INTERNATIONAL NUCLEAR FUEL CYCLE FACT BOOK

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S. J. Mitchell

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

Pacific Northwest Laboratory
Richland, Washington 99352
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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 has developed for a ready source of information concerning foreign fuel cycle programs, facilities, and personnel. This Fact Book was compiled to meet that need.

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

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

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

International Program Support Office
Pacific Northwest Laboratory
P.O. Box 999
Richland, WA 99352

Tel: 509-376-4539
FTS: 444-4539
Fax: 509-376-1101
Verif: 444-5059
Tlx: 15-2874
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CMEA (Council for Mutual Economic Assistance) .. INTL.3
IAEA (International Atomic Energy Agency) ...... INTL.3
ICRP (International Commission on Radiological Protection) ........................................ INTL.5
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Reactors (white spiral bindings only) ............... RCTR.1

APPENDIX - Organizations, Facilities, and Technical Terms ................................. A.1
INTRODUCTION
The International Nuclear Fuel Cycle Fact Book has been compiled in an effort to provide current data concerning fuel cycle and waste management facilities, R&D programs and key personnel.

The Fact Book is organized as follows:

- **National summaries**—a section for each country which summarizes nuclear policy, describes organizational relationships and provides addresses, names of key personnel, and facilities information.

- **International agencies**—a section for each of the international agencies which has significant fuel cycle involvement, and a listing of nuclear societies.

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

**DIRECT DIALING**

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

**HOLIDAYS**

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

INTRO.1
MAPS

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

PASSPORTS/VISA

Requirements listed are those applicable to United States citizens.

SOURCES


Reactor Mix figures are obtained from "World List of Nuclear Power Plants," Nuclear News, 8/89.

TIME

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

VISITS TO U.S. DOE FACILITIES

Foreign visitors to U.S. DOE facilities must complete and submit a form IA-473 (OMB 1910-2100) "Request for Foreign National Unclassified Visit or Assignment" to DOE Office of International Affairs, Washington, DC 20585, at least 30 days before the proposed visit. The itinerary should be based on prior arrangement with appropriate DOE or DOE contractor staff concerning a suitable time for the visit.

INTRO.2
In addition, for visits requested under a bilateral waste management agreement, notification of the visit should be made by the Principal Coordinator of the visitor's country to the U.S. Principal Coordinator for that agreement. The U.S. Principal Coordinator will assist, if necessary, in making the arrangements for the visit.
ARGENTINA

MAJOR PUBLIC HOLIDAYS (1990)

Jan. 1 New Year June 18 Flag Day
Jan. 6 Epiphany July 9 Independence Day
Feb. 3-7 Carnival Aug. 1 Assumption
Apr. 12 Holy Thursday Aug. 20 General San Martin
Apr. 13 Good Friday Oct. 15 Columbus Day
May 1 Labor Day Nov. 1 All Saints
May 25 Revolution Anniv. Nov. 6 Bank Holiday
May 28 Corpus Christi Dec. 8 Immac. Conception
June 10 Sovereignty Dec. 25 Christmas

TIME

Standard Time Washington D.C.: + 2 hours
Standard Time Period: 03/04 - 10/13/90

PASSPORT/Visa

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 1850.00 Austral
per Wall Street Journal, 01/31/90. 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: 54-1-774-7110
Tlx: 18156 AMEMBAR

Science Counselor Dr. Robert G. Morris
ENERGY

Population 1988 31.9 million
Electric Power Plant Capacity 1988 12.7 GWe
Electric Power Production 1987 42.8 TWh

44% hydro/geoth.
41% oil/coal
15% nuclear

NUCLEAR POWER

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

Nucl. Power Plant Capacity 1989 0.9 GWe
1995 1.6 GWe
2000 1.6 GWe

1 (1994)

INDUSTRIAL FUEL CYCLE

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

Waste Management Strategy: Reprocess spent fuel; vitrify HLW in pot process; dispose of HLW glass canisters in granite host-rock repository. Reduce volumes of LLW/ILW for disposal in shallow ground.

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

AR.1
ARGENTINA

Demonstration/Production Activities

• D₂O production: delayed--250 t/a D₂O enrichment plant, supplied by a Swiss firm; developing domestic technology.


• Conversion of yellowcake to UO₂: 300 t/a; UO₂ fuel fabrication.

Major Milestone

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

INTERNATIONAL RELATIONSHIPS

Member of IAEA. Has not signed non-proliferation treaty (NPT).

ORGANIZATION

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

CNEA (National Atomic Energy Commission)

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

Tcl: 54-1-70-7711
Fax: 21388 PREAT AR

President
Manuel A. Mondino

Radioactive Waste Mgt.
Dr. Jaime Pahissa Campá
(Ezeiza Atomic Center)

AR.2
EZEIZA ATOMIC CENTRE

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

Facilities

• Fuel fabrication: the first of three planned fabrication lines started up in 1982; second line 1985; produces 240 elements/yr for Atucha I and 5,360 elements/yr for Embalse; third line to produce Atucha II fuel elements.

• Fuel reprocessing: Ezeiza pilot plant, planned capacity of 20 kgU/d feed, 10-15 kgPu/a product; non-radioactive runs--1990; hot startup--1994. Potential expansion of pilot plant to commercial facility or new plant with 160 kg/d (40 MTU/yr) capacity (late 1990s). Reprocessing plant construction has been put on indefinite hold.
AUSTRALIA

MAJOR PUBLIC HOLIDAYS (1990)

Jan. 1 New Year Apr. 25 ANZAC Day
Jan. 26 Australia Day June 11 Queen's Birthday
Apr. 13 Good Friday Dec. 25-26 Christmas
Apr. 15-16 Easter

TIME

Standard Time Washington D.C.: (New S. Wales) + 15 hours
Standard Time Period: 03/04 - 10/27/90

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 1.27 Australian Dollar
per Wall Street Journal, 01/31/90. 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: 61-62-70-50-00
Fax: 61-62-70-59-70

Scientific Attaché Donald R. Cleveland
AUSTRALIA

ENERGY

Population 1988 16.5 million
Electric Power Plant Capacity 1988 34.8 GWe
Electric Power Production 1988 110.8 TWh
80% coal
11% hydro/geoth.
9% gas
1% oil

NUCLEAR POWER

Policy: No nuclear power installed; none planned. Large uranium reserves; uranium currently produced for export. Government sponsors nuclear 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 UK.

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

Joint Alligator Rivers analogue project with Japan, Sweden, the UK, and the U.S.

ORGANIZATION

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

Australian Nuclear Science
and Technology Organization
New Illawarra Rd, Lucas Heights
Private Mail Bag 1, Menai N.S.W. 2234, Australia
Tel: 61-2-543-31-11, Fax: 61-2-543-50-97, Tlx: AA 24562

Executive Director: Dr. D. Cook
Chairman: Prof. R. E. Collins
Deputy Chairman: Russell Fynmore
General Manager, Scientific: D. Davy
Advanced Materials: Dr. A. Jostsons
Materials Technology: Dr. K. U. Snowden
Advanced Ceramics and SYNROC: Dr. Keith D. Reeve
Operations: A. Ridal
Environmental Science: Dr. J. Evans
Nuclear Technology: D. McCulloch
Nuclear Services: Justin M. Silver

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

Facilities:

- **Non-radioactive SYNROC Demonstration Plant**
  Mission: Engineering-scale tests of SYNROC process to provide data for a conceptual radioactive SYNROC plant design by mid-1991.
  Design Basis: 10 kg/h SYNROC (40 cm); all operations compatible with remote handling; highly instrumented and partly automated.
  History: Startup, 5/88 (integrated operation of all steps; three days of operation per month since).

- **SYNROC Glove Box Line**
  Mission: Produce SYNROC containing actinides\(^{99}\)Tc.
  Process Scale: Hundreds of grams.
  History: Startup, 1984.
• Hot-Cell Processing Line for SYNROC
  Mission: Produce SYNROC containing beta/gamma-active fission products.
  Process Scale: Hundreds of grams.
  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.

• Alkoxide Powder Preparation Facility
  Mission: Provide fine powders for making 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.

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

MAJOR PUBLIC HOLIDAYS (1990)

<table>
<thead>
<tr>
<th>Jan.</th>
<th>New Year</th>
<th>July 21</th>
<th>National Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr. 15-16</td>
<td>Easter</td>
<td>Aug. 15</td>
<td>Assumption</td>
</tr>
<tr>
<td>May 1-2</td>
<td>Labor Day</td>
<td>Nov. 1</td>
<td>All Saints</td>
</tr>
<tr>
<td>May 24</td>
<td>Ascension</td>
<td>Nov. 15</td>
<td>Dynasty Day</td>
</tr>
<tr>
<td>June 3-4</td>
<td>Pentecost</td>
<td>Dec. 25-26</td>
<td>Christmas</td>
</tr>
</tbody>
</table>

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time Period: 03/25 - 09/29/90

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 35.40 Franc
per Wall Street Journal, 01/31/90. 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  Patricia Haigh
### ENERGY

<table>
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<tr>
<th></th>
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<tbody>
<tr>
<td>Population</td>
<td>14.0 GWe</td>
<td>14.0 GWe</td>
<td>14.0 GWe</td>
<td>14.1 GWe</td>
</tr>
<tr>
<td>Electric Power Plant Capacity</td>
<td>39% nuclear</td>
<td>39% nuclear</td>
<td>39% nuclear</td>
<td>39% nuclear</td>
</tr>
<tr>
<td>Electric Power Production</td>
<td>58.6 TWh</td>
<td>66% nuclear</td>
<td>62% nuclear</td>
<td>58% nuclear</td>
</tr>
<tr>
<td></td>
<td>25% coal</td>
<td>3% oil</td>
<td>2% hydro/geo.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3% gas</td>
<td></td>
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</table>

### NUCLEAR POWER

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity</th>
<th>Mix</th>
</tr>
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<tbody>
<tr>
<td>1989</td>
<td>5.5 GWe</td>
<td>PWR: 7 (1975-85)</td>
</tr>
<tr>
<td>1995</td>
<td>5.5 GWe</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>6.8 GWe</td>
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</tr>
</tbody>
</table>

### INDUSTRIAL FUEL CYCLE

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

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

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

Major Milestone

• Acceptance of waste from reprocessing in France 1993

INTERNATIONAL RELATIONSHIPS

DOE/SCK Umbrella Agreement for Waste Management Exchange
Term: 1-19-81 to 1-19-94.
Scope: Terminal storage in geologic formations; technology of retrievable storage; waste processing technology; environmental effects.
Emphasis: General information exchange.

Member of EC, IAEA, OECD/NEA. Partnership in Eurodif uranium enrichment plant (France) and in SNR-300 LMFBR demonstration project (FRG). Belgian underground research laboratory at Mol is co-sponsored by CEC.

ORGANIZATION

MINISTRY OF ECONOMIC AFFAIRS PRIVATE INTERESTS

-- CEN/SCK--50%-> BELGONUCLEAIRE <---- 50% --

-- ONDRAF/NIRAS -- Belgoprocess

-- 50% ------------> SYNATOM <-------------- 50% --

BE.2
BELGONUCLEAIRE

Belgonucleaire S.A.
Rue du Champ de Mars 25
1050 Brussels, Belgium
Tel: 32-2-513-9700
Fax: 32-2-511-0359

General Director J. Van Dievoet
Tel: 32-2-513-9690

Function: Provide engineering services for nuclear power plants, nuclear fuel cycle facilities, and waste treatment plants; fabricate MOX fuels.
Sponsor: CEN/SCK (50%), utilities/holding companies (50%).

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

BELGOPROCESS

Belgoprocess
Gravenstraat
2480 Dessel, Belgium
Tel: 32-14-24-41-11
Fax: 32-14-31-30-12

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

Activities: Maintenance/dismantling of ex-Eurochemic facilities; medium-level waste conditioning; operation of PAMELA pilot plant (Mol) which vitrifies liquid high-level radioactive waste; interim waste storage; operation of FRG CEN/SCK waste treatment facility.
Owner: ONDRAF/NIRAS

BE.3
BELGIUM

BELGOPROCESS (contd)

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 on stand-by.

- **Eurowatt** (hot pilot plant-solvent treatment)
  Mission: Treat PUREX (TBP-kerosene) solvent.
  Design Basis: Extract TBP with concentrated H₃PO₄, pyrolyze H₃PO₄ fraction; capacity, 1 m³/d.
  History: Startup, 1982; now dismantled.

- **PAMELA ILLW Vitrification Plant** [built by FRG (see WAK in FRG Section) and operated by WAK/Belgoprocess team]

- **Eurowetcomb** (hot pilot plant-acid digestion)
  Mission: Wet combustion of combustible TRU wastes and Pu recovery.
  Design Basis: Acid digestion with H₂SO₄-HNO₃.
  History: Startup, 1982; now shut down.

**CEN/SCK (Nuclear Energy Research Center)**

Centre d’Étude de l’Énergie Nucléaire/Studiecentrum voor Kernenergie
Laboratory of the CEN/SCK
Boeretang 200
2400 Mol Belgium
Tel: 32-14-31-18-01 Fax: 32-14-31-50-21

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

Owner: Government—Ministry of Economic Affairs.

BE.4
BELGIUM

CEN/SCK (contd)

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

Facilities:

- **HERMES Pilot Plant** *(Head-End Research facility on Mockup Engineering Scale)*
  
  **Mission:** Develop head-end treatment technology for LWR fuels.
  
  **Design Basis:** Chop-leach; silver zeolite and cryogenic treatment of off gas.
  
  **Process Components:** Double-pin chopper, critically safe dissolver, centrifugal filtration for solution clarification, fuel residue dissolver, "super dissolver" for cleanup of hulls, off-gas scrubbers, treatment of hulls by high-pressure compaction, encapsulation of compacted hulls.
  
  **Throughput:** 10 kg irradiated fuel (20-30% PuO2 in UO2) per batch.
  
  **History:** No longer in operation.

- **FLK Slagging Incinerator** *(radioactive)*
  
  **Mission:** Volume reduction of combustible, and of selected noncombustible, low-activity TRU wastes.
  
  **Design Basis:** High-temperature combustion (1200-1500°C); capacity, 50 kg/h; product, insoluble granular slag.
  
  **History:** Startup, 1975; first tests with Pu-bearing wastes (tens of grams Pu in several tons of waste), 1983; shutdown, 1988.

- **CEN/SCK Waste Preparation Plant**
  
  **Mission:** Immobilize Belgian LLW.
  
  **Design Basis:** Stirred evaporator, batch process; capacity, 800 \( \ell \)/h liquid LLW or 100 kg/h dried sludge.
  
  **History:** Startup, 1964 (liquids), 1970 (solids).
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, 30
1040 Brussels, Belgium
Tel: 32-2-233-6636  
Fax: 32-2-514-0635
MINISTRY OF PUBLIC HEALTH AND ENVIRONMENT

Ministère de la Santé Publique
et de l'Environnement
Quartier Vésale 2-3/32
1010 Brussels
Belgium
Tel: 32-2-210-4978
Fax: 32-2-210-4967

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

Organisme National des D échets Radioactifs et des Mati è res Fissiles (ONDRAF/NIRAS)
Place Madou 1, B.P. 24/25
1030 Brussels
Tel: 32-2-212-1011
Fax: 32-2-218-5165

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

Owner: Government.

Function: Organize transportation of radioactive materials, waste treatment/conditioning and interim storage, spent fuel AFR storage, waste disposal; fissile material storage; define waste management R&D requirements.

