6370

SAVANNAH RIVER FIELD OFFICE (SR)

U.S. Department of Energy
Savannah River Field Office
P.O. Box A
Aiken, SC 29801

Tel: 803-725-6211
Fax: -2033
-1259

Manager	Peter M. Heckman, Jr.	725-2277
Asst. Mgr. for Envir. Restoration & Waste Mgmt.	L. C. Sjoström	-1378
Deputy Asst. Manager	A. Lee Watkins	-1379
Dir. Solid Waste Div.	Michael G. O'Rear	-5541
Dir. Envir. Restoratr. Div.	Lewis C. Goldell	-3966

DOE CONTRACTORSANL

Argonne National Laboratory	Tel:	708-972-2000
9700 South Cass Avenue	Fax:	-2343
Argonne, IL 60439		-2206
	Verif:	-2209

Director	Alan Schriesheim	972-3872
Waste Mgmt. Program	James E. Helt	-7335
Separations Sci. & Tech.	George Vandegrift	-4513
Pyroprocessing	James Battles	-4383
Special Projects	Charles E. Klotz	-6385
ANL-West (ID), ALD	Charles E. Till	208-533-7000

Fuel Cycle and Waste Management Activities: Remedial action for formerly-used AEC sites (FUSRAP) and for surplus facilities management program (SFMP); D&D of ANL-East (Argonne, Illinois) contaminated facilities; Materials Integration Office; Mixed waste treatment and disposal, groundwater treatment; LLW/TRU waste technology; TRUEX process development; Pyrometallurgical 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.

Major Facilities

ANL-East (Argonne, IL): High-Level Hot-Cell Facilities; Large Gamma Radiation Facility; Alpha-Gamma Hot-Cell Facility (AGHFC).

ANL-West (Idaho Falls, ID): 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 (FCF, HFEF/S).

BATTELLE

Battelle - Columbus Operations
505 King Avenue
Columbus, OH 43201

Tel: 614-424-6424
Fax: -5263
Verif: -4182

Energy Systems

VP/General Manager	Richard A. Nathan	424-4295
LLW Programs	Wayne A. Carbiener	-4507
Technology Development	Walter E. Newcomb	-4318
Nuclear Safety	Richard S. Denning	-7412
Chemical Process Safety	Fred L. Leverenz	-4623
Energy Syst. Tech.	Walter E. Newcomb (A)	-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; Regulatory compliance.

Hazardous Chemical and Mixed Waste Activities: Transportation; Risk assessment; Modelling; Regulation; Waste management; Policy support; Regulatory Compliance.

BNL

Brookhaven National Laboratory
Associated Universities, Inc.
Upton, NY 11973

Tel: 516-282-2123
Fax: -3000
Verif: -2547

Director	N. P. Samios	282-2772
LLW (DOE)	Peter Soo	-4094
HLW (DOE)/LLW (NRC)	Peter Colombo	-3045

Fuel Cycle and Waste Management Activities: Low-level waste form evaluation; Waste management criteria.

Major Facilities: Hot and Cold Development Laboratories.

INEL**Idaho National Engineering Laboratory**

EG&G Idaho, Inc.

P.O. Box 1625

Idaho Falls, ID 83415

Tel: 208-526-0111

Fax: -9591

Verif: (recipient)

Manager

James C. Oleson

526-9671

Waste Management

Harry P. Mann

-1014

Power Reactor Prog.

Frank C. Fogarty

-8742

Waste Tech. Dev.

Robert R. Stiger

-8505

Fuel Cycle and Waste Management Activities: National LLW technology; D&D (EBR-II, MTR, OMRE, Spent Reactors); TMI-2 R&D; Operation of SWEPP for TRU waste; LLW disposal operation; Cask systems development; SF 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) for TRU wastes; Test Area North Spent Fuel Storage Area (TAN); Advanced Test Reactor (ATR).

LANL**Los Alamos National Laboratory**

University of California

P.O. Box 1663

Los Alamos, NM 87545

Tel: 505-667-5061

Fax: -1754

Verif: -5113

Director

Siegfried S. Hecker

667-5101

Dir. Applied

Envir. Technologies

Jim P. Shipley, Jr.

-2211

Nuc. Waste Mgmt. R&D

Richard J. Herbst

-4960

Fuel Cycle and Waste Management Activities: Fundamental studies of waste materials (BES); Migration from LLW (BES); D&D of various site facilities; HLW disposal site characterization (RW).

(contd next page)

LANL (contd)

Major Facilities: Waste Disposal Field Experimental Facility; Controlled Air Incinerator Demonstration Facility; Glove Box Reduction Facility; TRU Waste Assay Systems; Advanced Testing Line for Actinide Separations (ATLAS).

LLNL

Lawrence Livermore National
Laboratory

University of California
P.O. Box 808
Livermore, CA 94550

Tel: 415-422-1100
Fax: -1370
Verif: -4546

Director	John H. Nuckolls	422-5435
Dir. YMSCP	Leslie Jardine	-5032
Technical Manager	Lyndon Ballou	-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 potential tuff repository; Waste package design criteria; Monitoring techniques for geologic repositories; Geochemical code for potential 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	Fax: -3742
Miamisburg, OH 45343	Verif: -3575

General Manager	Donald E. Michel	865-5090
Tritium Technology	Eric T. Kirk	-4842
D&D	Ralph R. Jaeger	-3275
Waste Management	James F. Griffin	-3831

(contd next page)

MOUND (contd)

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 scrap; D&D of ²³⁸Pu facilities.

Major Facilities: Glass Melter; Waste Treatment Facility; Combined Electrolysis Catalytic Exchange System (CECE); Tritium Effluent Recovery System (ERS); Hydrogen Isotope (Cryogenic Distillation) Separation System (HISS); Tritium Aqueous Waste Recovery System (TAWRS).

ORNL

**Oak Ridge National Laboratory
Martin Marietta Energy**

**Systems, Inc.
P.O. Box 2008
Oak Ridge, TN 37831**

**Tel: 615-576-5454
Fax: -2912
Verif: -6068**

Director	Alvin Trivelpiece	576-2900
Dir. Waste Mgmt. & Remedial Actions	Gene McNees	-7456
Dir. Robotics & Process Systems	Sam Meacham	-7065
Dir. OCRWM Programs	Ronald Pope	-6461
Dir. Waste R&D Prog.	Tony Malinauskas	-1092

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.

(contd next page)

ORNL (contd)

Major Facilities: LLW Disposal/Storage Facilities; Waste Examination Assay Facility (WEAF); 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
Laboratories

Battelle Boulevard
P.O. Box 999
Richland, WA 99352

Tel: 509-375-2121
Fax: 376-3876
Verif: (recipient)

Director	William R. Wiley	375-2201
Waste Technology Center	Jack L. McElroy	6-6253
Waste Treatment Technology	Harry C. Burkholder	6-3090
Waste Process Engineering	Charles R. Allen	6-1712
Waste Systems	Gary W. McNair	5-6537
Intl. Program Support	Sue J. Mitchell	5-6479
Reactor Technology Center	Bill D. Shipp	5-2921
Envir. Mgmt. Operations	David B. Van Leuven	6-8679
Matls. & Chem. Sciences	Walter W. Laity	5-2780
Molecular Sciences Res.	Michael L. Knotek	5-2272
Laboratory Programs	J. Adrian Roberts	5-2614
Environmental Technology	Mark S. Hansen	5-6812

(contd next page)

PNL (contd)

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 potential Yucca Mountain repository and Performance Assessment Scientific Support (PASS) studies; HLW technology; TRU waste 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.

Rocky Flats Plant

P.O. Box 464

Golden, CO 80402-0464

Tel: 303-966-7000

Fax: -7183

Verif: -2272

General Manager

J. O. Zane

966-4361

Waste Operations

R. V. Morgan

-5012

Waste Minimization

Mark D. Shepard

-4014

Technology Development

R. J. Merlini

-6477

Fuel Cycle and Waste Management Activities: Defense TRU waste technology; LLW technology development; Waste treatment facilities operation; TRU/LLW minimization technology.

Major Facilities: Solid Waste Reduction Facility; TRU Waste Supercompaction; TRU Waste Assay; Liquid Waste Treatment and Fixation Facilities; Microwave Melting of Liquid Waste Treatment Sludges.

SNL

Sandia National Laboratory
P.O. Box 5800
Albuquerque, NM 87185-5800

Tel: 505-844-5678
Fax: -1068
Verif: -8917

President	Al Narath	844-7261
VP Energy & Environment	Dan Hartley	5-9488
Energy & Environ. Sector	Thomas O. Hunter	4-3763
Envir. & Transportation	Joan Woodard	5-9917
Nuclear Waste Mgmt.	Dori Miller	4-2964
Nuclear Energy Technology	Nestor Ortiz	4-0577
Reactor Engineering	Jim Rice	5-7301

Fuel Cycle and Waste Management Activities: ER/WM technology development, radioactive waste management (Yucca Mountain, WIPP, Greater Confinement Disposal, LLW), waste management strategic planning, reactor safety, new production reactor, reactor engineering technology.

Major Facilities: Research reactors and numerous test facilities.

SRS

Savannah River Site
Westinghouse Savannah
River Co. (WSRC)
P.O. Box 616
Aiken, SC 29802

Tel: 803-725-6211
Fax: -1780
-3945
Verif: -1555

VP/Gen. Mgr. Waste Mgmt.
& Environ Restoration
Mgr. Waste Mgmt
Mgr. DWPF
Mgr. Envir. Remediation

Norm F. Boyter 725-2585
G. Todd Wright -1527
David B. Amerine -1050
James M. Pope -1420

Fuel Cycle and Waste Management Activities: Operate fuel reprocessing facilities; Operate associated spent fuel storage, HLLW tank storage, and treatment facilities for defense waste; Operate LLW shallow-land burial grounds; Start-up and operate DWPF; Store mixed waste; Site remediation.

SRS (contd)

Major Facilities (existing and planned): Defense 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 Technology Center

Fax: 803-725-1660
Verif: -2304

VP/Director

Richard T. Begley

725-3422

Waste Mgmt. & Envir. Tch.

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; Mixed/Hazardous Waste Technology Development; Groundwater Remediation Technology Development.

Major Facilities: HLW Vitrification Pilot Plant; HLW Tank Mockup; HLW Caves for Process Development; Groundwater Remediation Demonstration; Bioremediation Demonstration.

TRW**TRW Environmental Safety
Systems Inc.****2650 Park Tower Drive
Vienna, VA 22180****Tel: 703-204-8500
Fax: -8580****Mailing Address****One Federal Systems Park Dr.
Fairfax, VA 22033**

President & General Mgr.	Roland L. Robertson	204-8600
Asst. Gen. Mgr. Operins.	Ray W. Godman	-8605
Asst. Gen. Mgr. Systems	Art B. Greenberg	-8610
Nevada Site Manager	L. Dale Foust	702-794-1804
	Fax:	-1843

Function: Management and Operating Contractor (M&O) for the DOE Office of Civilian Radioactive Waste Management (OCRWM); supports OCRWM through systems engineering, design, development, and technical direction of the Civilian Radioactive Waste Management System. The OCRWM mission is permanent disposal of the nation's spent nuclear fuel and HLW 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	Fax:	-4668
Richland, WA 99352	Verif:	-5777

President	Thomas M. Anderson	376-5107
Executive VP	Ralph R. DiSibio	-7803
VP Facility Operations	Ronald J. Bliss	-6427
VP Tank Waste Remediation		
System Div.	Harry D. Harmon	373-4724
Tank Waste Remedial System		
Projects/HWVP	Robert A. Smith	376-8041
HWVP Technology	E. Thomas Weber	6-9181
Tank Waste Disposal	Denny J. Newland	2-0425
VP Eng. Applications	Michael K. Korenko	6-9992
Nuclear Process Engr.	Eric W. Gerber	6-9356
Processing/Anal. Labs	Eugene J. Kosiancic	3-1594
Character/Waste		
Minimization	Rod W. Powell	376-9618
Dir. Restoration Remed.	Henry E. McGuire	-1400
Environmental Div.	Ronald E. Lerch	-5556
Tri-Party Agreement	Timothy B. Veneziano	-0543
Solid/Liquid Waste Disp.	William H. Hamilton	-4596
Dir. Environment, Safety,		
Health/QA	Kenneth R. Jordan	-3692

Fuel Cycle and Waste Management Activities: Hanford site operating contractor HLW tank storage; Cs/Sr recovery and encapsulation; HLW concentration and solidification; Liquid LLW treatment and fixation; TRU waste assay; Hanford waste disposal; D&D of 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, shut down 4/92); Fuel Development Laboratories.

WINCO

Westinghouse Idaho Nuclear Co., Inc.
 Idaho Chemical Processing Plant
 P.O. Box 4000
 Idaho Falls, ID 83403

Tel: 208-526-0111
 Fax: -3499
 Verif: -3506

President	W. C. Moffitt	526-0998
Production	L. F. Ermold	-4628
Technology	Bert R. Wheeler	-3373

Fuel Cycle and Waste Management Activities: Operate associated spent fuel storage, naval and test reactor fuel reprocessing, HLW tank storage, HLLW calcining facilities, and associated environmental restoration and compliance.