ORGANIZATION

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

SYNATOM S.A.
Avenue Marnix, 13
1050 Brussels, Belgium
Tel: 32-2-518-66-66
Fax: 32-2-513-10-76

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

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

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

MAJOR PUBLIC HOLIDAYS (1990)

<table>
<thead>
<tr>
<th>Date</th>
<th>Holiday</th>
<th>Date</th>
<th>Holiday</th>
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<tbody>
<tr>
<td>Jan. 1</td>
<td>New Year</td>
<td>Sept. 7</td>
<td>Independence</td>
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<tr>
<td>Feb. 26-27</td>
<td>Carnival</td>
<td>Oct. 12</td>
<td>N.S. Aparecida</td>
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<td>April 13</td>
<td>Good Friday</td>
<td>Nov. 2</td>
<td>All Souls</td>
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<td>April 21</td>
<td>Tiradentes Day</td>
<td>Nov. 15</td>
<td>Proclamation of</td>
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<td>May 1</td>
<td>Labor Day</td>
<td>Dec. 25</td>
<td>Christmas</td>
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<tr>
<td>June 14</td>
<td>Corpus Christi</td>
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</table>

TIME

Standard Time Washington D.C.: (East/all coast) + 2 hours
Standard Time Period: 02/11 - 10/13/90

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 17.14 Cruzados (Cz$)
per Wall Street Journal, 01/31/90. 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
Tx: 61-1091

Science Counselor
Barbara Tobias
ENERGY

Population 1987 141 million
Electric Power Plant Capacity 1987 45 GWe
Electric Power Production 1987 201.6 TWh
94% hydro
6% thermal
0.3% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity 1989 0.6 GWe
1995 1.9 GWe
2000 3.1 GWe

2 (1994/97)

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

INDUSTRIAL FUEL CYCLE

Policy: To develop full commercial capability for closed fuel cycle -- conversion of $\text{U}_3\text{O}_8$ to $\text{UF}_6$; enrichment; $\text{UO}_2$ fuel fabrication; fuel reprocessing.

Waste Management Strategy: Not yet defined.

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

BR.1
Demonstration/Production Activities

• Uranium mining and milling: 300 tU$_3$O$_8$/a--in operation.

• UF$_6$ production: (1984) 90 tU/a; planned expansion delayed indefinitely.


• Uranium enrichment (Becker nozzle process), at Resende:
  - First Cascade, 24 stages; 6 kSWU/a (1985).
  - Second Cascade, 64 kSWU/a (1988).

• Fuel fabrication: 100 tU/a (1982); design capacity--400 tU/a.

• Spent fuel reprocessing: 10 kg/d pilot plant (1986 startup originally scheduled, currently delayed indefinitely).

INTERNATIONAL RELATIONSHIPS

Joint Natural Analog Studies - Pocos de Caldas Project
Joint study by Sweden, Switzerland, United Kingdom, and United States of migration of radionuclides from ore deposits in Brazil.

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.

• CSPN (Superior Council for Nuclear Policy)--sets guidelines for nuclear industry and controls CNEN through non-military board.
ORGANIZATION (contd)

- 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.
  - Uranio do Brasil, S.A.
  - Ownership: 51% government (CNEN); 49% private.

- Electrobas -- construction and operation of nuclear power plants.

**CDTN (Center for the Development of Nuclear Technology)**

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

Director V. Mattos Andrade Silva

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

**CNEN (National Nuclear Energy Commission)**

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

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

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

Instituto de Engenharia Nuclear
Cidade Universitária
Ilha do Fundão
Caixa Postal 2186
CEP 20001, Rio de Janeiro, RJ
Brazil
Tel: 55-21-280-5622
Fax: 55-21-280-5622
Tlx: 21-21112 CNEN BR

Director: Alcyr Mauricio

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

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

IPEN (Energy and Nuclear Research Institute)

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

BR.4
IPEN (contd)

Facilities:

• Laboratory for spent fuel reprocessing
• Small experimental gas centrifuge uranium enrichment
• Low power PWR reactor development
• Swimming pool 10 MW reactor (isotope production)

IRD (Health Physics and Dosimetry Institute)

Instituto de Radioproteção e Dosimetria
Avenida das Américas Km 11,5
Barra Da Tijuca
CEP 22700, Rio de Janeiro, RJ
Brazil
Tel: 55-21-5252
Fax: 21-31624 IRD

Director
Anamelia Habib de Mendonça

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

Facility

• Brazilian Secondary Standards Dosimetry Laboratory
CANADA

MAJOR PUBLIC HOLIDAYS (1990)

Jan. 1      New Year                   Sept. 3      Labor Day
Apr. 13    Good Friday                Oct. 8       Thanksgiving
Apr. 15-16 Easter                     Nov. 11      Remembrance Day
May 21     Victoria Day               Dec. 25-26   Christmas
July 1     Canada Day

TIME

Time zones correspond to those in the United States.
Daylight Saving Time period: 04/01 - 10/27/90

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.$ = 1.18 Canadian Dollar

per Wall Street Journal, 01/31/90. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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

U.S. EMBASSY - OTTAWA

American Embassy
100 Wellington Street
Ottawa K1P 5T1
Canada
Tel: 613-238-5335
Fax: 613-238-8750

Science Counselor
Victor D. Comras
ENERGY

Population 1988 26.3 million

Electric Power Plant Capacity 1987 101.3 GWe
12% nuclear
1988 101.0 GWe
12% nuclear
1990 106.2 GWe
13% nuclear
1995 120.4 GWe
13% nuclear

Electric Power Production 1988 489.0 TWh
62% hydro/geoth.
18% coal
16% nuclear
2% oil
2% gas
1988 16% nuclear
1994 17% nuclear
1995 19% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity 1988 11.7 GWe
1990 13.9 GWe
1995 15.6 GWe
2000 15.6 GWe

Reactor Mix 1988 PHWR: 18 (1968-87)
4 (1990-93)

INDUSTRIAL FUEL CYCLE

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

Waste Management Strategy: Geologic disposal of "nuclear fuel waste," either used CANDU fuel or immobilized HLW, in a crystalline rock repository.
CANADA

Cumulative Used Fuel

<table>
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<tr>
<th>Year</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>1988</td>
<td>12,400 tU</td>
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<tr>
<td>1990</td>
<td>17,700 tU</td>
</tr>
<tr>
<td>2000</td>
<td>33,900 tU</td>
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Major Milestones

- Environmental assessment panel appointed 1989
- Env. assessment panel issue identification phase 1990
- Env. impact statement on geological disposal concept 1991

INTERNATIONAL RELATIONSHIPS

DOE/AECL Umbrella Agreement for Cooperation in Radioactive Waste Management Exchange

Term: 9-8-76 to 8-25-92.

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

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

Member of IAEA and OECD/NEA. Information exchange agreements with EEC (Euratom), BMFT/Germany, SKB/Sweden, UKAEA/United Kingdom, PNC and JAERI/Japan, KAERI/South Korea, IVO and TVO/Finland.

ORGANIZATION

- AECB (Atomic Energy Control Board)—regulatory.

- AECL (Atomic Energy of Canada Limited)—a Crown Corporation owned by the federal government. Design, engineering and sale of CANDU reactors at CANDU operations (Ontario). Nuclear R&D at WNRE (Manitoba) and CRNL (Ontario).
ORGANIZATION (contd)

- **OH (Ontario Hydro)**--provincial public utility. Owns/operates 11,200 MWe CANDU nuclear power plants and has 3,500 MWe more under construction. (The first of these new units is now undergoing preliminary testing.) Waste management R&D.

- **HQ (Hydro Quebec)**--provincial public utility. Owns/operates Gentilly 2 (600 MWe CANDU station).

- **NBEPC (New Brunswick Electric Power Commission)**--provincial utility. Owns/operates Point Lepreau Nuclear Generating Station (600 MWe CANDU).
FEDERAL GOVERNMENT RESPONSIBILITIES--FUEL CYCLE/WASTE MANAGEMENT

Ministry of Energy, Mines and Resources (EMR)

-- Atomic Energy Control Board (AECB)
  • Regulations, Licensing

-- Atomic Energy of Canada, Limited (AECL)
  -- CANDU Operations
    • Reactor Design, Engineering, Export
  -- AECL Research (see CA-4)

-- Department of Energy, Mines and Resources (EMR)
  -- Geological Survey of Canada
    • Information/Services
    • Minerals/Continental Geoscience
    • Sedimentary/Cordilleran Geosciences
    • Geophysics/Marine Sciences

-- Canadian Centre for Mineral and Energy Technology (CANMET)
  -- Mining Research Laboratories
    -- Sudbury Laboratory
    -- Elliot Lake Laboratory
    -- Canadian Mining Technology Laboratory

-- Mineral Sciences Laboratories
  • Radionuclide Recovery from Thorium Mill Tailings

-- Metal Technology Laboratories

CA.4
ATOMIC ENERGY OF CANADA LIMITED -- PARTIAL ORGANIZATION

AECL RESEARCH

-- Whiteshell Nuclear Research Establishment (WNRE)
  • Small Reactor Technology/Local Energy Systems
  • Reactor Safety Research
  • Material Sciences
  • Radiation Applications Research
  • Analytical Science
  • Waste Management Program
    - Geological/Environmental Science
    - Geochemistry/Waste Immobilization

-- Chalk River Nuclear Laboratories (CRNL)
  • Nuclear Waste Management Technology
  • Reactor Development
  • Physics and Health Sciences
  • Radiation Application and Isotopes

-- Research Company Head Office, Ottawa
  • Low-Level Radioactive Waste Management Office
CANADA

AECB

Atomic Energy Control Board
P.O. Box 1046
270 Albert Street
Ottawa, Ontario K1P 5S9
Canada
Tel: 613-995-5894
Fax: 613-995-5086

President
Dr. Rene J. A. Levesque

Fuel Cycle/Materials Regulations
W. D. Smythe

Waste Management
G. C. Jack

Safeguards and Security
D. B. Sinden

Reactor Regulation
Z. Domaratzki

Research and Radiation Protection
J. W. Beare

Safety and Safeguards
J. R. Coady

AECL

Atomic Energy of Canada Ltd.
344 Slater Street
Ottawa, Ontario K1A OS4
Canada
Tel: 613-237-3270
Fax: 613-563-9499

Acting Chairman
Marnie Paikin

Acting President/CEO
Dr. Stanley R. Hotcher

Acting Pres., AECL Research
Dr. Terry E. Rummery

Low-Level Waste Management
Dr. Robert Pollock

AECL-CRNL

AECL-Chalk River Nuclear Laboratories
Chalk River, Ontario KOJ 1JO
Canada
Tel: 613-584-3311
Fax: 613-589-2039

General Manager
Dr. P. J. Harvey

Reactor Development, V.P.
Dr. R. E. Green

Physics/Health Sciences, V.P.
Dr. J. D. Milton

Radiation Appl./Isotopes, V.P.
Dr. G. Dolling

Waste Management Technology
Dr. Don H. Charlesworth

CA.6
Facilities

- **WTC (Waste Treatment Center)**

- **IRUS (Intrusion Resistant Underground Structure)**
  Mission: LLW/ILW repository consisting of two concrete vault "prototype units." Each vault, with a capacity of 3,000 m$^3$ radwaste in barrels or bales, will be covered with backfill, roofed with concrete and mounded with earth. Waste can be retrieved from the IRUS module until concrete cap is poured over the vault.

- **IST (Improved Sand Trench)**
  Mission: An enhanced shallow-ground concept for the lowest class of low-level waste. It is currently in the conceptual design stage.

---

**AECL-WNRE**

AECL-Whiteshell Nuclear Research Establishment
Pinawa, Manitoba ROE 1L0
Canada

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

General Manager: M. G. Wright
Waste Management, V.P.: Dr. D. Torgerson
Geological/Environmental: Dr. K. W. Dormuth
Geochem./Waste Immobilization: Dr. K. Nuttal
Facilities

- **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 groundsurface 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 from WNRE, on the Lac du Bonnet Batholith.
  
  **Mission:** Provide a research facility in a virgin granite pluton characteristic of the Canadian granite formations which may be selected for waste repository construction. (U.S./DOE has participated in experimental programs).
  
  **Design Basis:** Vertical shaft with shaft stations at 130 m, 240 m, 300 m, and 420 m depths. Horizontal tunnel with adjoining rooms located at 240 m level. Experiment access at the 420 m level being developed. Currently planning major experiments at 240 m and 420 m levels. Licensed radioactive sources and selected licensed tracers may be used in the facility, but no radioactive wastes are to be employed there.
  
  **Milestones:** Underground operation startup, 1985; completion of shaft extension and 420 m level access, 1990. Start of major siting experiments, 1980; start of major in situ experiments, 1989.

- **IITF (Hydrostatic Test Facility)**
  
  **Mission:** Test the performance of containers made of different metals under temperature/pressure conditions that could exist in an underground disposal vault.
  
  **Design Basis:** Carbon steel pressure chamber with a test cavity 1.5 m in diameter and 3 m in depth contained in a 4 m x 4 m x 4.6 m deep concrete-lined pit. Temperature/pressure can be adjusted and controlled over long periods of time.
  
  **History:** Startup, 1984; currently inoperative. Studies underway to assess feasibility of facility upgrading.
AECL-WNRE (contd)

- **IFTF (Immobilized Fuel Test Facility)**
  Mission: Test the effects of water, heat and pressure on waste forms, containers, buffer, and rock in the presence of a radiation field. Waste forms include used fuel and fuel recycle glass or glass/ceramics.
  Design Basis: Heated concrete canisters contain a number of pressure vessels with container or waste form samples, buffer and groundwater. A radiation source within the canister simulates the radiation field in a disposal vault. The facility also contains "warm cells" for experiments involving moderate levels of radiation. Three Laboratories: Analytical, Low-Activity Examination, and Alpha.
  History: First canister loaded, August 1984.

- **LBRMF (Large Block Radionuclide Migration Facility)**
  Mission: Study the migration of non-reactive and reactive contaminants, including radionuclides, over a distance up to 1 m through natural fractures in quarried intact rock.
  Determine the spatial distribution of sorbed radionuclides on fracture surfaces and in the rock matrix at the end of the migration experiments.
  Design Basis: The facility consists of an experimental section, equipped with moveable active fume hoods to hold quarried rock, and an analysis section, equipped with a 2-D gamma-scaner, active fume hoods, and equipment to handle blocks of rock up to 2000 kg.
  History: First migration experiment, using uranine, $^{131}$I, and $^{137}$Cs, has been completed and results published. Second experiment, using uranine, $^3$H, $^{85}$Sr, $^{99}$mTc, $^{137}$Cs, and $^{144}$Ce is completed. Third migration experiment being designed.

CAMECO (CANADIAN MINING & ENERGY CORP.)

Cameco
122 Third Ave. North
Saskatoon, Saskatchewan S7K 2H6, Canada
Tel: 306-956-6200
Fax: 306-956-6201
Chairman
Executive V.P./CEO
William A. Gatenby
Bernard Michel

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

Energy, Mines and Resources Canada
Science and Technology
580 Booth Street
Ottawa, Ontario K1A OE4
Canada
Tel: 613-995-3065
Fax: 613-996-6424

Director General,
Uranium/Nuclear Energy
Dr. R.W. Morrison

Director of Radioactive Waste Management
Peter Brown

EMR-CANMET

EMR-Canada Centre for Mineral and Energy Technology
555 Booth Street
Ottawa, Ontario K1A 0G1
Canada
Tel: 613-995-4029
Fax: 613-996-9673

Director General, Policy Planning/Services
J. Ferron

Director General, Mineral Technology Branch
Dr. J. T. Jubb

Mineral Research Laboratories
Dr. J. E. Udd

Mineral Sciences Laboratories
Dr. H. Steger

Metals Technology Laboratories
Dr. W. H. Erickson

EMR-GSC

EMR-Geological Survey of Canada
580 Booth Street
Ottawa, Ontario K1A 0E4
Canada
Tel: 613-992-5910
Fax: 613-995-3082

Assistant Deputy Minister
Dr. E. A. Babcock

Chief Scientist
Dr. Robin Riddihough
Ontario Hydro
700 University Avenue
Toronto, Ontario M5G 1X6
Canada
Tel: 416-592-5111
Fax: 416-592-2753

Director, Design/Development  H. S. Irvine
Radioactive Mtls. Management  P. Stevens-Guille
Radioactive Mtls. Storage/Disposal  P. J. Armstrong
Used Fuel Management  S. Naqzi
Radioactive Mtls. Transportation  J. Tanaka
Radioactive Mtls. Processing  R. Kohout

RWOS (Radioactive Waste Operations Site)

Bruce Nuclear Power Development
Box 1540
Tiverton, Ontario, NOG 2T0
Canada
Tel: 519-368-7031

Contact:  B. Vaughan

Function: Process and store low- and medium-level radioactive waste from Ontario Hydro CANDU reactors and research and 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 k/Pa and low force drum crusher.
  History: Startup, 1977.
OH (contd)

- **Low-Level Waste Storage:**

  5 *above-ground warehouse-type buildings*; waste with a radiation field of $<$1R/h at 30 cm is stored in stackable containers with a storage capacity of 8000 m$^3$.

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

  15 *quadricells*; above-ground, reinforced concrete structures; sufficient shielding for storage of waste with radiation fields of $>$15 R/hr (e.g., ion exchange resins, filters and reactor core components), with a storage capacity of 24 m$^3$ each.

  272 *in-ground containers*; welded steel liners concreted into augered holes; designed for storage of waste with radiation fields $>$15 R/h (e.g., ion exchange resins, filters and reactor core components) ranging in storage capacity from 1 to 18 m$^3$. 
CHINA
(People's Republic of China)
CHINA
(People's Republic of China)

MAJOR PUBLIC HOLIDAYS (1990)

Jan. 1  New Year
Jan. 27-28  Spring Festival
Mar. 6  Women's Day
May 1  Labor Day
June 1  Children's Day
Aug. 1  Army Day
Oct. 1, 2  National Liberation

TIME

Standard Time Washington D.C.: + 13 hours
Daylight Saving Time Period: 04/15 - 09/15/90

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 4.72 Yuan
per Wall Street Journal, 01/31/90. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

U.S. EMBASSY - BEIJING

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

Science Attaché  William W. Thomas
ENERGY

Population 1987 1.07 billion

Electric Power Plant Capacity 1985 86 GWe
1986 91 GWe

Electric Power Production 1985 406 TWh
~70% coal
~24% oil
6% hydro/geoth.
1986 445 TWh
gas

NUCLEAR POWER

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

Nuclear Power Plant Capacity 1990 0.3 GWe
2000 5.0 GWe

Reactor Mix 1989 PWR: 3 (1990-93)

Reactor Development BWR, HTR, FBR

INDUSTRIAL FUEL CYCLE

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

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

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

ORGANIZATION

- CNNC (China National Nuclear Corporation) -- fuel cycle development
  - IAE (Institute of Atomic Energy)
  - INET (Institute of Nuclear Energy Technology)
  - CNEC (China Nuclear Engineering Corporation)
    -- handles import and export.
  - China Zhongyuan Engineering Corporation
    -- provides technical services and engineering work, contracts building projects.

- NNSA (National Nuclear Safety Administration) -- responsible for standards/regulations, construction permits/operating licenses, monitoring plant operations; conducts joint safety research with other nations.

- Southwest Institute of Physics -- nuclear R&D.

CNEC

China Nuclear Engineering Corporation
P.O. Box 840 Tel: 86-1-89-4794
Beijing Fax:
People's Republic of China Tlx: 22240 CNEC-CN

Manager Jia Dexian
Contact Song Ruo
China National Nuclear Corporation

China National Nuclear Corporation
C/o Ministry of Energy Resources
P.O. Box 2102
Beijing
People's Republic of China
Tel: 86-1-86-7784
Fax:
Tlx: 222315 FACNC CN

General Manager
Jiang Xingxiong
Science/Tech.Com., V.Chairman
Lu Rong Guang
Nuclear Fuel Department
Wang Xiaoli

General Machinery Research Institute

General Machinery Research Institute
Shu Shan Road
Hefei City, Province Anhui
People's Republic of China
Tel: 86-3-1337
Fax:

Contact
Schou Gang

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

Director
Sun Zuxun
Honorary Director
Dai Cuanzheng

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

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

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

CH.3
National Nuclear Safety Administration
54 San Lihe Rd.
Beijing, People's Republic of China
Tel: 86-1-86-8361
Fax:

Director General
Zhou Pin

Chief Engineer
Lin Chengge

Dep. Chief Engineer
Dong Bonian

Dep. Div. Chief
Xu Wanjin

Dep. Div. Chief
Li Zhiyu
FINLAND

MAJOR PUBLIC HOLIDAYS (1990)

<table>
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<tr>
<td>Jan. 1</td>
<td>New Year</td>
</tr>
<tr>
<td>Apr. 13</td>
<td>Good Friday</td>
</tr>
<tr>
<td>Apr. 15-16</td>
<td>Easter</td>
</tr>
<tr>
<td>May 1</td>
<td>May Day</td>
</tr>
<tr>
<td>June 22</td>
<td>Midsummer Eve</td>
</tr>
<tr>
<td>Dec. 6</td>
<td>Independence Day</td>
</tr>
<tr>
<td>Dec. 24-26</td>
<td>Christmas</td>
</tr>
</tbody>
</table>

TIME

Standard Time Washington D.C.: + 7 hours
Daylight Saving Time Period: 03/25 - 09/29/90

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 4.01 Markka (FIM)
per Wall Street Journal, 01/31/90. 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
Itaen Puistotie 14A Tel: 358-0-17-1931
00140 Helsinki Fax: 358-0-17-4681
Finland Tx: 12-1644 USEMB SF
ENERGY

Population 1988 5.0 million

Electric Power Plant Capacity

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity</th>
<th>Nuclear</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>11.5 GWe</td>
<td>20%</td>
</tr>
<tr>
<td>1988</td>
<td>11.7 GWe</td>
<td>20%</td>
</tr>
<tr>
<td>1990</td>
<td>12.4 GWe</td>
<td>19%</td>
</tr>
<tr>
<td>1995</td>
<td>13.4 GWe</td>
<td>17%</td>
</tr>
</tbody>
</table>

Electric Power Production

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
<th>Nuclear</th>
<th>Hydro/Geo</th>
<th>Coal</th>
<th>Solids</th>
<th>Gas</th>
<th>Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>53.5 TWh</td>
<td>37%</td>
<td>26%</td>
<td>17%</td>
<td>12%</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>1988</td>
<td>36% nuclear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>30% nuclear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>27% nuclear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NUCLEAR POWER

Nuclear Power Plant Capacity

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>2.3 GWe</td>
</tr>
<tr>
<td>1995</td>
<td>2.3 GWe</td>
</tr>
<tr>
<td>2000</td>
<td>2.3 GWe</td>
</tr>
</tbody>
</table>

Reactor Mix

<table>
<thead>
<tr>
<th>Year</th>
<th>Type</th>
<th>Reactors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>PWR</td>
<td>2 (1977/81)</td>
</tr>
<tr>
<td></td>
<td>BWR</td>
<td>2 (1979/82)</td>
</tr>
</tbody>
</table>

INDUSTRIAL FUEL CYCLE

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

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

<table>
<thead>
<tr>
<th>Year</th>
<th>TVO</th>
<th>IVO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>22</td>
<td>46</td>
</tr>
<tr>
<td>1985</td>
<td>228</td>
<td>140</td>
</tr>
<tr>
<td>1990</td>
<td>450</td>
<td>140</td>
</tr>
<tr>
<td>2000</td>
<td>900</td>
<td>140</td>
</tr>
</tbody>
</table>

Major Milestones

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

INTERNATIONAL RELATIONSHIPS

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

ORGANIZATION

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

ADVISORY COMMITTEE ON NUCLEAR SAFETY

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

Chairman: Prof. Jarl Forstén
Secretary-General: Hannu H. Koponen

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

GEOLOGICAL SURVEY OF FINLAND

Geological Survey of Finland
Betonimiehenkuja 4
02150 Espoo
Finland

Director: Prof. L. K. Kauranne
Research Director: Prof. K. Korpela
Nuclear Waste Disposal: Paavo Vuorela

IVO (National Power Company)

Imatran Voima Oy (IVO)
Rajatorpantie 8
01600 Vantaa
Finland

Nuclear Waste: Jussi-Pekka Palmu

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

Owner: Government.
NUCLEAR ENERGY COMMISSION

Nuclear Energy Commission
Ydinenergianeuvottelukunta
Kauppa- ja teollisuusministeriö
Pohjoinen Makasiinikatu 6
00130 Helsinki
Finland
Tel: 358-0-160-5229
Fax: 358-0-160-2695
Chairman
Prof. Jorma Routti
Secretary-General
Sakari Immonen

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

STUK (Finnish Centre for Radiation and Nuclear Safety)

Finnish Centre for Radiation and Nuclear Safety
P.O. Box 268
Kumpulantie 7
00520 Helsinki
Finland
Tel: 358-0-7082-1
Fax: 358-0-7082-392
Director
Prof. Antti Vuorinen
Nuclear Fuel Cycle
Hannu H. Koponen
Nuclear Waste
Esko Ruokola

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

TVO (Industrial Power Company)

Teollisuuden Voima Oy (TVO)
Fredrikinkatu 51-53 B
00100 Helsinki, Finland
Tel: 358-0-605-022
Fax: 358-0-605-135

Nuclear Waste
Veijo Ryhänen

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

Owners: Government 43%; private 57%.
Facilities:

- **KPA-STORE** (Interim storage facility for spent nuclear fuel) located at reactor site. First stage, construction of three pools (capacity of 600-900 tU, depending on choice of storage racks) completed November 1987. Expansion of capacity to 1,200-1,800 tU planned in second stage.

- **VLJ Repository** located at reactor site. Low- and intermediate-level wastes packaged in metal drums/containers will be buried in two silos 70-100 m deep. ILW silo will have reinforced 0.6 m concrete liner. Construction start 4/88; completion 1992.

### VTT (Technical Research Center of Finland)

**VTT Nuclear Engineering Laboratory**

P.O. Box 169  
00181 Helsinki  
Finland  
Tel: 358-0-648-931  
Fax: 358-0-603-626

Director:  
Dr. Lasse Mattila  
Nuclear Waste Management:  
Dr. Seppo Vuori

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

**VTT Reactor Laboratory**

Otakaari 3A  
02150 Espoo  
Finland  
Tel: 358-0-4561  
Fax: 358-0-4610-85

Director:  
Prof. Pekka Hiismaki  
Nuclear Waste Management:  
Arto Muurinen

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

VTT (contd)

VTT Metals Laboratory
Kemistintie 3
02150 Espoo
Finland
Tel: 358-0-4561
Fax: 358-0-4356-7002

Director
Dr. Jarl Forsten
Nuc. Fuel Mtl. Research
Esa Vitikainen

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

VTT Geotechnical Laboratory
Betonimiehenkuja 1
02150 Espoo
Finland
Tel: 358-0-4561
Fax: 358-0-467-927

Director
Dr. Markku Tammirinne
Rock Mechanics
Dr. Kari Saari

UNIVERSITY OF HELSINKI

University of Helsinki
Department of Radiochemistry
Unioninkatu 35
00170 Helsinki
Finland
Tel: 358-0-1911
Fax: 358-0-6565-91

Director
Prof. T. Jaakkola
FRANCE

MAJOR PUBLIC HOLIDAYS (1990)

<table>
<thead>
<tr>
<th>Jan. 1</th>
<th>New Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr. 15-16</td>
<td>Easter</td>
</tr>
<tr>
<td>May 1</td>
<td>Labor Day</td>
</tr>
<tr>
<td>May 24</td>
<td>Ascension</td>
</tr>
<tr>
<td>June 3-4</td>
<td>Pentacost</td>
</tr>
<tr>
<td>July 14</td>
<td>Bastille Day</td>
</tr>
<tr>
<td>Aug. 15</td>
<td>Assumption</td>
</tr>
<tr>
<td>Nov. 1</td>
<td>All Saints</td>
</tr>
<tr>
<td>Nov. 11</td>
<td>Remembrance Day</td>
</tr>
<tr>
<td>Dec. 25</td>
<td>Christmas</td>
</tr>
</tbody>
</table>

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time Period: 03/25 - 09/29/90

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 5.78 Franc
per Wall Street Journal, 01/31/90. 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
Tel: 33-1-42-96-12-02
Fax: 33-1-42-61-80-75

Science Counselor
Dr. Alan L. Sessoms
FRANCE

ENERGY

Population 1987 55.5 million

Electric Power Plant Capacity 1987 97.9 GWe
57% nuclear
1988 100.5 GWe
52% nuclear
1990 102.2 GWe
54% nuclear
1995 105.1 GWe
56% nuclear

Electric Power Production 1988 372.4 TWh
70% nuclear
20% hydro/geoth.
8% coal
2% oil
1990 76% nuclear
1995 79% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity 1989 51.8 GWe
1990 53.5 GWe
1995 61.5 GWe
2000 64.4 GWe
2020 77.0 GWe

Reactor Mix 1988 GCR: 4 (1967-72)
PWR: 49 (1970-88)
9 (1989-93)
LMFBR: 2 (1974/85)

FR.1
INDUSTRIAL FUEL CYCLE

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

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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>248</td>
<td>2,900</td>
<td>7,300</td>
<td>20,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cumulative Waste Arisings, m^3</th>
</tr>
</thead>
<tbody>
<tr>
<td>vitrified HLW</td>
</tr>
<tr>
<td>packaged TRU waste</td>
</tr>
<tr>
<td>packaged LLW/ILW</td>
</tr>
</tbody>
</table>

Industrial-Scale Activities


- Uranium enrichment (kSWU/a)
  - Pierrelatte, gaseous diffusion: 600
  - Eurodif, gaseous diffusion: 10,800

- Fuel fabrication (tHM/a)
  - UO₂: 1987--1,300
  - MOX: for FBR fuels--5; for LWR fuels--15.

- Spent fuel reprocessing (t/a)
  - Marcoule: 400 (U metal fuels)
  - La Hague: 1600 (UO₂, LWR fuels)
Major Milestones

- **R7 vitrification plant (La Hague)** 1989
- **UP3 reprocessing plant (La Hague)** 1989/90
- **T7 vitrification plant (La Hague)** 1992
- **UP2-800 reprocessing plant (La Hague)** 1992
- **LLW disposal facility (Centre de l'Aube)** 1991
- **Melox (MOX fuel fabrication plant-Marcoule)** 1993
- **Underground Research Laboratory** (Site recommendation 1990)

INTERNATIONAL RELATIONSHIPS

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

Term: 7-26-83 to 7-26-93.
Scope: Preparation/packaging; D&D; waste/spent fuel storage; geologic disposal; transportation requirements.
Emphasis: Technical workshops in the areas of LLW and TRU waste management; exchange of waste repository site characterization technology and data for granite and salt host rocks.

**NRC/CEA Technical Exchange and Cooperation Arrangement in the Field of Safety of Radioactive Waste Management**

Term: 1-10-84 to 1-10-89, presently being renegotiated for 5 year extension.
Scope: Cooperative information exchange for improving and thus ensuring the safety of radioactive waste management: characteristics/long-term performance of conditioned high-level and TRU wastes; methods/data for evaluating radionuclide migration from repository to biosphere; methods of classification, treatment and disposal of LLW; methods for analysis/assessment of operational safety at waste disposal sites.