Major Facilities: Idaho Chemical Processing Plant (ICPP); Fuel Reprocessing, Uranium Recovery, HLLW Storage. New Waste Calcining Facility (NWCF) and Remote Mockup; Wet and Dry Fuel Storage; Kr-85 Cryogenic Recovery.

WIPP

Waste Isolation Pilot Plant
 Westinghouse Electric Corporation
 Advanced Energy Systems Division
 P.O. Box 2078
 Carlsbad, NM 88221

Tel: 505-887-8100
 Fax: -0707
 Verif: -8110

Proj. (DOE) Mgr. WIPP Site	Arlen E. Hunt	-8101
Operations (WEC) Mgr.	A. L. Trego	-2200
Nuclear Waste (SNL)		
Technical Mgr.	Wendell D. Weart	844-4855

Fuel Cycle and Waste Management Activities: WIPP construction technical support, including design review, construction, safety assurance, operational planning and 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 defense waste.

WVNS

West Valley Nuclear Services, Inc.	Tel:	716-942-3235
P.O. Box 191	Fax:	-4376
West Valley, NY 14171-0191	Verif:	-4367

President	William G. Poulson	-4344
VP/Deputy Project Mgr.	James L. Little	-4570

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	Tel:	202-260-2090
401 M Street S.W.	Fax:	-7883
Washington, DC 20460	Verif:	-2078

International Activities

Assistant Administrator	Timothy B. Atkinson	260-4870
Multilat. Staff Dir.	Alan Sielen	-4875

Radiation Programs

Director	Margo T. Oge	260-9600
Criteria Stnds. Div.	J. William Gunter	703-308-8777
Waste Mgmt. Standards	Floyd L. Galpin	260-9633

Solid Waste

Director	Sylvia Lowrance	260-4627
Dep. Dir. State Programs	Matthew Hale	-4746

Function: Establish and enforce general standards for environmental protection related to radioactive and hazardous waste.

EPRIElectric Power Research Institute

3412 Hillview Avenue	Tel:	415-855-2000
P.O. Box 10412	Fax:	-1026
Palo Alto, CA 94303	Verif:	-2372

President	Richard Balzhiser	855-2141
VP/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	Robert Williams	-5064

(contd next page)

EPRI (contd)

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	Fax:	504-2260
	Verif:	-2262

Chairman	Ivan Selin	492-1759
Commissioner	Kenneth C. Rogers	-8150
Commissioner	James R. Curtiss	-1875
Commissioner	Forrest Remick	-1820
Commissioner	E. Gail de Planque	-1800

Office of International Programs (OIP)

Director	Harold R. Denton	492-1780
Deputy Director	Sheldon A. Schwartz	-1771
Policy & Program Dev.	James R. Shea	-2347
Coop. Exchange Prog.	Albert P. Kenneke	-2336
Exports/Security/Safety	Ronald D. Hauber	-2344

Nuclear Material Safety and Safeguards (NMSS)

Director	Robert M. Bernero	492-3352
HLW Management	B. Joe Youngblood	-3404
LLW Mgmt/Decommiss.	Richard L. Bangart	-3340
Safeguards/Transp.	Robert F. Burnett	-3365
Indust./Medical		
Nuclear Safety	R. E. Cunningham	-3426

(contd next page)

NRC (contd)**Nuclear Reactor Regulation (NRR)**

Director	Thomas E. Murley	301-492-1270
Reactor Projects I/II	Steven A. Varga	-1403
Reactor Projects III/IV/V	Bruce A. Boger	-1354
Adv. Reactors/Special Proj.	Dennis M. Crutchfield	-1199
Systems Technology	Ashok C. Thadani	-2884
Engineering Technology	James Richardson	-2722
Operational Events Assoc.	Charles E. Rossi	-1163
Reactor Insp./Safeguards	Brian K. Grimes	-2903
Rad. Prot./Emerg. Prep.	Frank J. Congel	-1088
Lic. Perform./Qual. Eval.	Jack W. Roe	-1004

Nuclear Regulatory Research (RES)

Director	Eric S. Beckjord	492-3700
Engineering	Lawrence C. Shao	-3800
Safety Issues Resolution	Warren Minners	-3900
Systems Research	Brian Sheron	-3500
Regulatory Applications	Bill M. Morris	-3750

Regional Offices**San Francisco - Region III**

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 Francisco - Region V	John B. Martin	510-975-0335

Function: Issue regulations and licenses and enforce them for commercial nuclear activities and disposal of spent fuel and HLW, in compliance with general environmental standards issued by the EPA; carry out R&D to support regulatory function.

NWTRB

U.S. Nuclear Waste Technical

Review Board
1100 Wilson Boulevard, Suite 910
Arlington, VA 22209

Tel: 703-235-4473
Fax: -4495
Verif: -4473

Chairman
Executive Director
Dir. External Affairs

John E. Cantlon
William D. Barnard
Paula N. Alford

Function: Established by Congress in the Nuclear Waste Policy Amendments Act of 1987 to provide independent review of DOE's technical and scientific program for the disposal of commercial spent nuclear fuel and defense HLW. At full complement, eleven members will be appointed by the President to serve on the Board.

ONWN

Office of the U.S. Nuclear
Waste Negotiator
Headquarters, PO Box 777
Boise, ID 83777

Tel: 208-334-9876
Fax: -9880
Verif: -9876

Negotiator
Chief of Staff

David H. Leroy
Chuck B. Lempesis

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 an MRS facility or permanent repository for HLW. Authorized to negotiate with interested potential hosts to determine the terms and conditions under which they would agree to serve as host.

(contd next page)

ONWN (contd)

ONWN Washington Liaison Office	Tel:	202-634-6244
1823 Jefferson Place, N.W.	Fax:	-6251
Washington, DC 20036	Verif:	-6244

Counsel	Robert M. Mussler
Assistant to the Negotiator	Bradley J. Hoaglund

USGS

U.S. Geological Survey	
410 National Center	Tel: 703-648-4000
12201 Sunrise Valley Drive	Fax: -5295
Reston, VA 22092	Verif: -5235

Director	Dallas L. Peck	648-7411
Asst. Dir./Eng. Geology	James F. Devine	-4423
Nuclear Waste Hydrology		
HLW	Newell J. Trask	-5719
LLW	Peter R. Stevens	-5721
Toxic Waste	Gail Mallard	-6872

YMP (Denver Office)	
Technical Proj. Officer	Larry R. Hayes 303-776-0515

Fuel Cycle and Waste Management Activities: Basic/applied research on hydrogeologic processes relevant to radioactive and toxic waste disposal; geologic/hydrologic investigations to determine suitability of potential HLW repository site at Yucca Mountain; site investigations/research at DOE and DOD installations and EPA superfund sites; consultant for EPA, DOE, DOD, Dept. of Agriculture (DOA), Bureau of Land Management (BLM), Mines (BOM), Reclamation (BOR), 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**

Filippo Naria Pandolfi

Director-General, Science/R&D

Paolo Fasella

Director-General, JRCs, Deputy

Jean-Pierre Contzen

Director General, Science/R&D

Sergio Finzi

Director, Nuclear R&D

32-2-235-9177

Division, Fuel Cycle

Serge Orłowski

32-2-235-4063

R&D Program RWM

Henning von Maravic

Safety Studies

Nicolo Cadelli

Waste Form R&D

Karl Schaller

R&D Program Decommissioning

Rainer Simon

Nuclear Installation

32-2-235-6623

Division, Nuclear Plant Safety

Emilio L. Menchero

Division, Radiological Protection

Jaak Sinnaeve

**Director, Nuclear Safety, Industry/
Environment, Civil Protection**

Edward Bennett

32-2-235-2251

Division, Radiation Protection

Hans Eriskat

Division, Envir. Monitoring

F. Luykx

Director, Euratom Safeguards

Wilhelm Gmelin

32-2-352-4301

-2211

Dir. Gen., Euratom Supply Agency

Michael Goppel

32-2-235-7894

MEMBER STATES - EUROPEAN COMMUNITY (EC)

Belgium

Greece

Netherlands

Denmark

Italy

Portugal

France

Ireland

Spain

Germany

Luxembourg

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 and partly (50%) funded by CEC HQ under cost-sharing contracts; conducted by research centers, universities, and industries in the Member States:
 - Decommissioning of Nuclear Installations
 - Radioactive Waste Management and Disposal
 - 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 on R&D.

CEC-JRC: ISPRA

CEC Joint Research Center
Ispra Establishment
21020 Ispra (Varese)
Italy

Tel: 39-332-78-9111
Fax: 39-332-78-9045

Location: Northern Italy; may be reached by air travel to Milan, ground transport to Ispra, about 50 km.

Safety Technology
Nuclear Fuel Cycle R&D

H. Holtbecker
H. Dworkin

Waste Management R&D: R&D in treatment and storage of radioactive waste; volume reduction and conditioning TRU wastes; actinide separation; nuclide assay in wastes.

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 KIK in Linkenheim, near Karlsruhe.

Function: Basic research in the transuranium elements, especially plutonium, reactor fuels development; R&D on actinide partitioning and transmutation.

Fuel Cycle R&D: Plutonium conversion and plutonium fuels.

Waste Management R&D: Characterization of vitreous HLW forms and SF when considered as waste.

Safeguards R&D: Fissile material solution analyses.

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****Head, Nuc. Mtl./Fuel Cycle Tech.****Hans Blix****Boris Semenov****Jia-Luo Zhu****Donald E. Saire****Michael J. Bell****Candice Y. Chan****Norubu Oi****Dep. Dir.-Gen. Safeguards****Dep. Dir.-Gen. Tech. Cooperation****Dep. Dir.-Gen. Research/Isotopes****Dep. Dir.-Gen. Administration****Jon Jennekens****bin Muslim Noramly****Sueo Machi****William J. Dirks****MEMBER STATES****116 nations (U.N. members, including the U.S.).****FUNCTION**

Develop peaceful uses of atomic energy, safeguards, nuclear safety and standards, information exchange, and technical cooperation and assistance; ensure that 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 in 1957, directed by a Board of Governors (composed of representatives from 34 member states) and a General Conference (consisting of the entire membership).

IAEA (contd)**WASTE MANAGEMENT ACTIVITIES**

- Collection, preparation, review and dissemination of technical and scientific information in
 - 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 management
 - waste management database/infrastructure.
- Development of internationally accepted standards, guidelines, and codes of practice for use by national authorities.
 - Radioactive Waste Safety Standards (RADWASS) Program, a series of international consensus documents on the safe management and disposal of radioactive waste.
- Protection of the environment by fulfilling responsibilities under international conventions.
- Promotion and sponsorship of research work and development of data and technology.
- Technical cooperation, assistance, peer reviews, and training for Member States upon request; including:
 - Waste Management Advisory Program (WAMAP) to developing Member States.
 - International peer review (WATRP) to developed Member States.

U.S. Mission to IAEA (UNVIE)
Obersteinergasse 11
1190 Vienna
Austria

Tel: 43-222-36-3152
Fax: 43-1-364-1585

Nuclear Policy
Nuclear Technology
Safeguards

Michael J. Lawrence
Bruce Cooper
Marvin Peterson

ICRP

**International Commission
on Radiological Protection
Clifton Avenue
Sutton, Surrey SM2 5PU
United Kingdom**

**Tel: 44-81-642-4680
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
Dep. Secretary General**

**Jean Claude Paye
Robert A. Cornell
Pierre Vinde
M. Taniguchi**

**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
Le Seine-Saint-Germain
12 Boulevard des Isles
92130 Issy-Les-Moulineaux
France

Tel: 33-1-45-24-11-12
Fax: 33-1-45-24-11-10

Director General

Kunihiko Uematsu
33-1-45-24-10-00

Deputy Director General

Samuel Thompson
33-1-45-24-10-02

Deputy Dir., Safety/Regulation

Klaus Stadie
33-1-45-24-10-04

Radiation Protection/Waste Mgmt.

Jean-Pierre Olivier
33-1-45-24-10-40

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NEA Data Bank

Nigel Tubbs

Nuclear Development

Geoffrey Stevens
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MEMBER STATES

Australia	Austria	Belgium	Canada
Denmark	Finland	France	Germany
Greece	Iceland	Ireland	Italy
Japan	Luxembourg	Netherlands	Norway
Portugal	Spain	Sweden	Switzerland
Turkey	U.K.	U.S.	

FUNCTION

Promote orderly development of peaceful uses of nuclear energy through cooperation among Member States. Initiate, encourage, and coordinate cooperative work in reactor and nuclear fuel cycle studies, radiation protection and waste management, nuclear safety, regulatory matters, and nuclear data collection.

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OECD/NEA (contd)

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.
- Coordinating Group on Site Evaluation and Design of Experiments for Radioactive Waste Disposal (SEDE) - Established in 1990, forum for discussions of site characterization issues and promotion of specific studies in this area.
- Probabilistic System Assessment Group (PSAG) - Initiated in 1985; provides a broad forum for discussion and development of probabilistic safety assessment codes; sponsors code intercomparison exercises; reports to the RWMC on the technical aspects of such codes.