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

ORGANIZATION

• CEA (Atomic Energy Commission)--controls practically all nuclear R&D; controls long-term waste management, disposal included (ANDRA)

  Nuclear Research Centers: Cadarache, Fontenay-aux-Roses, Grenoble, Marcoule, 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%), FRAGEMA (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
  - TRANSNUCLEAIRE: transport

• EdF (Electricité de France, 100% government)-- public power generation; owns and operates all nuclear plants except Phenix (50% EdF, 50% CEA) and SuperPhenix (NERSA: 51% EdF, 33% ENEL, 16% RWE)
CEA STRUCTURE*

Minister of Industry, Telecommunication and Tourism

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

OPERATIONS UNITS

-- DAM - Military Applications
-- IPSN - Institute for Nuclear Safety-François Cogne
-- Direction des Sc.de la Matière-Robert Ayma
-- Direction des Sc.du Vivant-Michel Sus
-- Direction des Reacteurs Nucleaires-Jacques Bouchard
-- Direction des Cycles du Combustible-Jean-Yves Barre
-- Direction des Techniques Avancées-Yannick D'Escatha
-- ANDRA - National Agency for Waste Management-François Chenevier

RESEARCH CENTERS

-- CEN (see Page FR-9)

PROGRAM DIRECTORS

-- Direction des Technologies

-- DgN Nuclear R&D (Reactor/Fuel Cycle)- Robert Lallement
-- DgED Waste Management-Jean Lefevre
-- DgD Decommissioning-Annie Sugier
-- DgV Diversification-Bertrand Barre

-- DAMN - Nuclear Materials
-- DPN - Nuclear Propulsion

* A major reorganization of the CEA structure (the first in nearly two decades) has been initiated during recent months. Some of the resultant changes are already reflected above while others were not known at the time of this printing.

FR.5
FRANCE

COGEMA

-- La Hague Center
  • Reprocessing (LWR)
  • AVH - Vitrification

-- Marcoule Center
  • APM - Reprocessing (Metal)
  • AVM - Vitrification
  • Melox - MOX Fuel Fabrication

CEA

RESEARCH CENTERS (CEN)

-- Cadarache - Jean Megy, Director
  • MOX Fuel
  • TRU Waste and LLW/ILW
  • Environmental

-- Fontenay-aux-Roses - Yves Martin, Director
  • Disposal R&D
  • MOX Fuel
  • TRU Waste and LLW/ILW
  • Engineered Barriers
  • Safety and Health Protection

-- Grenoble - Francis DeCool, Director

-- Saclay - Paul Delpeyrroux, Director
  • MOX Fuel Fabrication
  • TRU Waste and LLW/ILW Treatment
  • Engineered Barriers

-- Marcoule - Albert Teboul, Director
  • FBR Fuel Cycle
  • Reprocessing
  • HLW
  • TRU Waste and LLW/ILW R&D
ANDRA (National Agency for Radioactive Waste Management)

Agence Nationale pour la Gestion
des Déchets Radioactifs
Commissariat à l'Energie Atomique
Route Du Panorama Robert Schumann
B.P. 38
92266 Fontenay-aux-Roses Cedex
France
Tel: 33-1-46-54-7080
Fax: 33-1-46-54-9925

Director: François Chevenier
Deputy Director: Denis Alexandre
Deputy Director: Yves Marque

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

Facilities:

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

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

- **Two new centers planned; one site approved (1987): Soulaines (Aube), to be commissioned in 1991; will accommodate 1,000,000 m³ of IL/LLW over a period of 30 years.**

- **Four possible sites** (in clay, granite, schist and salt) selected for characterization of underground HLW storage. Site selection of URL early 1990s; disposal facility--2000/TRU; 2010/glass.
BRGM (Bureau of Geological and Mineral Research)

Bureau de Recherches Géologiques et Minières
B.P. 6009
45060 Orléans Cedex 2
France
Tel: 33-38-64-36-34
Fax: 33-38-64-36-43
Tlx: 78-0258 F

Director
Gerard Renon

Managing Director, Geology
H. Astie

Waste Storage
P. F. R. Peaudecerf

Hydrogeology
J. J. Collin

Geotechnology
Ph. Masure

CEA (Atomic Energy Commission)

Commissariat à l'Energie Atomique (CEA)
Centre d'Etudes Nucléaires (CEN)
29-33, Rue de la Federation
75752 Paris
France
Tel: 33-1-40-56-10-00
Fax: 33-1-42-53-91-22
Tlx: 200671 ENERGAT

Chairman
Philippe Rouvillois

High Commissioner
Jean Teillac

CEA-IPSN (Institute for Nuclear Safety)

Institut de Protection et de Sûreté Nucléaire (IPSN)
B.P. 6
92260 Fontenay-aux-Roses
France
Tel: 33-1-46-54-70-80
Fax: 33-1-47-35-14-23

Director
François Cogne

Technical Protection
Anne-Marie Chapuis
33-1-46-54-72-33

Waste Protection Research
Christian Devillers
33-1-46-54-70-53

Safety Analysis Services
Michel Montjoie
33-66-79-63-02

Decommissioning (CEN-VALRHO)

FR.8
CEN-CA (Cadarache Nuclear Research Center)

Centre d’Etudes Nucléaires de Cadarache
B.P. 1  Tel:  33-42-25-70-00
13115 Saint-Paul-lez Durance  Fax:  CEACA 440678 F
France  Tlx:  CEACA 440678 F

Director       Jean Megy

(Marseille-Marignane Airport; 65 km to Cadarache by car
provided by Center, or rental car.)

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

Facilities:

• Solid Waste Treatment Pilot Plant (Prolixe, Elise)
  Mission: TRU solid waste reduction by cryogenic crushing
  and Pu recovery by acid leaching.
  Design Capacity: Eight 100 liter drums per batch, one batch
every 24 - 48 hours.
  History: Startup, 1985.

• Bituminization Plant
  Design Basis: Immobilize reactor wastes; twin-screw extruder;
capacity, 260 m³/a.
  History: Startup, 1977.

• MOX Fuel Fabrication

• LLW Incinerator

• Resin Embedding Pilot Facility

• Solvent Incinerator
FRANCE

**CEN-TaR (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
Yves Martin

Dir., Waste Research (DgED)
Jean Lefevre

Dir., Decommissioning (DgD)
Annie Sugier
33-1-46-54-75-46

**CEN-G (Grenoble Nuclear Research Center)**

Centre d'Etudes Nucléaires
de Grenoble
Avenue des Martyrs 85X
38041 Grenoble
France

Tel: 33-76-97-41-11
Fax: 320323 ENERGAT
Tlx: GRENO

Director
Francis DeCool

Facility:
- Waste Resin Embedding Facility

**CEN-VALRHO (Marcoule Nuclear Research Center)**

Centre d'Etudes Nucléaires
de la Vallée du Rhône
B.P. 171
30205 Bagnols-sur-Ceze
Marcoule, France

Tel: 33-66-79-60-00
Fax: 33-66-89-38-50

Director
Albert Teboul

Manager, HLW
Roger Bonniaud

Deputy Manager
Claude Sombret
33-66-79-63-62

D&D
André Créguet

Decommissioning (IPSN)
Michel Montjoie

FR.10
Facilities:

- **APM (Cogema-operated demonstration reprocessing plant for FBR, MOX and high burn-up fuels)**
  Mission: Develop technology for FBR, MOX and high burn-up fuels.
  Design Basis: PUREX flowsheet, mixer-settlers and pulsed columns; 5 tHM/a.

- **PIVER (Hot Pilot Plant-Vitrification)**
  Mission: Test batch vitrification processes (1969-1973); produce samples for characterization and advanced (high-temperature) waste forms.
  Design Basis: Pot calciner/melter; capacity, 90 kg glass/batch or 25-30 m³ HLW/a; product, borosilicate glass blocks, 25 cm dia by 2.5 m high.

- **PIVER II. Vitrification of HLW from APM.**


- **PEV Prototype (full-scale, non-radioactive R7/T7 vitrification process).** Startup, 1984.

---

**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: 690641 F ENERGAT SACLAY

Director Paul Delpeyroux

Facilities:

- **Bituminization Plant (radioactive).**

- **Metal Waste Melter (startup, 1985).**
COGEMA (Compagnie Generale des Matières Nucléaires)

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
Jean Syrota
Vice President
Christian Gobert
Ind. Director, Reprocessing
Maurice Delange

COGEMA, Inc.
7401 Wisconsin Ave.
Bethesda, MD 20814-3416
Tel: 301-986-8585
Fax: 301-652-5690

President, CEO
Michael McMurphy
Vice President
Frank A. Shallo

NUMATEC, Inc.
(subsidiary of/same location as Cogema, Inc.)
President
William Gallagher

COGEMA-LA HAGUE CENTER

COGEMA, Centre de La Hague
B.P. 508
50105 Cherbourg
France
Tel: 33-33-03-60-00
Fax: 33-33-44-71-77

Director
Hugue Delaunay
33-33-03-60-01

Fuel Cycle Program: Spent fuel reprocessing and HLW 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.
COGEMA-LA HAGUE CENTER (contd)

Facilities

- **UP2 (Fuel Reprocessing Plant)**
  Mission: Reprocess magnesium-clad, natural uranium metal fuels from gas/graphite reactors and 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 (6/76) through 8/88 total HAO throughput was 2,310 t fuel from LWRs and 10 t from Phenix.

- **UP2-800 (Fuel Reprocessing Plant)**
  Mission: Reprocess U oxide and MOX fuels from French LWRs.
  Design Basis: Progressive expansion of UP2 plant from 400 to 800 t/a of LWR fuel started in 1984, to be completed in 1992. Chop leach head-end, PUREX flowsheet, AVM vitrification process [R7 vitrification plant: rotary calciner, metallic or ceramic melter; capacity, 600 m³/a HLLW feed three lines - 60 liters/h HLLW, 25 kg/h glass; canister dimensions: 42 cm dia x 1.3 m high (400 kg glass)].
  Capacity: 800 t/a.
  History: Startup, 1992; R7 startup, 1989, 125 glass canisters poured at the end of 1989. (UP2 HLLW backlog).

- **UP3 (Fuel Reprocessing Plant)**
  Mission: Reprocess LWR fuels.
  Design Basis: Chop-leach head-end; PUREX flow-sheet; AVM vitrification process (T7 plant: identical to R7 vitrification plant).
  Capacity: 800 MTU/a.
  History: Startup, 1989.

- **STE3 (Liquid Waste Treatment Facility)**
COGEMA-MARCOULE CENTER

COGEMA, Centre de Marcoule
B.P. 170
30200 Bagnols-sur-Ceze
Marcoule, France

Tel: 33-66-79-60-00
Fax: 33-66-89-38-50

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

Director
Jean Charlade
Reprocessing Plant
Maurice Chotin
AVM Manager
Pierre Hugony

Facilities:

• UP1 (Reprocessing Plant)
  Mission: Reprocess magnesium-clad natural uranium metal fuels from military or gas/graphite power reactors.
  Design Basis: Mechanical declad; PUREX flowsheet; contact maintenance
  Capacity: 400-450 tU/a of gas/graphite reactor fuel, in addition to military fuel load.
  History: Startup, 1958; total gas/graphite power reactor fuels processed up to 11/88: 3,800 t.

• AVM (Ateliers de Vitrification de Marcoule)
  Mission: Demonstrate AVM process: vitrify Marcoule UP1 wastes.
  Design Basis: Rotary calciner feeding an induction-heated metallic melter; capacity 50 liters/h HLLW 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, 6/78; as of 1/01/90, 1,213 m³ of HLLW had been vitrified (1,650 canisters = 530 t borosilicate glass).
**FRANCE**

**COGEMA-MARCOULE CENTER** (cont'd)

- Incinerator
- Bituminization Facility
- PIVER II: Vitrification of HLW from APM.
- Melox: MOX fuel fabrication (100 t/a); 1993.

**DAM (Directorate of Military Applications)**

Direction des Applications Militaires  
Commissariat à l'Energie Atomique  
31-33 Rue de la Fédération  
B.P. 510  
75752 Paris, Cedex 15  
France  
Tel: 33-1-40-56-10-00  
Fax:  
Director, Quality/Security  
Jean Ohmann

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

Société Franco-Belge de Fabrication de Combustibles  
2-6 Place de l'Iris  
92400 Courbevoie, France  
Tel: 33-1-47-62-88-00  
Fax: 33-1-47-74-71-67

Facilities:

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

- **Fuel Fabrication Plant** (Dessel, Belgium)  
  Mission: Fabricate UO₂ fuels.  
  Design Capacity: 400 t/a.
PARIS SCHOOL OF MINES

Ecole Nationale Superieure
des Mines de Paris
Centre d'Informatique Geologique
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
Dr. Ghislain de Marsily
Deputy Director
Dr. G. E. Ledoux

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

SGN

Societe Generale pour les Techniques Nouvelles
1 Rue des Herons
Montigny-le-Bretonneux
78182 Saint-Quentin en Yvelines Cedex
France
Tel: 33-1-30-58-60-00
Fax: 33-1-30-58-60-61

President
Claude Aygoberry
Vice President
Jean Louis Ricaud
Technical Director
Claude Bernard

TN

Transnuclaire
11 Rue Christophe-Colomb
75008 Paris
France
Tel: 33-1-47-23-78-50
Fax: 280992

General Manager
Bernard Savornin
Technical Manager
Paul Blum
GERMANY (FRG)

MAJOR PUBLIC HOLIDAYS (1990)

Jan. 1 New Year  May 24 Ascension
Apr. 13 Good Friday  June 3-4 Pentecost
Apr. 15-16 Easter  June 17 Day of Unity
May 1 May Day  Dec. 25-26 Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time Period: 03/25 - 09/29/90

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 1.70 Mark (DM)
per Wall Street Journal, 01/31/90. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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

U.S. EMBASSY - BONN

American Embassy
Deichmannsaeule  Tel: 49-228-339-1
5300 Bonn 2  Fax: 49-228-339-2125
Federal Republic of Germany  Tlx: 885-452

Science Counselor  Edward M. Malloy
ENERGY

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Population</td>
<td>59.2 million</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electric Power Plant Capacity</td>
<td>95.5 GWe</td>
<td>97.2 GWe</td>
<td>98.7 GWe</td>
<td>101.1 GWe</td>
</tr>
<tr>
<td></td>
<td>20% nuclear</td>
<td>22% nuclear</td>
<td>23% nuclear</td>
<td>23% nuclear</td>
</tr>
<tr>
<td>Electric Power Production</td>
<td>418.3 TWh</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>54% coal</td>
<td></td>
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<tr>
<td></td>
<td>31% nuclear</td>
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<td></td>
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<tr>
<td></td>
<td>7% gas</td>
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<tr>
<td></td>
<td>5% hydro/geoth.</td>
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<tr>
<td></td>
<td>3% oil</td>
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<tr>
<td></td>
<td>34% nuclear</td>
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<tr>
<td></td>
<td>37% nuclear</td>
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<td></td>
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<tr>
<td></td>
<td>36% nuclear</td>
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NUCLEAR POWER

<table>
<thead>
<tr>
<th></th>
<th>1989</th>
<th>1990</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear Power Plant Capacity</td>
<td>22.7 GWe</td>
<td>22.7 GWe</td>
<td>22.7 GWe</td>
</tr>
<tr>
<td>Reactor Mix</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PWR: 14 (1972-88)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BWR: 7 (1972-85)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>FBR: 1 (1990)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HTR: 1 (1987)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GERMANY

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 for at least 10 years; disposal of reprocessing wastes in salt-dome repository; disposal of reactor and decommissioning wastes in abandoned iron mine or salt repository.

Cumulative Spent Fuel Arisings (LWR)

<table>
<thead>
<tr>
<th>Year</th>
<th>Spent Fuel Arisings (tU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>1,800 tU</td>
</tr>
<tr>
<td>1990</td>
<td>3,800 tU</td>
</tr>
<tr>
<td>2000</td>
<td>8,950 tU</td>
</tr>
</tbody>
</table>

Cumulative Waste Arisings

<table>
<thead>
<tr>
<th>Year</th>
<th>Waste Arisings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>196,300 m³ conditioned, radioactive waste with negligible heat production</td>
</tr>
<tr>
<td></td>
<td>5,800 m³ conditioned, radioactive waste with heat production</td>
</tr>
</tbody>
</table>

Industrial-Scale Activities

- Uranium mining and milling (tU/a): 100.
  Uranium enrichment (tSWU/a): 1985--100, 1986--400.

- Fuel fabrication
  - UO₂ fuel: 950 tU/a
  - MOX fuel: either 40 tHM/a for LWR fuels or 10 tHM/a for FBR fuel elements (ALKEM).

- AFR spent fuel storage
  - 1,500 t, dry storage (Gorleben), startup 1988.
  - 1,500 t, dry storage (Ahaus), startup 1989.
GERMANY

Major Milestones

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

INTERNATIONAL RELATIONSHIPS

DOE/BMFT Umbrella Agreement for Cooperative Radioactive Waste Management Technology Exchange

Term: 12-20-74 to 12-31-89 (In the process of being extended.)
Scope: Geologic disposal in salt deposits; retrievable surface storage; D&D; operational aspects of LL/ILW storage and disposal; transportation.
Emphasis: Waste treatment technology (design/operation of HLW vitrification pilot plants, conditioning of LLW/TRU wastes, waste form characterization), waste package development; collaboration in in-situ tests in FRG’s Asse salt mine; U.S. observation of shaft drilling at the Gorleben repository site; cooperation in tests of transport/storage casks and in waste transportation studies.

DOE/BMFT Implementing Agreement for HLW Immobilization Studies

Term: 11-28-84 to 11-28-90.
Scope: Plant design, construction and operation; fabrication at PNL of heat-and-radiation sources simulating HLW glass canisters, for FRG tests at Asse.

DOE/BMFT Agreement in the Field of Remote Systems Technology

Term: 04-24-87 to 04-24-92.
Scope: Exchange of information regarding R&D, demonstration and operational activities in the field of remote/offgas technology.
GERMANY

ORGANIZATION

• Federal Government
  - Coordinate FRG nuclear program
  - Sponsor R&D
  - Build and operate radioactive waste disposal facilities
  - Set licensing rules

• States (Länder)
  - License nuclear installations
  - Provide LLW interim storage area

• Utilities
  - Provide spent fuel/reactor waste storage, contract for reprocessing and waste treatment
  - Pay for waste disposal

GE.4
GOVT. RESPONS. -- NUCLEAR FUEL CYCLE/WASTE MGT.

BMFT (Federal Ministry for Research and Technology)
- Government Fuel Cycle/Waste Management Program Administration

-- GSF/IfT
- FRG Geologic Waste Disposal R&D
- Supporting Lab Work - Salt Properties
- Asse II Studies

-- KfK
- LWR/FBR Spent Fuel Reprocessing R&D
- LWR Fuel Cycle Waste Treatment/Packaging R&D
- LWR Spent Fuel Management Alternatives R&D
- HLW Vitrification R&D - PAMELA Support

-- KFA
- HTGR Fuel Cycle
- Waste Treatment

-- DBE
- Emplacement
- Backfill/Sealing R&D
- Safety Analysis
GERMANY

GOVT. RESPONS. -- NUCLEAR FUEL CYCLE/WASTE MGT.  
(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)
  • 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

LÄNDER (State Governments)
  • Licensing of Nuclear Installations

GE.6
INDUSTRIAL/UNIVERSITY RESPONSIBILITIES

DWK - Owned by FRG nuclear utilities
  • Construction of Spent Fuel Conditioning Plant at Gorleben (PKA)

-- WAK - DWK Subsidiary
  • Reproc. Pilot Plant
  • Operation of PAMELA Pilot Plant

NUKEM - Owned by Degussa (35%), RWE (45%), RTZ (10%), MG (10%)
  • LLW/TRU Waste Treatment R&D Facility Design
  • R&D--Spent Fuel Packaging for Disposal

GNS - Owned by Nuclear Utilities (80%), STEAG (20%)
  • Waste Treatment/Conditioning
  • Transportation of Radioactive Materials
  • Shipping Cask Development
  • Engineering & D&D Services

-- BLG - GNS Subsidiary
  • Operation of Gorleben Spent Fuel/LLW Storage Facilities

-- BZA - GNS Subsidiary
  • Operation of Ahaus Spent Fuel Interim Storage Project

NCS - Nuclear Cargo Service
  • Transportation of Radioactive Materials

SBII - Owned by Siemens AG
  • Fabrication of Uranium/MOX Fuels, including R&D/Waste Management

TUM - Technical University Munich
  • Actinide Chemistry R&D

GE.7
GERMANY

**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

**BfS (Federal Institute for Radiation Protection)**

Bundesamt für Strahlenschutz
Postfach 10 01 49
3320 Saltzgitter 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
Gert Wosnik
Henning Rosel
Prof. Dr. Horst Schneider
49-531-592-7620

Dir., Div. Project Mgt.
Dr. Ernst Warnecke

Dir., Div. Waste Disposal Safety
Dr. Gerhard Stier-Friedland

Radioactive Waste Geoscience
Dr. Dietrich Ehrlich

Radiology and Radiation Protection
Dr. Heinrich Illi

System Analysis
Dr. Wilhelm Collin

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

- **Gorleben Site** (planned repository), 100 km northeast of Braunschweig.
  
  **Mission**: Disposal of all types of solid radioactive waste.
  
  **Repository Concept**: 300 to 600 m deep boreholes in tunnel floors at depths of about 850 m in the Gorleben salt dome.
  
  **Milestone**: Startup of disposal, 2008.

- **Konrad Site** (planned repository in a former iron ore mine), 10 km southwest of Braunschweig.
  
  **Mission**: Disposal of waste with negligible thermal impacts on host rock formation.
  
  **Milestone**: Startup of disposal, 1994/95.

---

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

Bundesanstalt für Geowissenschaften und Rohstoffe
Stilleweg 2, Postfach 510153
3000 Hannover 51
Federal Republic of Germany
Tel: 49-511-643-0
Fax: 49-511-643-2304

Director, Division 2, Tech. Environmental Geology
Prof. Dr. Helmut Venzlaff

Director, Subdivision, Engin. Geology/Geotechniques
Prof. Dr. Michael Langer

Rock Mechanics
Prof. Dr. A. Pahl

Engineering Seismology
Dr. R. Lüdeling

Salt Mechanics
Dr. H. Albrecht

Mining Rock Mechanics
Dr. D. Meister

Salt Geology
Dr. W. Jaritz

Numerical Modeling
Dr. Manfred Wallner

Hydrogeology
Dr. H. Vierhuff

Groundwater Geophysics
Dr. W. Giesel

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

BMFT (Federal Ministry for Research and Technology)

Bundesministerium für Forschung
und Technologie
Heinemannstrasse 2
Postfach 200240
5300 Bonn 2
Federal Republic of Germany

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

Minister, Science/Technology
Dr. Heinz Riesenhuber
Director General, Energy/
Environment/Raw Materials
Dr. Walter Borst
Director, Energy Sci. Tech.
Fuel Cycle/Safeguards
Dr. Knut Bauer
Dr. Rolf-Peter Randl
49-228-59-3759

Waste Mgt./D&D
Dr. Stefan Theis
49-228-59-3754

U Supply/Fuel Fabrication
Dr. Ernst Budde
49-228-59-3757

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

Waste Disposal
Dr. Diethard Lummerzheim
49-228-59-3762

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

Geological Disposal
W. Busch
49-228-59-3764

BMU (Federal Ministry for Environmental Protection and Reactor Safety)

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

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

Minister
Prof. Dr. Klaus Töpfer
Walter Hohlefelder

Dir. Gen., Nuc. Installation
Safety/Radiation Protection/
Nuclear Fuel Cycle
Dr. Gast
49-228-305-2805
BMU (contd)

Director, Radiation Protection  Dr. von Ertzen  49-228-305-2905
Director, Fuel Cycle  Dr. Arnolf Matting  49-228-305-2950
Policy  Dr. Bröckling  49-228-305-2930
International Relations  Dr. Ch. Breest  49-228-305-2800
Fuel Supply  Arno Ehret  49-228-305-2831
Reprocessing/Conditioning  Armin Hagen  49-228-305-2821
Treatment/Storage/Transp.  Herbert Dreisvogt  49-228-305-2721
Final Repository  Dr. Manfred Bloser  49-228-305-2951
Chairman, Reactor Safety  Dr. Mayinger
Commission (RSK)
Chairman, Radiation Protection  Prof. Dr. A. M. Kellerer
Commission (SSK)

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

Deutsche Gesellschaft zum Bau und Betrieb von Endlagern für Abfallstoffe mbH
Woltorfer Strasse 74
3150 Peine 1
Federal Republic of Germany
Tel:  49-5171-43-1
Fax:  49-5171-43-218

Managing Directors  Dr. Jürgen P. Lempert
Manfred Florl  49-5171-43-250
Dr. Hans-Jürgen Krug
Wolfgang Schulz

Project Gorleben, Mgr.  Rüdiger Putzer  49-5171-43-310
Project Konrad, Mgr.  Dr. Hans-Jürgen Engelmann  49-5171-43-272
Project-Related R&D, Mgr.
GERMANY

**DBE (contd)**

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

**DHI (German Hydrographic Institute)**

Deutsches Hydrographisches Institut
Isotopenlaboratorium
Bernhard-Nacht-Str. 78
P.O. Box 220
2000 Hamburg 4
Federal Republic of Germany
Tel: 49-40-3190-1
Fax: 21-1138 BMVHH D

President: Prof. Gerhard Zickwolff

**DWK (German Fuel Reprocessing Company)**

Deutsche Gesellschaft für Wiederaufarbeitung
von Kernbrennstoffen mbH
Hamburger Allee 4, Postfach 1407
3000 Hannover 1
Federal Republic of Germany
Tel: 49-511-3390-0
Fax: 49-511-3390-207

Board Member/Plant Operations: Dr. Walter Weiland
R&D/Cooperation Division: Dr. Karl-Dieter Kuhn
Project Direction, PKA: Dr. Hans-Otto Willax

Function: Planning, acquisition, construction and operation of facilities as well as performing services involved in the back end of the fuel cycle. Major organizational and functional changes have recently taken place and are expected to be completed during 1990.
DWK (contd)

Facility:

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

**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
Norbert Semann

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

**Ownership:** 80% nuclear utilities, 20% STEAG.

Facility:

- **AFR Spent Fuel Storage Facilities (Gorleben and Ahaus sites)**
  **Design Basis:** Dry storage in CASTOR casks - 400 casks in a building which has dimensions of 600 ft x 125 ft x 62 ft high.
  **Capacity:** 1500 t each.
  **History:** Startup of AFR Gorleben, 1988; Ahaus, 1989.
GERMANY

**GRS (Company for Reactor Safety)**

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

General Manager
Prof. Dr. Adolf Birkhofer

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

**GSF/IiT (Company for Radiation and Environmental Research/Institute for Underground Storage)**

Gesellschaft für Strahlen- und Umweltforschung mbH München, Institut für Tiefenlagerung
Theodor-Heuss-Strasse 4
3300 Braunschweig
Federal Republic of Germany

Director, GSF/IiT and Engineering Development
Prof. Dr. Klaus Kühn
49-531-8012-231

Director, Disposal Technology
Alfred Beinlich
49-531-8012-211

Geotechnology
Manfred W. Schmidt
49-531-8012-200

Test Fields
Tilmann Rothfuchs

Geophysics
Dr. Dieter Flach

Director, Disposal Safety
Dr. Wernt Brewitz

Safety Analysis
Dr. Richard Storck

Chemical Waste
Dr. Thomas Brasser

Geochemistry
Dr. Hermann J. Gies

Geology/Hydrogeology
Dr. Konrad Klarr

Director, Project Management
Dr. Rolf Stippler

ILW/HLW Projects
Dr. Ingo Müller-Lyda

Direct Disposal Project
Jürgen Kunze

Asse Projects
Christoph Starke

Konrad/Gorleben Work
Dr. Wolfgang Bode

Test Dam Project
Dr. Helmut Fleck

Long-Term Safety Projects
Dr. Peter Faber

Director, Mine Operations
Klaus Dürr
49-531-8012-211
GERMANY

**GSF/Iff (contd)**

**Waste Management R&D:** Development and testing of safe, final geological storage for radioactive wastes, and of data for planning, constructing and operating repositories.

**Schachtanlage Asse**
3346 Remlingen
Federal Republic of Germany
Tel: 49-5336-891

Mine Manager: Oswald Opp
Tech. Planning: Helmut Kolditz
Radiation Protection: Herbert Meyer

**Facilities:**

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

- **Chemical and Hydrology Laboratories** (Braunschweig)

- **Rock Mechanics Laboratory** (Braunschweig)

**KEWA (Fuel Cycle Consulting Company)**

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

Executive: Hanns-Rudolf Oeser
49-511-3390-601

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

GE.15
GERMANY

KFA (Jülich Research Center)

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

Director, Institute of Chemical Technology (ICT)
Prof. Dr. Erich R. Merz
49-2461-61-3114

Director, Institute of Reactor Materials (IRW)
Prof. Dr. Hubertus Nickel
49-2461-61-3058

HTGR Fuel Cycle Project (HTA/HBK)
Dr. Norbert Kirsch
49-2461-61-6991

ILW/Spent Fuel HTGR Fuel
Dr. Heiner Brücher
49-2461-61-6409

Waste Treatment (ZFK-DE)
Dr. Manfred Laser
49-2461-61-5288

Quality Assurance (PKS)
Dr. Reinhard Odoj
49-2461-61-3058

Function: Develop advanced waste management procedures.

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

Kernforschungszentrum Karlsruhe GmbH
Postfach 3640
7500 Karlsruhe 1
Federal Republic of Germany
Tel: 49-7247-821
Fax: 49-7247-82-5070

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

Manager, Waste Management Project (PWA)
Dr. Reinhard Kroebel
49-7247-82-2032
Fax: 49-7247-82-4315

Manager, Waste Treatmt. (HDB)
Wolfgang Pfeifer
49-7247-82-4050

Manager, Alternative SF Mgt./Disposal Techniques
Dr. Klaus-Detlef Closs
49-7247-82-5790

Director, Inst. for Hot Chem.
Prof. Klaus Ebert
49-7247-82-2400

Deputy Director
Dr. Gunter Koch
49-7247-82-2405

Director, Institute for Nuc. Waste Tech. (INE)
Dr. Helmut Krause
49-7247-82-2230

Final Disposal
Dr. R. Koester
49-7247-82-2302

Chemistry
Dr. Werner Lutze
49-7247-82-4457

Process Engineering
Dr. S. Weisenburger
49-7247-82-4288

Director, Institute for Radiochemistry (IRCh)
Prof. Ache
49-7247-82-3200

Director, Ctrl. Eng. Dept. (IT)
Dr. Hermann Rininsland
49-7247-82-3000

Remote Handling
G. Boehme
49-7247-82-2600

Director, Lab. for Aerosol Phys./Filter Tech. (LAF II)
J. Wilhelm
49-7247-82-3107
GERMANY

KfK (contd)

Facilities:

• MILLI Hot Cell Facility (fuel reprocessing)
  Mission: LWR and FBR fuel reprocessing R&D.

• MINKA Hot Glove Boxes (U and Pu)
  Mission: Extraction code verification for pulsed columns and maloperation experiments.
  Design Basis: Small scale pulse columns first extraction cycle.
  History: U startup, 1985; Pu startup, 1986.

• PUTE Hot Facility (fuel reprocessing)
  Mission: U/Pu Separation.
  History: Startup, 1982.

• 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 (nonradioactive)
  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.

GE.18
GERMANY

NUKEM

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

Managing Directors
Bernd Jobst Breloer
L. Aumüller, H. Pirk

Process Engineering
H.W. Binzel

Fuel Cycle Services
K. Schreiber

Non-Destructive Testing
Dr. R. Gerhardt

Environmental Technology
Dr. P.G. Maurer

System Manufacturing
H. Wagner

Solar Energy Technology
Dr. W. Hoffmann

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

SBH

Siemens AG Brennelementenwerk Hanau
Postfach 110060
6450 Hanau 11 (Wolfgang)
Federal Republic of Germany

Director
Horst Roepenack
49-6181-58-4600

Fabrication Manager
Jürgen Krellmann
49-6181-58-4599

Chemistry/Waste Management
Dr. Volker Schneider
49-6181-58-4590
Dr. F.-W. Ledebrink
49-6181-58-4169

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

SBH (contd)

Facility:

• Fuel Fabrication Plant
  Capacity: MOX - 40 t/a, LWR fuel; 10 t/a, FBR fuel; LEU - 800 tHM/a.