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OECD/NEA (contd)

- Liaison Committee for Co-operative Program on Decommissioning
Participants: Belgium, Canada, France, Germany, Italy, Japan, Spain, Sweden, U.K., U.S.
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 (ARAP)
Participants: Australia, Japan, Sweden, U.K., U.S.
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.

- Committee on Radiation Protection and Public Health (CRPPH)
 - 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, U.K., U.S., IAEA; IMO is an associate member.
Term: 1981-1995.
Scope: Investigate oceanographic and biological characteristics of the northeast Atlantic disposal site and perform related scientific work; as of 1987, extended to cover land-based discharges.

- Committee for Tech./Econ. Studies on Nuclear Energy Development and Fuel Cycle (NLC)
 - 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.

PARTIAL NEA ORGANIZATION

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Kunihiko Uematsu

Dep. Dir. General
Samuel Thompson

Safety and Evaluation
Klaus Stadie

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- CRPPH - Committee for Radiation Protection/
Public Health
- RWMC - Radioactive Waste Management
Committee

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Donald McPherson

Jacques Royen

- CSNI - Com. Attlee for Safety of Nuclear Installations
- CNRA - Committee for Nuclear Regulatory Activities

Nuclear Development
Geoffrey Stevens

James Jonsten

Pierre Girouard

- NDC - Committee for Technical/Economic Studies
on Nuclear Energy Development/Fuel Cycle

Science and Information Processing
Johnny Rosen

Nigel Tubbs

- CRP - Committee for Reactor Physics
- NDC - Nuclear Data Committee

NUCLEAR SOCIETIES

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GLOSSARY

ORGANIZATIONS, FACILITIES TECHNICAL AND OTHER TERMS

ORGANIZATIONS AND FACILITIES

Page

A

ABUS	Waste treatment plant	GE-22
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/RS	AEA Reactor Services	UK-11
AEA/S&R	AEA Safety & Reliability	UK-10
AEB	Atomic Energy Bureau	JA-8
AEB	Atomic Energy Office	KS-4
AEC	Atomic Energy Commission	IN-6
		JA-8
		KS-4
AEC	Atomic Energy Corporation	SF-3
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-6
AESJ	Atomic Energy Society of Japan	INTL-14
AGHFC	Alpha-Gamma Hot-cell Facility	US-14
AGIP	Nuclear fuel company	IT-2
AMOR-II	Uranium recovery facility	GE-22
ANA	Australian Nuclear Association	INTL-11
ANDRA	Agence Nationale pour la Gestion des Déchets Radioactifs	FR-7
ANL	Argonne National Laboratory	US-14
ANRE	Agency of Natural Resources & Energy	JA-17
ANS	American Nuclear Society	INTL-17
ANSTO	Australian Nuclear Science and Technology Organization	AS-2
ANU	Australian National University	AS-4
APM	Demonstration Reprocessing plant ...	FR-12
ARAP	Alligator Rivers Analogue Project	AS-1
Aspö	Hard rock laboratory	SW-7

ASBL	Forum Nucléaire Belge	INTL-11
Asse	Salt dome repository	GE-16
ATLAS	Advanced Testing Line for Actinide Separation	8-17
ATS	Finnish Nuclear Society	INTL-12
AVH	Ateliers de Vitrification de La Hague	FR-5
AVM	Ateliers de Vitrification de Marcoule	FR-16
AWRE	Atomic Weapons Research Establishment	UK-11

B

B205	Reprocessing facility	UK-13
BAM	Bundesanstalt für Materialforschung und -prüfung	GE-7
BARC	Bhabha Atomic Research Centre	IN-5
BEATE	Reprocessing facility	GE-19
BES	Basic Energy studies	US-16
BEW	Bundesamt für Energiewirtschaft	SZ-3
BfS	Bundesamt für Strahlenschutz	GE-7
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe	GE-9
BGS	British Geological Survey	UK-11
BITF	Borehole Instrumentation Test Facility	CA-9
BINE	Beijing Institute of Nuclear Engineering	CH-2
BLM	Bureau of Land Management	US-31
BMFT	Bundesministerium für Forschung und Technologie	GE-10
BMU	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit	GE-11
BNES	British Nuclear Energy Society	INTL-16
BNF	British Nuclear Forum	INTL-16
BNFL	British Nuclear Fuels plc	UK-12
BNL	Brookhaven National Laboratory	US-15
BNS	Belgian Nuclear Society	INTL-11
BOM	Bureau of Mines	US-31
BOR	Bureau of Reclamation	US-31

BRE	Building Research Establishment	UK-15
BRGM	Bureau de Recherches Géologiques et Minières	FR-8

C

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
Cédra	Société coopérative nationale pour l'entreposage de déchets radioactifs	SZ-4
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-11
CEN-S	Centre d'Études Nucléaires de Saclay .	FR-11
CEN/SCK	Centre d'Études de l'Énergie Nucléaire/ Studiecentrum voor Kernenergie ...	BE-5
CEN-VRH	Centre d'Études Nucléaires de la Vallée du Rhône	FR-11
CHALMERS	Technical University	SW-4
CIAE	China Institute of Atomic Energy	CH-4
CIEMAT	Centro de Investigaciones Energéticas, Medio Ambientales y Tecnológicas .	SP-3
Cisra	Società cooperativa nazionale per l'immagazzinamento di scorie radioattive	SZ-4
CIPE	Interministerial Committee for Economic Planning	IT-2
CIS	Commonwealth of Independent States	UR-1
CLAB	Central storage for spent fuel	SW-7
CLM/X	Spent fuel test facility	US-17

CNA	Canadian Nuclear Association	INTL-11
CNEA	Comision Nacional de Energia Atomica	AR-2
CNNC	China National Nuclear Corporation	CH-3
CNEIC	Chinese Nuclear Energy Industry Corporation	CH-3
CNEN	Comissão Nacional de Energia Nuclear	BR-4
CNRA	Committee for Nuclear Regulatory Activities	INTL-10
CNS	Canadian Nuclear Society	INTL-11
CNS	Chinese Nuclear Society	INTL-11
CNS	Council for Nuclear Safety	SF-4
CNS	Center for Nuclear Studies	PK-4
COGEMA	Compagnie Generale des Matières Nucléaires	FR-13
COMMOX	COGEMA subsidiary	FR-4
COMURHEX	Uranium conversion company	FR-4
COVRA	Centrale Organisatie Voor Radioactief Afval	NL-3
CPF	Chemical Processing Facility	JA-23
CRESP	Coordinated Research and Environmental Surveillance Programme (NEA)	INTL-10
CRIEPI	Central Research Institute of Electric Power Industry	JA-8
CRL	Chalk River Laboratories	CA-7
CRP	NEA-Committee on Reactor Physics	INTL-10
CRPPH	Committee on Radiation Protection and Public Health (NEA)	INTL-11
CSN	Consejo de Seguridad Nuclear	SP-3
CSNI	Committee, for Safety of Nuclear Installations	INTL-10
CSPN	Superior Council for Nuclear Policy ..	BR-3
CTC	Computer Training Center	PK-4