TUM (Technical University Munich)

Technische Universität München
Institut für Radiochemie
Walther-Meissner-Strasse
8046 Garching (München)
Federal Republic of Germany
Tel: 49-89-3209-220
Fax: 49-89-3209-2204

Director
Prof. Franz Baumgärtner

WAK (Fuel Reprocessing Company)

Wiederaufarbeitungsanlage Karlsruhe
Betriebsgesellschaft mbH
Postfach 220
7514 Eggenstein-Leopoldshafen 2
Federal Republic of Germany
Tel: 49-7247-2881
Fax: 49-7247-4755

(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. K. L. Huppert
49-7247-88-2507

Reprocessing Plant Manager
Dr. Martin Weishaupt

Facilities:

• WAK Reprocessing Plant (owned by KfK)
  Mission: Reprocess UO₂ and MOX fuels; recover plutonium for recycle; test advanced technology.
  Design Basis: Chop-leach head-end; PUREX process; capacity, 175 kgHM/d.
  History: On-line from 9/71 to early 1980, when it was shut down for dissolver replacement. Operation resumed, October 1982. Total throughput to 1989, 203 tHM (130 tHM from LWR fuel).
GERMANY

WAK (contd)

• TEKO Hall (cold semi-works, owned by KfK)
  Mission: Test fuel cycle components and unit operations; currently being equipped for fuel reprocessing studies.
  Design Basis: Shear, centrifuge, solvent extraction battery; capacity: 4 tHM/d.

  Manager Dr. Lorenz Finsterwalder

• 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 December 1989: 531 m³ waste vitrified, 1791 canisters filled.

DWK-PAMELA
 c/o Belgoprocess
 Gravenstraat  Tel: 32-14-244-501
 2480 Dessel, Belgium  Fax: 32-14-319-497

PAMELA Plant Manager Horst Wiese

* As of 4/1/90 under WAK (previously a DWK facility).

GE.21
INDIA

MAJOR PUBLIC HOLIDAYS (1990)

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Year</td>
<td>Jan. 1</td>
</tr>
<tr>
<td>Republic Day</td>
<td>Jan. 26</td>
</tr>
<tr>
<td>Vasanta</td>
<td>Feb.</td>
</tr>
<tr>
<td>Maha Sivarati</td>
<td>Feb.</td>
</tr>
<tr>
<td>Holi</td>
<td>Mar. 10</td>
</tr>
<tr>
<td>Dulhendi</td>
<td>Mar.</td>
</tr>
<tr>
<td>Durga Ashtmi/Idu'l Fitr</td>
<td>Apr. 27</td>
</tr>
<tr>
<td>Muharram</td>
<td>Apr. 28</td>
</tr>
<tr>
<td>Mahavir Jayanti</td>
<td>Apr. 29</td>
</tr>
<tr>
<td>Baisakhi</td>
<td>Apr. 13</td>
</tr>
<tr>
<td>Buddha Purima</td>
<td>May 9</td>
</tr>
<tr>
<td>Sacrifice Feast</td>
<td>July 4-6</td>
</tr>
<tr>
<td>Islamic New Year</td>
<td>July 25</td>
</tr>
<tr>
<td>Raksha Bandhan</td>
<td>Aug.</td>
</tr>
<tr>
<td>Janmashtami</td>
<td>Aug. 14</td>
</tr>
<tr>
<td>Independence</td>
<td>Aug. 15</td>
</tr>
<tr>
<td>Anant Choudas</td>
<td>Sept.</td>
</tr>
<tr>
<td>Dussehra</td>
<td>Sept. 28</td>
</tr>
<tr>
<td>Bhaiya Dooj</td>
<td>Oct.</td>
</tr>
<tr>
<td>Gandhi's Birth</td>
<td>Oct. 2</td>
</tr>
<tr>
<td>Diwali</td>
<td>Oct. 18</td>
</tr>
<tr>
<td>Fest. of Lights</td>
<td>Oct. 18</td>
</tr>
<tr>
<td>Guru Nanak's Birthday</td>
<td>Nov. 2</td>
</tr>
<tr>
<td>Singh's Birth</td>
<td>Dec.</td>
</tr>
<tr>
<td>Bank Holiday</td>
<td>Dec. 13</td>
</tr>
<tr>
<td>Christmas</td>
<td>Dec. 25</td>
</tr>
</tbody>
</table>

TIME

Standard Time Washington D.C.: + 10.5 hours

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 16.89 Rupees per Wall Street Journal, 01/31/90. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

U.S. EMBASSY - NEW DELHI

American Embassy
Shanti Path
Chanakyapuri
New Delhi, 110021
India

Tel: 91-11-600-651
Fax: 91-11-672-476
Tlx: 031-65269 USEM IN

Science Counselor
Peter Heydemann
ENERGY

Population 1987 815 million

Electric Power Plant Capacity 1986 45 GWe
2000 100 GWe

Electric Power Production 1988 180 TWh
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 Plant Capacity 1989 1.5 GWe
1990 1.7 GWe
1995 3.7 GWe
2000 4.4 GWe

HWR: 5 (1973-89)
      5 (1990-95)

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 fuel cycle--uranium milling, conversion to UO₂, fuel fabrication, reprocessing (in small plants adjacent to power stations); if enriched UF₆ supply for India's BWRs is cut off, they may fuel with UO₂–PuO₂.

IN.1
**Waste Management Strategy:** Vitrification of HLW, interim storage for at least 20 years and disposal in a crystalline rock formation.

<table>
<thead>
<tr>
<th>Cumulative Spent Fuel Arisings (LWR and HWR)</th>
<th>1980</th>
<th>370 tU</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1985</td>
<td>780 tU</td>
</tr>
<tr>
<td></td>
<td>1990</td>
<td>1,580 tU</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>5,000 tU</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cumulative Waste Arisings</th>
<th>1982</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary solid wastes</td>
<td>1,700 m³</td>
<td>107,000 m³</td>
</tr>
<tr>
<td>LLW concentrates</td>
<td>2,500 m³</td>
<td>77,000 m³</td>
</tr>
<tr>
<td>ILW</td>
<td>650 m³</td>
<td>20,000 m³</td>
</tr>
<tr>
<td>HLW</td>
<td>350 m³</td>
<td>8,000 m³</td>
</tr>
</tbody>
</table>

**Industrial-Scale Activities**

- **Heavy-water design capacity (t/a):** 1985--85, 1988--150; additional capacity is planned.

- **Uranium mining and milling (t/a):** 1985--130, 1988--170.

- **UO₂ fuel fabrication (t/a):** 1981--100; 1984--210; 2000--1500.

- **Fuel reprocessing:**
  - Trombay pilot plant, 30 t/a (1962--)
  - Tarapur plant, 100 t/a (1982--)
  - Kalpakkam plant, 100 t/a (1992/93).

- **HLW vitrification:** Tarapur (1985--)

**Major Milestones**

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

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

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

ORGANIZATION

Prime Minister

-- Department of Atomic Energy

-- Atomic Energy Commission

-- Atomic Minerals
-- Nuclear Fuels
-- Power Project Engineering
-- Research and Development

-- Reactor Research Center (Kalpakkam)
  • Fuel Cycle R&D
  • Waste Management

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

Facilities:

- **Trombay Fuel Reprocessing Plant**
  Mission: Reprocess natural uranium metal fuels.
  Design Basis: Chemical declad, PUREX flowsheet; contact maintenance; capacity, 0.1-0.15 tHM/d.
  History: On-line, 1965-1974; modified and being readied to operate again.

- **WIP (Waste Immobilization Plant) - Trombay**

- **HLW Vitrification Plant**

- **Experimental Uranium Enrichment Facility**
DAE

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

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

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

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

Function: Regulation and licensing of nuclear facilities.

Nuclear Power Corporation (formerly Nuclear Power Board)

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

IGCAR

Indira Ghandi Centre
for Atomic Research
Kalpakkam 603 102
Tamil Nadu, India    Tlx: 041-6244

Fast Breeder Reactor Centre    C. V. Sundaram

Located near Madras power station.

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

IN.5
IGCAR (contd)

Facilities:

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

KOLAR WASTE DISPOSAL RESEARCH STATION

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

Function: Assess the suitability of peninsular gneisses for location of a 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, 0.5 tHM/d for PHWR fuels.

- WIP (Waste Immobilization Plant)-Kalpakkam

- ISF (Interim Storage Facility)-Kalpakkam

IN.6
**TARAPUR ATOMIC POWER STATION**

Tarapur Atomic Power Station  
Tarapur, Maharashtra, India

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

**Facilities:**

- **Tarapur Fuel Reprocessing Plant (PREFRE)**  
  **Mission:** Reprocess natural and low-enriched UO₂ fuels.  
  **Design Basis:** Chop-leach head-end; PUREX flowsheet; contact maintenance; capacity, 0.5 tHM/d.  
  **History:** Construction completed, 1975; hot operation, 12/82.

- **WIP (Waste Immobilization Plant)-Tarapur**  
  **Mission:** Vitrify Tarapur HLW.  
  **Design Basis:** Two-step calcination and melting in drainable pot; capacity, 25 liters/h HLLW, 125 kg glass/canister, 1 canister/d; product, borosilicate glass blocks.  

- **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 Tarapur and Trombay waste.  
  **Milestone:** Completion, 1990.

- **ILW Bituminization Plant**

- **Polymerization Facility**
ITALY

MAJOR PUBLIC HOLIDAYS (1990)

Jan. 1    New Year
Jan. 6    Epiphany
Apr. 15-16  Easter
Apr. 25  Liberation Day
May 1    Labor Day
Aug. 15  Assumption
Nov. 1    All Saints
Dec. 8    Immaculate Conception
Dec. 25-26 Christmas

TIME

Standard Time Washington D.C.:
+ 6 hours
Daylight Saving Time Period:
03/25 - 09/29/90

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 1266 Lira

per Wall Street Journal, 01/03/90. 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
Tlx: 62-2322 AMBRMA

Science Counselor    Reno L. Harnish
ITALY

ENERGY

Population 1987 58 million

Electric Power Plant Capacity

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity (GWe)</th>
<th>Nuclear Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>56.5</td>
<td>2%</td>
</tr>
<tr>
<td>1988</td>
<td>56.9</td>
<td>2%</td>
</tr>
<tr>
<td>1990</td>
<td>59.2</td>
<td>2%</td>
</tr>
<tr>
<td>1995</td>
<td>70.0</td>
<td>0%</td>
</tr>
</tbody>
</table>

Electric Power Production

<table>
<thead>
<tr>
<th>Year</th>
<th>Production (TWh)</th>
<th>Fuel Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>201.4</td>
<td>45% oil, 23% hydro/geoth., 16% coal, 16% gas</td>
</tr>
<tr>
<td>1988</td>
<td>0</td>
<td>0% nuclear</td>
</tr>
<tr>
<td>1990</td>
<td>0</td>
<td>0% nuclear</td>
</tr>
<tr>
<td>1995</td>
<td>0</td>
<td>0% nuclear</td>
</tr>
</tbody>
</table>

NUCLEAR POWER

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

Nuclear Power Plant Capacity

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity (GWe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>0.0</td>
</tr>
<tr>
<td>2000</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Reactor Mix

<table>
<thead>
<tr>
<th>Year</th>
<th>PWR</th>
<th>BWR</th>
<th>HWR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>1 (1964)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

INDUSTRIAL FUEL CYCLE

Waste Management Strategy: HLW--vitrify and store in engineered surface facility for 50-60 years; emplace canisters in geologic repository (clay).
ITALY

Cumulative Spent Fuel
Arisings (LWR)

<table>
<thead>
<tr>
<th>Year</th>
<th>1980</th>
<th>160 tU</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>330 tU</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>520 tU</td>
<td></td>
</tr>
</tbody>
</table>

INTERNATIONAL RELATIONSHIPS

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

ORGANIZATION

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

**AGIP**

AGIP S.p.A  
Viale Brenta, 29  
20139 Milano  
Italy  
Tel: 39-2-520-1  
Fax:  
Tlx: 320192 AGN I  
Dir., Nucl. Fuel Development  
Ing. Enrico Crispino

**Function:** Develop advanced technologies for use in several innovative applications pertaining to the nuclear field (and other non-conventional energy sources).

**Facility:**

- **Centre for Advanced Technologies (CeTA),** located at Medicina, near Bologna.
  - Production of GSP (Gel-Supported Precipitation) precursors for application in the SYNROC system of liquid radioactive waste immobilization.
  - Fabrication and characterization of special oxide nuclear fuels.

**ENEA (National Organization for Nuclear and Alternative Energy Sources)**

Energia Nucleare e Delle Energie Alternative  
Viale Regina Margherita 125  
00198 Rome, Italy  
Tel: 39-6-8528-1  
Fax: 39-6-8528-2591  
Tlx: 61183  
President  
Prof. Umberto Colombo  
Director General  
Dr. Fabio Pistella

**Function:** Direct pure and applied nuclear research, maintain technical control over nuclear power plants, cooperate in international program.

**Owner:** Government.
ENEACASACIA

ENEACasaccia Center
C.P. 2400
00100 Rome, Italy
Tel: 39-6-3048-3171
Fax: 39-6-3048-3190

Director, Fuel Cycle Dr. Paolo Venditti
Waste Management Dr. B. Dello Vicario
Reprocessing Dr. G. Rolandi

Function: Applied research—advanced technology, fast breeder development; fuel cycle and alternative energies R&D.

Waste Management R&D: MOX fuel reprocessing, HLW solidification, actinide transmutation, treatment of LLW and characterization of waste forms, waste isolation in clay formations (site characterization and thermal properties).

ENEASALUGGIA

ENEA-Impianto Eurex
13040 Saluggia (Vercelli)
Italy
Tel: 39-161-48415
Fax: 38-0058 EURI

(Located about 35 km from Torino and 120 km from Milan.)

Director, Eurex Pilot Plant Dr. Franco Pozzi
Deputy Director, Eurex Dr. Arnoldo Hall

Function: Applied nuclear research.

Facilities:

- EUREX (fuel reprocessing pilot plant-radioactive)
  Mission: Reprocess MTR and low-enriched uranium (including $^{235}$U) fuels.
  Design Basis: EUREX process for MTR fuel has capacity of 30 kg U-Al/d. Plant will be modified for LWR fuel.
ITALY

**ENEA-SALUGGIA (contd)**

- **IVEX (HLW vitrification plant-radioactive) - Planned.**  
  Mission: Immobilize EUREX HLW.

- **IFEC (fuel element fabrication plant)**

**ENEA-TRISAIA**

ENEA-Trisaia Center  
S.S. 106 Ionica, km 419.5  
75025 Rotondella (Matera)  
Italy  
Tel: 39-835-972241  
Fax: 760085 ENEATR I

(Located about 5 km from the coast of the Ionian Sea in the Gulf of Taranto.)

Energy Research Dr. G. Lapolla  
ITREC Plant Dr. T. Candelieri  
Tech. Devel./Backend Fuel Cycle Dr. A. Canonico  
Vitrif. Plant Operations Dr. E. Scoditti

**Waste Management R&D:** Fuel reprocessing; centrifugal contactor development; cladding hulls compaction; HLW vitrification; D&D; waste isolation (clay repositories); operation of inactive vitrification pilot plant; remote technology development for HLW and reprocessing, optimization of glass composition.

**Facilities:**

- **ITREC (fuel reprocessing pilot plant-radioactive)**  
  Mission: Special fuel reprocessing R&D; reprocess thorium and MOX (FBR) fuels.  
  Design Basis: Chop-leach head-end; maintenance by remote removal of modules; capacity, 15 kgHM/d (ThO₂ and UO₂).  
  History: Startup, 1975.
ITALY

**ENEA-TRISAIA (contd)**

- **IVET-1** (vitrification pilot plant-nonradioactive)
  
  **Owner:** ENEA and AGIP.
  
  **Mission:** Develop full-scale HLW vitrification process.
  
  **Design Basis:** IVET-1 pot vitrification (rising-level process); capacity, 20 liters/h feed; product, borosilicate glass cylinders, 0.25 m dia x 1 m.
  