D

DAE	Department of Atomic Energy	IN-6
DAM	Direction des Applications Militaires	FR-16
DAIF	Deutsches Atomforum	INTL-13
DBE	Deutsche Gesellschaft zum Bau und Betrieb von Endlagern für Abfallstoffe mbH	GE-12
DEN	Department of Energy	UK-5
DES	Department of Education and Science	UK-5
DISP	Direzione Centrale per la Sicurezza Nucleare e la Protezione Sanitaria ..	IT-2
DKS	Danish Nuclear Society	INTL-13
DOA	Department of Agriculture	US-31
DOE	Department of Energy	US-7
DoE	Department of the Environment	UK-4
DOI	Department of Interior	US-4
DOT	Department of Transportation	US-5
Drigg	Waste disposal facility	UK-14
DWK	Deutsche Gesellschaft für Wiederauf- arbeitung von Kernbrennstoffen ...	GE-12
DWPF	Defense Waste Processing Facility	US-21

E

EARP	Enhanced Actinide Removal Plant ...	UK-14
EBES	Belgian utility	BE-9
EBR-II	Experimental Breeder Reactor No. 2 ..	US-14
EC	European	INTL-1
ECN	Stichting Energieonderzoek Centrum Nederland	NL-3
EdF	Electricité de France	FR-4
EDF	Engineering Demonstration Facility ..	IA-23
EEC	European Economic Community	INTL-1
Electrobas	Construction/operation company	BR-3
EM	DOE Environmental Restoration & Waste Management	US-8
EMR	Department of Energy, Mines and Resources	CA-10

ENEA	Ente per le Nuove Technologie, l'Energia l'Ambiente	IT-2
ENEL	Ente Nazionale per l'Energia Elettrica	IT-3
ENI	Ente Nazionale Idrocarburi	IT-2
ENRESA	Empresa Nacional de Residuos Radioactivos	SP-4
ENS	European Nuclear Society	INTL-12
ENSM	Ecole Nationale Supérieure des Mines de Paris	FR-16
ENUSA	Empresa Nacional del Uranio	SP-4
EP-1, 2	Waste treatment facilities	UK-14
EPA	Environmental Protection Agency	US-27
EPB	Electric Power Bureau	KS-4
EPRI	Electric Power Research Institute	US-26
ERAM	Endlager für Radioaktive Abfälle Morsleben	GE-13
ERS	Effluent Recovery System	US-18
ESKOM	South African utility	SA-4
ETAN-NDE	Professional Section of ETAN for Nuclear Technique and Technology	INTL-17
ETF	Engineering Test Facility	IA-23
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-17
FFTF	Fast Flux Test Facility	US-24
FIEN	Forum Italiano dell'Energia Nucleare	INTL-14
FK	Föreningen Kärnteknik	INTL-16
FLK	Radioactive slagging incinerator	BE-6
FN	Fabricazioni Nucleari	IT-4
FO	DOE field offices	US-4
FORATOM	Forum Atomique Européen	INTL-12
FRAGEMA	COGEMA subsidiary	FR-4

FRG	Federal Republic of Germany	GE-1
FURNAS	Subsidiary of Electrobrás	BR-3
FUSRAP	Remedial action program	US-14

G

GHZ	Hot cell facility	GE-17
GIRIO	Government Industrial Research Institute	IA-9
GNS	Gesellschaft für Nuklear-Service	GE-13
Gorleben	Repository site	GE-8
GRS	Gesellschaft für Reaktorsicherheit ...	GE-14
GSC	Geological Survey of Canada	CA-11
GSF/IRT	Forschungszentrum für Umwelt und Gesundheit	GE-15

H

HADES	Underground research laboratory	BE-7
HERMES	Head-End Research Facility on Mockup Engineering Scale	BE-5
HFEF	Hot Fuel Examination Facility	US-14
HISS	Hydrogen Isotope Separation System	US-18
HITACHI	Hitachi, Ltd	IA-9
HMIP	H.M. Inspectorate of Pollution	UK-15
HPPR	Hot pilot plant reprocessing	CA-8
HQ	DOE-Headquarters	US-3
HSE	Health and Safety Executive	UK-5
HSK	Nuclear Safety Inspectorate	SZ-3
HTA/HBK	HTGR fuel cycle project	GE-17

I

IAEA	International Atomic Energy Agency	INTL-4
ICPP	Idaho Chemical Processing Plant	US-25
ICRP	International Commission on Radiological Protection	INTL-6
ICT	Institute of Chemical Technology	GE-17
IE	DOE-International Affairs/Energy Emergencies	US-9

IEA	Instituto de Engenharia Nuclear	BR-4
IEA	International Energy Agency	INTL-9
IFTF	Immobilized Fuel Test Facility	CA-9
IGCAR	Indira Ghandi Centre for Atomic Research	IN-7
IHI	Ishikawajima-Harima Heavy Industries	IA-10
IMO	International Maritime Organization .	INTL-9
INB	Industrias Nucleares do Brasil	BR-3
INE	Institute for Nuclear Waste Technology	GE-18
INEL	Idaho National Engineering Laboratory	US-16
INER	Institute of Nuclear Energy Research	TW-3
INET	Institute of Nuclear Energy Technology	CH-4
INTERCOM	Belgian utility	BE-9
INuE	Institution of Nuclear Engineers	INTL-16
IOS	Institute of Oceanographic Sciences ..	UK-16
IPEN	Instituto de Pesquisas Energeticas e Nucleares	BR-5
IPSN	CEA-Institut de Protection et de Sûreté Nucléaire	FR-9
IRD	Instituto de Radioproteção e Dosimetria	BR-6
IRUS	Intrusion Resistant Underground Structure	CA-7
IRW	Institute of Reactor Materials	GE-17
ISF	Interim Storage Facility	IN-8
IST	Improved Sand Trench	CA-7
IVO	Imatran Voima Oy	FI-4

J

JAERI	Japan Atomic Energy Research Institute	IA-11
JAIF	Japan Atomic Industrial Forum	INTL-14
JET	Joint European Torus	UK-9
JGC	JGC Corporation	IA-12
JNFI	Japan Nuclear Fuel Industries Company	IA-14

JNFL	Japan Nuclear Fuel Ltd.	IA-14
JNFS	Japan Nuclear Fuel Service Co.	IA-14
JPDR	Japan Power Demonstration Reactor	IA-7
JRC	Joint Research Center (CEC)	INTL-3