  **History:** Startup, July 1980.

- **IVET-2** (HLW vitrification pilot plant-radioactive) - Planned.
  
  **Owner:** ENEA.
  
  **Mission:** Process development; solidify HLW from EUREX fuel reprocessing pilot plant.
  
  **Design Basis:** Pot vitrification (rising-level process); capacity, 15 liters/h feed (2 canisters/wk) or 10 m³ HLLW/a; product, borosilicate glass cylinders, 0.25 m dia x 1 m.
  
  **History:** Startup, late 1980s.

**ENEL (National Electric Energy Agency)**

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

President: Franzo Viezzoli
Vice President: Dr. Marcello Inghilesi
Director General: Dr. Alberto Negroni

Government agency, responsible for all electric power production.

**ENI**

Ente Nazionale Idrocarburi
Piazza Enrico Mattei
00144 Rome, Italy
Tel: 39-6-5900-1
Fax: 39-6-5900-2141

President: Dr. Gabriele Cagliari

Oil and energy holding company (owned by the government).
Provides nuclear fuel cycle services.
NUCLECO

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

President Ing. Silvio Cao

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

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

SNIA TECHINT

Snia Techint
Tecnologie Energetiche
Avanzate S.p.A
Via A. Bargoni 34
00153 Rome
Italy
Tel: 39-6-589-4041
Fax: 39-6-580-9058

General Manager Dr. Marino Fiorelli

Function: Provide architect-engineering services for reprocessing, fuel handling and HLW conditioning facilities.
JAPAN

MAJOR PUBLIC HOLIDAYS (1990)

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

TIME

Standard Time Washington D.C.: + 14 hours

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 145.30 Yen

per Wall Street Journal, 01/31/90. 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  Tel: 81-3-224-5000
Tokyo 107  Fax: 81-3-505-1862
Japan  Tlx: 24-22118 AMEMBJ

Science Counselor  Dr. Richard W. Getzinger
DOE Representative  Milton A. Eaton
## ENERGY

<table>
<thead>
<tr>
<th>Population</th>
<th>1987</th>
<th>122.1 million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Power Plant Capacity</td>
<td>1987</td>
<td>151.7 GWe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17% nuclear</td>
</tr>
<tr>
<td></td>
<td>1988</td>
<td>154.5 GWe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17% nuclear</td>
</tr>
<tr>
<td></td>
<td>1990</td>
<td>161.9 GWe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18% nuclear</td>
</tr>
<tr>
<td></td>
<td>1995</td>
<td>181.0 GWe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21% nuclear</td>
</tr>
<tr>
<td>Electric Power Production</td>
<td>1987</td>
<td>719.1 TWh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28% oil</td>
</tr>
<tr>
<td></td>
<td></td>
<td>26% nuclear</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20% gas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15% coal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11% hydro/geoth.</td>
</tr>
<tr>
<td></td>
<td>1988</td>
<td>27% nuclear</td>
</tr>
<tr>
<td></td>
<td>1990</td>
<td>30% nuclear</td>
</tr>
<tr>
<td></td>
<td>1995</td>
<td>36% nuclear</td>
</tr>
</tbody>
</table>

## NUCLEAR POWER

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

| Nuclear Power Plant Capacity | 1990   | 29.4 GWe    |
|                             | 1995   | 38.5 GWe    |
|                             | 2000   | 50.4 GWe    |

|            |        | BWR: 19 (1970-88) |
|            |        | 10 (1990-99)    |
|            |        | PWR: 18 (1970-89) |
|            |        | 5 (1991-97)     |
|            |        | HWR: 1 (1979)   |
|            |        | FBR: 1 (1993)   |

| Reactor Development | HWR (ATR), LMFBR, HTGR |

JA.1
INDUSTRIAL FUEL CYCLE

Policy: Obtain ownership of foreign uranium resources; develop complete fuel cycle capability (enrichment, reprocessing and waste treatment, buying foreign reprocessing services as long as necessary); recycle Pu to FBRs, HWRs, and LWRs.

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

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

Industrial-Scale Activities (Capacity)

• Uranium mining and conversion (tUF₆/a): 200

• Uranium reconversion (tU/a): 1,028

• Uranium enrichment (tSWU/a):
  1981 -- 50
  1988 -- 250
  2000 -- 3000

• Fuel fabrication
  - UO₂ (tU/a):
    1987 -- 2495
  - MOX--FBR (t/a):
    1988 -- 6
  - ATR (t/a):
    1988 -- 10
    1993 -- 50

• Reprocessing (t/a):
  1981 -- 210
  2000 -- 800
Major Milestones

- Tokai Vitrification Facility (PNC) 1992
- Return of HLW from COGEMA and BNFL 1992
- MONJU LMFBR 1992
- Commercial uranium enrichment plant ~1991 (Rokkasho-mura; FEPC/JNFI)
- Underground Research Laboratory ~1992
- HLW glass storage facility (Horonobe-PNC) 1992
- Commercial LWR fuel reprocessing plant (Rokkasho-mura; JNFS) ~1995
- Selection of demonstration site for After 2000 in situ test with actual waste package
- FBR fuel reprocessing pilot plant After 2000
- Commercial HLW vitrification plant ~1997
- Startup of disposal site After 2000
- Experimental sea-dumping of LLW TBD
- Commercial LLW storage facility ~1991 (Rokkashomura; JNFI)

INTERNATIONAL RELATIONSHIPS

DOE/PNC Implementing Agreement for Collaborative Testing of the Radioactive Liquid-Fed Ceramic Melter
Term: 3-29-85 to 3-29-90.
Scope: PNC participation in startup and operation of radioactive ceramic melter facility at PNL, including testing of PNC components and simulated waste streams in PNL facility; DOE participation in similar PNC activities.

DOE/PNC Agreement for Cooperation in the Area of Radioactive Waste Management
Term: 12-3-86 to 12-3-96.
Scope: HLW/TRU waste; waste form development, assay and characterization; treatment/packaging/transportation; storage/disposal; D&D; facility operations; environment/safety and public acceptance issues.
Emphasis: Information exchange of HLW and TRU waste conditioning technology.
DOE/JAERI Agreement on Decommissioning Nuclear Facilities
Term: 7-2-87 to 7-2-92.
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: 11-7-84 to 11-7-89 (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, UK.

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.
JAPAN

NUCLEAR FUEL CYCLE/WASTE MANAGEMENT ORGANIZATION

Prime Minister

- AEC
  * Nuclear program policy

- NSC
  * Safety

- MITI
  * Nucl. power development
  * Nucl. power reactor licensing
  * Comm. fuel cycle/waste management
  * Indus. sponsors (util., manufacturers, etc.)

- STA

- NSB
  * Tech. support to NSC
  * Safety
  * Regulation
  * Radiation protection

- NIRS
  * Radiological sciences

- AEB
  * Tech. support to AEC
  * Policy
  * Research
  * Development

- CRIEPI
  * R&D for utilities
  * SF storage tech.
  * Properties of LLW packages

- JNFI
  * Comm. equip.
  * LLW storage/displ.
  * Comm. U enrichment

- RMCI
  * LLW disposal R&D
  * Environ. monitoring and safety

- JNFS
  * Comm. reprocessing
  * Waste treatment
  * HLW storage

- STA

- JNFS
  * Comm. reprocessing
  * Waste treatment
  * HLW storage

- PNC
  * Fuel cycle process development & demonstration (U enrichment; reprocessing; MOX fuel fab.; waste mgmt.)
  * Advanced reactor development

- JAERI
  * Reactor safety R&D
  * Waste mgmt. & environ. safety assessments
  * Partitioning of HLW

---

Government

Semi-government or industry

JA.5
PARTIAL PNC ORGANIZATION

Board of Directors

--- President
  --- Technology Management 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

--- Oarai Engineering Center
  --- Technology Development 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
  --- Waste Plants Operations Division

--- Tokai Reprocessing Plant

JA.6
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 Radioisotope
- Nuclear Safety Research Center
  - Department of Reactor Safety Research
  - Department of Fuel Safety Research
  - Department of Reactor Fuel Examination
  - Department of Environmental Safety Res.
    - Environmental Radioactivity
    - Radioactive Waste Management
    - Airborne Waste--Environmental Safety
**JAPAN**

**Atomic Energy Bureau (AEB)**
2-1 Kasumigaseki 2-chome
Chiyoda-ku, Tokyo 100
Japan
Tel: 81-3-581-1686
or: 81-3-581-5271
Fax: 81-3-592-1239

Director General
Kenjiro Ogata
Deputy Director General
Katsuhisa Ida
Director, Policy
Isamu Sasaya
Dir., Power Reactor Dev. Div.
Yasuhiro Kato
Dir., Nuclear Fuel Div.
Akio Yuki

**Function:** Provide support to the Atomic Energy Commission.

**Atomic Energy Commission (AEC)**
2-1 Kasumigaseki 2-chome
Chiyoda-ku, Tokyo 100
Japan
Tel: 81-3-581-2585 or 81-3-581-5271
Fax:

Chairman (Minister of State for Science/Technology)
Eizaburo Saito
Acting Chairman
Takashi Mukaibo

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

**Central Research Institute of Electric Power Industry (CRIEPI)**
1-6-1, Ohtemachi
Chiyoda-ku, Tokyo 100, Japan
Tel: 81-3-201-6601
Fax: 81-3-287-2880

President
Hiroshi Narita

**Function:** Provide R&D support for utilities.

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

Energy and Environmental Research Laboratory for Energy and Electric Power  
2-11-1, Iwato-kita, Komae-shi, Tokyo 201, Japan  
Tel: 81-3-480-211  
Fax: 2423098 CRIEPI J

GIRIO

Government Industrial Research Institute, Osaka  
1-8-31 Midorigaoka, Ikeda-shi, Osaka 563, Japan  
Tel: 81-727-51-8351  
Fax:  
Director, 4th Department Nuclear Waste Program  
Dr. Ryozo 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: 81-3-258-1111  
Fax: 81-3-258-6218

Yoshiaki Korei  
Hiromasa Kobayashi


Hitachi Engineering Co., Ltd.  
1-1 Saiwai-cho, 3-chome, Hitachi-shi, Ibaraki-ken, 317, Japan  
Tel: 81-294-21-1111  
Fax: 03645511

Kiyoshi Shimizu Yasuo Hirose Sadatoshi Inoue
HITACHI (contd)

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

IHI

Ishikawajima-Harima
Heavy Industries Co., Ltd.
Shin-Ohtemachi Bldg.
2-1, Ohtemachi 2-chome
Chiyoda-ku, Tokyo 100, Japan
Tel: 81-3-244-5111
Fax:
President
Gen.-Mgr., Nuclear Power
Kousaku Inaba
Masahiro Ogawa

IHI Research Institute
Yokohama Branch
1, Shin-nakaharacho, Isogo-ku
Yokohama 235, Japan

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
Tel: 81-3-592-2111
Fax: 81-3-580-6107

President
Vice President
Vice President
Exec. Director, International
Yoshinori Ihara
Toyojiro Fuketa
Eiichi Tsuji
Hakubi Sasaki

Location: JAERI headquarters and Radioisotope Center are in Tokyo. The Tokai and Oarai Research Establishments share government reservations at Tokai-mura and Oarai-machi with PNC. Tokai and Oarai are 120 and 100 km, respectively.
northeast of Tokyo, near the ocean. These sites can be reached by
train from Tokyo to the city of Mito, then by taxi. The recently
formed Naka Research Establishment (fusion energy) is in
Naka-machi near Tokai-mura.

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

JAERI: OARAI

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

Director General

Konomu Sanokawa

JAERI: TOKAI

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 Asaoka
Dr. Shojiro Matsuura
Dr. Sukenobu Taniguchi
Naomoto Shikazono
Facilities:

- **WASTEF** (glove box and hot cell facilities)
  
  Mission: Safety evaluations for high-level waste.
  

- **STEM** (Simulation Test for Environmental radionuclide Migration)
  
  Mission: Safety evaluation for land disposal of radioactive LLW.
  
  History: Startup, 1983.

**JGC**

JGC Corporation
Nuclear and Advanced Technology
New Ohtemachi Bldg.
2-1 Ohtemachi 2-chome
Chiyoda-ku, Tokyo 100, Japan
Tel: 81-3-279-5441
Fax: 81-3-273-8050

Exec. VP, General Manager
Dr. Takao Nakajima

Deputy General Manager
Dr. Hiroshi Kuribayashi

Deputy General Manager
Shigemi Morikawa

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

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

Yasuhiro Moriya

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

- **Demonstration Incineration Plant**
  
  **Mission:** Simultaneously melt combustible and noncombustible wastes.
  
  **Design Basis:** 100 kg/h at 1500°C. Low-level radwaste combustion technology licensed from Belgonucleaire SA.

- **Contaminated Liquid Waste Recycle Plant**
  
  **Mission:** Recovery of clean water for re-use from LLLW.
  
  **Design Basis:** 20 GPM, filtration, reverse osmosis, active-carbon bed adsorption, chelate resin adsorption, ion-exchange adsorption, evaporation, etc.

**JNFI**

Japan Nuclear Fuel Industries Co., Inc.
Daiichi Seimei Bldg.
Hirakawa-cho 1-7, Chiyoda-ku
Tokyo, Japan

Tel: 81-3-239-6521
Fax:

President: Tadao Ohgaki
V. President, U Enrichment: Yuzuru Yukawa
V. Pres., Envrnmnl. Adjmts.: Eisaku Okumura

**Function:** Construct/operate facilities for uranium enrichment, at an estimated cost of U.S. $865 million, with a capacity of 1.5 M SWU, and for LLW terminal storage, at an estimated cost of U.S. $480 million, with a capacity for storing 1 million drums.

Proposed site for both facilities is in the Ohishita area of Rokkasho-mura.
JAPAN

**JNFS**

Japan Nuclear Fuel Service Co., Ltd.
2-2, 2-chome, Uchisaiwaicho
Chiyoda-ku, Tokyo 100, Japan
Tel: 81-3-580-6911
Fax: 81-3-591-8723

President
Masatoshi Toyoda
Exec., Mg. Dir.-Technology
Yoshio Kawashima
Dir., Plant Design/Reproc.
Sadao Ito

Facility:

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

**KOBE STEEL**

Kobe Steel, Ltd.
No. 3-18, Wakinohamacho
1-chome
Chuo-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.
Norio Mitsushima
Deputy General Mgr., Nuc. Eng.
Kiyoshi Asahina
Gen. Mgr., Nuc. R&D Planning
Shoji Tsuchibuchi

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

JA.14
MITI
Ministry of International Trade and Industry
3-1, Kasumigaseki 1-chome, Chiyoda-ku, Tokyo 100, Japan
Tel: 81-3-501-1511
Fax: 81-3-501-0643 or 0644

Minister
Hikaru Matsunaga
V-Min., International Affairs
Naomichi Suzuki
Director, Nuc. Energy Industry
Kazumasa Kusaka
Director, Int. Nuc. Affairs
Toru Ishida

MMC
Mitsubishi Metal Corporation
5-2 Ohtemachi 1-chome, Chiyoda-ku, Tokyo 100, Japan
Tel: 81-3-213-2111
Fax: 81-3-215-2435 or 2436

General Manager, Nuc. Energy
Dr. Yumi Akimoto
Manager, Tech. Planning
Dr. Tamotsu Ishii
General Manager, Tech. Dept.
Eiji Yagi
Takaaki Kashiwagi

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

MOFA
Ministry of Foreign Affairs
2-1 Kasumigaseki 2-chome, Chiyoda-ku, Tokyo 100, Japan
Tel: 81-3-580-3311
Fax: 81-3-581-9470

Director, Nuclear Energy
Tatsuaki Iwata
Deputy Director
Yutaka Yoshizawa

JA.15
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
Director: Toshiyuki Kumatori

Function: Attached to the Science and 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
2-1, Kasumigaseki 2-chome
Chiyoda-ku, Tokyo 100, Japan
Tel: 81-3-581-5271
Fax: 81-3-581-0774

Director-General: Kenichi Murakami
Deputy Director-General: Akihiko Hayashi
Dir., Nuc. Safety Policy Div.: Hiroshi Tani
Dir., Reactor Reg. Div.: Mikio Hattori
Dir., Safeguards Division: Jiro Shibata
Dir., Radiation Protec. Div.: Tetsuhiko Yoshida

Function: Provide support to the Nuclear Safety Commission.