K

KAERI	Korea Atomic Energy Research Institute	KS-5
KAIF	Korea Atomic Industrial Forum	INTL-15
KAIST	Korea Advanced Institute of Science/Technology	KS-6
KALPAKKAM	Fuel reprocessing laboratory	IN-7
KANUPP	Karachi Nuclear Power Plant	PK-3
KEMA	N.V. Tot Keuring van Electro- technische Materialen Arnhem	NL-4
KEMAKTA	Kemakta Konsult	SW-4
KEPCO	Korea Electric Power Corporation ...	KS-6
KEWA	Kernbrennstoff Wiederaufar- beitungstechnik GmbH	GE-16
KFA	Kernforschungsanlage Jülich	GE-17
KfK	Kernforschungszentrum Karlsruhe ...	GE-18
Khlopin	Khlopin Radium Institute	UR-4
KIER	Korea Institute of Energy and Resources	KS-6
KINS	Korea Institute of Nuclear Safety Technology	KS-7
KNFC	Korea Nuclear Fuel Co.	KS-7
KNS	Korean Nuclear Society	INTL-15
KOBE	Kobe Steel, Ltd.	IA-16
KOLAR	Waste disposal research station	IN-7
Konrad	(Iron mine) repository site	GE-8
KOPEC	Korea Power Engineering Co.	KS-8
KPA-STORE	Spent nuclear fuel storage facility	FI-5
KRF	Krypton recovery pilot plant	IA-23
KS-KT-100	Cold pilot vitrification plant	UR-4
KTG	Kerntechnische Gesellschaft	INTL-13
KTH	Royal Institute of Technology	SW-4
Kurchatov	Russian Kurchatov Institute	UR-5

L

L'Aube	Disposal Facility	FR-7
LA HAGUE	COGEMA, Centre de la Hague	FR-13
La Manche	Disposal Facility	FR-7
LANL	Los Alamos National Laboratory	US-16
LBRMF	Large Block Radionuclide Migration Facility	CA-10
LLNL	Lawrence Livermore National Laboratory	US-17

M

M&O	Management and Operating Contractor	US-23
MAFF	Ministry of Agriculture, Fisheries and Food	UK-17
MAPI	Ministry of Atomic Power and Industry	UR-2
MAPS	Madras Atomic Power Station	IN-8
Mayak	Production Association	UR-6
MER	Ministry of Energy and Resources	KS-8
MINATOM	Ministry for Atomic Energy of the Russian Federation	UR-7
MITI	Ministry of International Trade & Industry	JA-17
MMC	Mitsubishi Metal Corporation	JA-17
MOD	Ministry of Defense	UK-5
MOFA	Ministry of Foreign Affairs	JA-18
MONJU	Japanese LMFBR	JA-3
MOST	Ministry of Science and Technology	KS-9
MRS	Monitored Retrievable Storage	US-2
MTR	Materials Test Reactor	US-16

N

Nagra	Nationale Genossenschaft für die Lagerung Radioaktiver Abfälle	SZ-4
NCS	Nuclear Cargo Service	GE-6
NCS	Nuclear Science Center	IN-7
NDC	NEA-Nuclear Data Committee	INTL-10
NDC	NEA Technical/Economic study	INTL-10
NEA	Nuclear Energy Agency (OECD)	INTL-7

NEC	National Energy Council	SF-2
NERC	National Environment Research Council	UK-5
NERSA	Groupeement Centrale Nucléaire Européene à Neutrons Rapides	FR-4
NFC	Nuclear Fuel Complex	IN-8
NFF	Nuclear Fuel Fabrication	CH-5
NII	Nuclear Installations Inspectorate	UK-17
NIREX	UK Nirex Ltd.	UK-18
NIRAS	Nationale Instelling voor Radioactief Afval en Splijtstoffen	BE-8
NIRS	National Institute of Radiological Sciences	JA-18
NMSS	Nuclear Material Safety and Safeguards	US-28
NMU	Niedersächsisches Umweltministerium	GE-19
NNSA	National Nuclear Safety Administration	CH-4
NPO	Waste Management Organization	UR-7
NRC	Nuclear Regulatory Commission	US-28
NRPB	National Radiological Protection Board	UK-18
NRR	NRC Office of Nuclear Reactor Regulation	US-29
NSB	National Safety Bureau	JA-18
NSC	Nuclear Safety Commission	JA-19
NTS	Nevada Test Site	US-17
NUCLECO	Waste Management Services company	IT-4
NUKEM	Nuclear fuel services company	GE-20
NUMATEC	COGEMA Inc. subsidiary	FR-13
NWCF	New Waste Calcining Facility	US-25
NWPA	Nuclear Waste Policy Act	US-2
NWPAA	Nuclear Waste Policy Amendments Act	US-2
NWTRB	Nuclear Waste Technical Review Board	US-30

O

OCRWM	DOE Office of Civilian Radioactive Waste Management	US-4
OECD	Organization for Economic Cooperation and Development	INTL-6
OH	Ontario Hydro	CA-11
OIP	NRC Office of International Programs	US-28
OMRE	Experimental/research reactor	US-16
ONDRAF	Organisme National de Déchets Radioactifs et des Matières Fissiles	BE-8
ONWN	Office of the U.S. Nuclear Waste Negotiator	US-30
OPLA	National research program	NL-2
ORNL	Oak Ridge National Laboratory	US-18

P

PAAG	Performance Assessment Advisory Group	INTL-8
PAEC	Pakistan Atomic Energy Commission	PK-2
PAMELA	Vitrification pilot plant	GE-23
PARR-1, 2	Research/Training reactors	PK-4
PASS	Performance Assessment Scientific Support	US-20
PASSAT	Filter test facility	GE-19
Pelindaba	National Nuclear Research Center	SF-3
PEV	Prototype vitrification facility	FR-12
PFR	Reprocessing plant	UK-9
Phenix	French FBR	FR-4
PINSTECH	Pakistan Institute of Science/Technology	PK-3
PIVER	Hot pilot plant - vitrification	FR-21
PIVER II	HLW vitrification facility	FR-21
PKA	Pilot fuel conditioning plant	GE-14
PKS	Quality assurance project	GE-17
PNC	Power Reactor and Nuclear Fuel Development Corporation	JA-20
PNL	Pacific Northwest Laboratory	US-19
PREPP	Processing Experimental Pilot Plant	US-16
PREFRE	Fuel reprocessing plant	IN-9

PSAG	Probabilistic System Assessment	
	Group (NEA)	INTL-8
PSI	Paul Scherrer Institute	SZ-4
PWSF	Pu-contaminated Waste Storage	
	Facility	IA-24
PWTF	Pu-contaminated Waste Treatment	
	Facility	IA-24

R

RADWASS	Radioactive Waste Safety Standards ..	INTL-5
RES	NRC Office of Nuclear Regulatory	
	Research	US-29
RFP	Rocky Flats Plant	US-20
RIVM	Rijksinstituut voor Volksgezondheid	
	en Milieuhygiene	NL-6
RLWTF	Radioactive Liquid Waste Treatment	
	Facility	US-14
RSK	Reaktor Sicherheitskommission	GE-6
RW	DOE-Office of Civilian Radioactive	
	Waste Management	US-9
RWMC	Radioactive Waste Management	
	Center	IA-25
RWOS	Radioactive Waste Operations Site ...	CA-12
RWMAC	Rad. Waste Management Advisory	
	Committee	UK-5
RWMC	Rad. Waste Management	
	Committee (NEA)	INTL-8
RWMC	Radioactive Waste Management	
	Complex	US-16

S

SAFO	Swedish Atomic Forum	INTL-16
Saluggia	ENEA nuclear research center	IT-3
SBH	Siemens Brennelementewerk Hanau ..	GE-21
SEDE	Site Evaluation and Design of Experi-	
	ments for Radioactive Waste	
	Disposal (NEA)	INTL-8
SFANS	Section Française d'Energie Nucléaire	INTL-13
SFEN	Société Française d'Energie Nucléaire	INTL-14

SFMP	Surplus Facilities Management Program	US-14
SFR	Swedish Final Repository	SW-7
SGAB	Sveriges Geologiska	SW-5
SGK	Schweizerische Gesellschaft der Kernfachleute	INTL-16
SGN	Société Générale pour les Techniques Nouvelles	FR-18
SICN	COGEMA subsidiary	FR-4
SKB	Svensk Kärnbränslehantering	SW-6
SKI	Statens Kärnkraftinspektion	SW-8
SKN	Statens Kärnbränsle Nämnd	SW-8
SNE	Sociedad Nuclear Española	INTL-15
SNI	Belgian utility	BE-8
SNI	Società Nucleare Italiana	INTL-14
SNL	Sandia National Laboratories	US-21
SPD	Sodium Process Demonstration Facility	US-14
SRS	Savannah River Site	US-21
SSI	Statens Strålskyddsinstitut	SW-8
SSK	Strahlenschutzkommission	GE-6
SSSF	Solid Storage Surveillance Facility	IN-10
ST	S.T. Sistemi e Technologie per l'Energia	IT-4
STA	Science and Technology Agency	IA-25
STE3	Liquid waste treatment facility	FR-15
STEM	Simulation Test Facility for Environmental Radionuclide Migration ...	IA-12
STMI	Nuclear services company	FR-4
STUDSVIK	Studsvik Energiteknik	SW-9
STUK	Finnish Center for Radiation and Nuclear Safety	FI-5
SuperPhenix	European FBR	FR-4
SVA	Schweizerische Vereinigung für Atomenergie	INTL-16
SWA	Waste water treatment plant	GE-22
SWEPP	Stored Waste Examination Pilot Plant	US-16
SYNATOM	Belgian company	BE-9

T

TAIPOWER	Thiwan Power Company	TW-3
TAN	Test Area North	US-16
TAPS	Tarapur Atomic Power Station	IN-9
TAWRS	Tritium Aqueous Waste Recovery System	US-18
TECHNI- CATOME	Nuclear fuel cycle services company ..	FR-4
THORP	Thermal Oxide Reprocessing Plant ...	UK-14
TN	Transnucléaire	FR-18
TREAT	Transient Reactor Test Facility	US-14
Trisaia	ENEA nuclear fuel services company	IT-3
Trombay	Fuel reprocessing plant	IN-5
TRUOX	TRU waste technology	US-14
TRW	TRW Environmental Safety Systems ..	US-23
TUM	Technische Universität München	GE-21
TVF	Tokai Vitrification Facility	JA-24
TVO	Tbollisuuden Voima Oy	FI-5

U

UKAEA	UK Atomic Energy Authority	UK-3
UNERG	Belgian utility	BE-9
UNVIE	U.S. Mission to IAEA	INTL-5
UP1	Fuel reprocessing plant	FR-15
UP2	Fuel reprocessing plant	FR-14
UP2-800	Fuel reprocessing plant	FR-14
UP3	Fuel reprocessing plant	FR-15
URENCO	Uranium enrichment consortium	NL-1
URL	Underground Research Laboratory ..	CA-9
USCEA	U.S. Council for Energy Awareness ..	INTL-17
USGS	U.S. Geological Survey	US-31
USSI	COGEMA subsidiary	FR-4
USSR	Union of Soviet Socialist Republics ..	UR-1

V

Vaalputs	LLW disposal facility	SF-3
Valindaba	U enrichment and conversion plants ..	SF-4
VKTA	Verein für Kernverfahrenstechnik and Analytik Rossendorf	GE-21

VLJ	LLW/ILW repository	FI-6
VTT	Technical Research Center of Finland	FI-6

W

WAK	Wiederaufarbeitungsanlage Karlsruhe	GE-23
WAMAP	Waste Management Advisory Program	INTL-5
WANO	World Association of Nuclear Operators	INTL-12
WASTEF	Glove box and hot cell facilities	JA-12
WATRP	International peer review program	INTL-5
WDF	Waste Dismantling Facility	JA-21
WEAF	Waste Examination Assay Facility	US-19
WEC	Westinghouse Electric Company	US-25
WERF	Waste Environmental Reduction Facility	US-16
WHC	Westinghouse Hanford Company	US-24
WINCO	Westinghouse Idaho National Company	US-25
WIP	Waste Immobilization Plant	IN-8
WIPE	Waste Immobilization Process Equipment	CA-8
WIPP	Waste Isolation Pilot Plant	US-25
WL	Whitshell Laboratories	CA-8
WSRC	Westinghouse Savannah River Co. ...	US-21
WTC	Waste Treatment Center	CA-7
WTC	Waste Treatment Complex	UK-14
WVNS	West Valley Nuclear Services	US-26
WVRF	Waste Volume Reduction Facility	CA-12

Y

YM	Yucca Mountain	US-9
YMP	Yucca Mountain Project	US-31
YMPO	Yucca Mountain Project Office	US-9
YMSCP	Yucca Mountain Site Characterization Project	US-17

Z

ZFK-DE	Waste treatment project	GE-17
ZPPR	Zero Power Plutonium Reactor	US-14
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
LLW	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	Mega Watts
MWd/t	Mega Watt days per ton
MWe	Mega Watts electric
MWt	Mega Watts 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 ton
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

END

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