NSC

Nuclear Safety Commission
2-1, Kasumigaseki 2-chome
Chiyoda-ku, Tokyo 100, Japan
Tel: 81-3-581-5271
Fax: 81-3-581-0774

Chairman: Hideo Uchida

Function: Responsible for carrying out national policy in regard to safety and security of nuclear energy R&D and utilization; advisory body to the Prime Minister's office.
Power Reactor and Nuclear Fuel Development Corporation
Sankaido Building
1-9-13 Akasaka
Minato-ku, Tokyo 107, Japan
Tel: 81-3-586-3311
Fax: 81-3-505-5125

President
Takao Ishiwatari
Mitsuru Sata, Hiroshi Ohishi
T. Sasaki
Yoshikazu Hashimoto
Kenji Miyahara
Naomi Tsunoda
Masao Yamamoto
Takao Tsuboya
H. Ando, N. Tajima
Tetsuya Shiota,
Tadashi Mano
Sumio Masuda, T. Ohsawa
Tetsuya Shiota
Takao Tsuboya, M. Kinugasa
Yoshiaki Matsuno
Tadatomo Yamaguchi

U.S. DOE Tech. Representative
Jim Scott
81-3-586-3311

PNC Washington Office:

Power Reactor and Nuclear Fuel Development Corporation
Suite 715
2600 Virginia Avenue NW
Washington, DC 20037
Tel: 202-338-3770
Fax: 202-333-1097

Manager
Takao Yagi
PNC: OARAI

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

Director
Waste Management Mgr.
Masao Hori
Hidehiko Miyao

Facilities:

- **Incinerator**
  - Mission: Burn solid LLW.
  - Design Basis: Three chambers—pyrolysis, combustion, after-burning.

- **WDF (Waste Dismantling Facility)**
  - Mission: Condition large contaminated equipment; develop decontamination and decommissioning technology.
  - Design Basis: Capacity to condition 5.5 t/yr.

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

Director
Tanehiko Yamanouchi
Deputy Directors
Makoto Toda, Nobukazu Saitoh, Kenichi Matsumoto
Dir., Reprocessing Plant
Kenichi Matsumoto
Dir., Technology Dev. Coord’n
Y. Kishimoto
Dir., Waste Technology Devel.
Nobukazu Saitoh
HLW Conditioning
Misato Horie
TRU Conditioning
Eiichi Inada
Geological Isolation Tech.
Noriaki Sasaki
Dir., Waste Plants Operations
Yoshio Asakura
Dir., Fuel Production
Katsuruki Otsuka

JA.18
PNC: TOKAI (contd)

Dir., Reproc. Technol. Devel.  Shotaro Hayashi

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, 9/77; 400 tU spent fuel processed through 12/88.

- **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 5/89.

- **Tokai Plutonium Fuel Production Facility**
  Mission: Fabricate large quantities of MOX fuel for FBR and ATR.
  Design Basis: FBR fuels, 5 t/a; ATR fuels 40 t/a.
  History: Startup of hot operation, 4/88.

- **EDF (Engineering Demonstration Facility)**
  Mission: Nonradioactive, full-scale and/or engineering mockup tests of processes and equipment for FBR spent fuel reprocessing.
  History: Startup, 4/82.
PNC: TOKAI (contd)

- ETF (Engineering Test Facility)
  Mission: Develop engineering test of vitrification and ceramic melter technologies.
  Design Basis: Joule-heated melter.
  History: Facility startup, 2/80.

- 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, 9/82.

- KRF - Krypton Recovery Facility (pilot plant)
  Mission: Demonstrate $^{85}$Kr recovery from Tokai-mura reprocessing plant off gas.
  Design Basis: Cryogenic distillation and pressurized cylinder storage.

- Bitumization Demonstration Facility
  Design Basis: 200 liter/h.

- Incinerator
  Mission: Burn solid LLW.
  Design Basis: 600 kg/d.

- PWTF (Plutonium-contaminated Waste Treatment Facility)
  Mission: Prepare PNC TRU wastes for disposal.
  Design Basis: Acid digestion of chloride-containing wastes; incineration of other combustibles; mechanical volume reduction.
PNC: **TOKAI** (contd)

- **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** (site to be determined)
  - **Mission:** Demonstrate FBR fuel reprocessing equipment and process technology.
  - **Design Basis:** 10 kg/h
  - **Milestone:** Startup, 1994.

- **FBR Fuel Reprocessing Pilot Plant** (reprocessing and HLW treatment, site to be determined)
  - **Mission:** Demonstrate FBR fuel reprocessing and HLW solidification.
  - **Design Basis:** 120 kg MOX/d (12 t/a).
  - **Milestone:** Hot operation, 1997.

---

**RMC**

Radioactive Waste Management Center  
No. 15, Mori Building  
2-8-10, Toranomon  
Minato-ku, Tokyo, 105, Japan  
Tel: 81-3-504-1081  
Fax:

- President: Toshio Fukuda
- Managing Director: Syunichi Murakoshi

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

**Owners:** Japanese industry, MITI and STA.

---

JA.21
STA

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

Tel: 81-3-581-5271
Fax: 2226720 STASGD

Minister, Science/Technology
Eizaburo Saito
Deputy Minister
Harumitsu Yoshimura
Director General
Mitsugu Ishizuka
Deputy Director-General
Yasumichi Hirose
Director, Policy Div.
Shigeo Suehiro
Director-General, NSB
Mitsugu Ishizuka
Director-General, AEB
Kenjiro Ogata

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.
REPUBLIC OF KOREA

MAJOR PUBLIC HOLIDAYS (1990)

Jan. 1-2 New Year
Mar. 1 Independence Movement
Apr. 5 Arbor Day
May 2 Buddha's Birthday
May 5 Children's Day
June 6 Memorial Day
July 17 Constitution Day
Aug. 15 National (Independence) Day
Oct. 2-4 Chusok (Thanksgiving)
Oct. 3 National Foundation Day
Oct. 9 Korean Alphabet Day
Dec. 25 Christmas

TIME

Standard Time Washington D.C.: + 14 hours

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 685.7 Won (W)

per Wall Street Journal, 01/31/90. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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

U.S. EMBASSY - SEOUL

American Embassy
82 Sejong-Ro, Chongro-Ku
Seoul Korea
Tel: 82-2-732-2601
Fax: 82-2-738-8845

Science Counselor Kenneth D. Cohen
ENERGY

Population 1989 43 million

Electric Power Plant Capacity 1988 19.9 GWe
34% nuclear

Electric Power Production 1988 25.6 GWe
37% nuclear
85.5 TWh
44% nuclear
28% coal
22% oil
6% hydro

NUCLEAR POWER

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

Nuclear Power Plant Capacity 1989 7.2 GWe
1990 7.2 GWe
1995 8.1 GWe
2000 11.4 GWe

Reactor Mix 1989
PWR: 8 (1978-89)
2 (1995-96)
HWR: 1 (1983)

Reactor Development (feasibility studies): FBR

INDUSTRIAL FUEL CYCLE

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

KS.1
KOREA

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

<table>
<thead>
<tr>
<th>Cumulative Spent Fuel Arisings</th>
<th>1980</th>
<th>17 tU</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1985</td>
<td>60 tU</td>
</tr>
<tr>
<td></td>
<td>1987</td>
<td>500 tU</td>
</tr>
<tr>
<td></td>
<td>1990</td>
<td>1,500 tU</td>
</tr>
<tr>
<td></td>
<td>1995</td>
<td>2,600 tU</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>4,400 tU</td>
</tr>
</tbody>
</table>

Industrial-Scale Activities

- Uranium milling--3 t ore/d pilot plant.
- Uranium conversion, yellowcake to UO₂--100 tU/a.
- UO₂ fuel fabrication pilot plant--10 tU/a.

Major Milestones

- LLW disposal site (550,000 t)  1996

INTERNATIONAL RELATIONSHIPS

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

ORGANIZATION

Atomic Energy Commission (AEC)
  -- Ministry of Energy and Resources (MER)
    -- Electric Power Bureau (EPB)
      -- Korea Electric Power Corporation (KEPCO)
      -- Korea Power Engineering Company (KOPEC)
  -- Ministry of Science and Technology (MOST)
    -- Atomic Energy Bureau (AEB)
      -- Nuclear Policy Division
      -- Nuclear Reactor Division
      -- Nuclear Energy R&D Division
      -- Radiation Safety Division
    -- Nuclear Safety and Cooperation Office
      -- Nuclear Safety Division
      -- Nuclear Cooperation Office
    -- Korea Nuclear Fuel Corporation (KNFC)
    -- Korea Advanced Institute of Science/Technology (KAIST)
    -- Korea Power Engineering Co. (KOPEC)
    -- Korea Institute of Energy and Resources (KIER)
    -- Korea Atomic Energy Res. Institute (KAERI)
    -- Korea Nuclear Safety Technology Institute (KNSTI)

KS.3
KOREA

**AEB**

Atomic Energy Bureau  
Ministry of Science and Tech.  
Gwacheon 171-11  
Republic of Korea  
Tel: 82-2-503-7654  
Fax: 82-2-503-7673

Director-General  
Ki Hun Chang  
Director, R&D Division  
Uk Jong Yoo  
Director, Nuclear Policy  
Sang Hoon Choi  
Director, Nuclear Reactor  
Kyong Chul Jang  
Director, Intem'l. Cooperation  
Tae Sik Min

**AEC**

Atomic Energy Commission  
1, Chungang-dong  
Kwachon Kyonggi-do  
Republic of Korea  
Tel: 82-2-503-7646  
Fax: 82-2-503-7673

Chairman: Deputy Prime Minister  
Soon Cho

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

**EPB**

Electric Power Bureau  
Ministry of Energy and Resources  
Seoul  
Republic of Korea  
Tel: 82-2-503-7171  
Fax: 82-2-503-9649

Dir. General, Nuclear Power  
Se-Jong Kim

KS.4
Korea Atomic Energy Research Institute

150 Tukjin-dong
Chung-gu, Taejon
Republic of Korea

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

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

Sr. V.P., Nuclear
Kwang Jae Lee

V.P for MRR Project
Poong Eil Jhun

Dir., Rad. Waste Management
Hun Hwee Park

Director, Safety/Exam. Analysis
Seung Gi Ro

Dir., Nuclear Safety/Research
Sung Ki Chae

Dir., Spent Fuel Management
Hyun Soo Park

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

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

Korea Advanced Institute of Science and Technology

207-43 Cheongryangri-dong
Seoul
Republic of Korea

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

President
Dr. Sang Soo Lee

KS.5
KEPCO

Korea Electric Power Corporation
167, Samsung-dong
Kangnam-Gu
Seoul, Republic of Korea
Tel: 82-2-550-3114
Fax: 82-2-550-5981

President Ahn Byong Wha

Function: Development of power resources, and the generation/transmission/transformation of electricity. Responsible to the government (MOST).

KIER

Korea Institute of Energy and Resources
71-2 Chang-dong
Chung-gu, Taejon, Republic of Korea
Tel: 82-42-861-9700
Fax: 82-42-861-9734

President Dr. Jee-Dong Kim

KNFC

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

President Dr. Pil-Soon Han

Function: Development of domestic nuclear fuel fabrication.

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

Facility:

- Fuel Fabrication Plant, Daeduck site, 200 tU/a (under construction, 1989)
KOREA

KNSTI

Korea Nuclear Safety Technology Institute
P.O. Box 7
Daeduk-Danji, Choong-Nam
Republic of Korea
Tel: 82-42-820-2000-1
Fax: 82-42-820-2702

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

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
Kee Jo Shin

Function: Development of Korea's self-reliance in nuclear power technology. Involved in plant design for all Korean nuclear 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
Dr. Bong-Suh Lee
Vice Minister
Sang Jin Chang
Dir. General/Electric Power
Se Jong Kim
KOREA

MOST

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

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

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

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

KS.8
NETHERLANDS

MAJOR PUBLIC HOLIDAYS (1990)

<table>
<thead>
<tr>
<th>Date</th>
<th>Holiday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 1</td>
<td>New Year</td>
</tr>
<tr>
<td>Apr. 13</td>
<td>Good Friday</td>
</tr>
<tr>
<td>Apr. 15-16</td>
<td>Easter</td>
</tr>
<tr>
<td>Apr. 30</td>
<td>Queen's Birthday</td>
</tr>
<tr>
<td>May 24</td>
<td>Ascension</td>
</tr>
<tr>
<td>May 5</td>
<td>Liberation Day</td>
</tr>
<tr>
<td>June 3-4</td>
<td>Pentecost</td>
</tr>
<tr>
<td>Dec. 25-26</td>
<td>Christmas</td>
</tr>
</tbody>
</table>

TIME

Standard Time Washington + 6 hours
Daylight Saving Time Period: 03/25 - 09/29/90

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 1.92 Guilder (Fl.)
per Wall Street Journal, 01/31/90. 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 The Hague Tel: 31-70-624911
Netherlands Fax: 31-70-614688
NETHERLANDS

ENERGY

Population 1987 15 million

Electric Power Plant Capacity

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>17.1 GWe</td>
</tr>
<tr>
<td>1988</td>
<td>17.5 GWe</td>
</tr>
<tr>
<td>1990</td>
<td>16.9 GWe</td>
</tr>
<tr>
<td>1995</td>
<td>17.6 GWe</td>
</tr>
</tbody>
</table>

Nuclear Power Plant Capacity 1989 0.5 GWe
2000 0.4 GWe

Reactor Mix

<table>
<thead>
<tr>
<th>Year</th>
<th>BWR</th>
<th>PWR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>1 (1969)</td>
<td></td>
</tr>
</tbody>
</table>

Reactor Development Participation in SNR-300 FBR

INDUSTRIAL FUEL CYCLE

NETHERLANDS

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

Cumulative Spent Fuel Arisings (LWR)

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount tU</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>103</td>
</tr>
<tr>
<td>1985</td>
<td>190</td>
</tr>
<tr>
<td>1990</td>
<td>270</td>
</tr>
<tr>
<td>2000</td>
<td>420</td>
</tr>
</tbody>
</table>

ORGANIZATION

• Government—Ministries of Economic Affairs; Housing, Physical Planning and Environment; and Social Affairs exercise overall control of nuclear matters with Parliamentary approval of their decisions.

• COVRA (Centrale Organisate Voor Radioactief Afval)—stores and collects all radioactive wastes.
  - Interim Storage Center, 1994.

• ECN (Netherlands Energy Research Foundation)—provides nuclear-related services, including waste treatment and disposal research.

• ILONA (Integrated National Research for Nuclear Waste - Policy Committee)—supervises and coordinates waste disposal research.

COVRA (CENTRAL ORGANIZATION FOR RADIOACTIVE WASTE)

Centrale Organisatie Voor Radioactief Afval
Westerduinweg 3
1755 ZG Petten, Netherlands
Tel: 31-2246-3344
Fax: 31-2246-1556

Director
Dr. Jan Vrijen
Radiation Protection
Dr. H.D.K. Codec
Waste Storage/Transportation
U. Bakema

NL.2
**COVRA (contd)**

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

**Facility:** New interim storage center for all radioactive wastes is in preparation and will be fully operational in 1994. Currently an interim storage facility for a limited quantity of low- and intermediate-level waste is being operated by COVRA.

**ECN (Netherlands Energy Research Foundation)**

Stichting Energieonderzoek
Centrum Nederland
Westerduinweg 3
Postbus 1
1755 ZG Petten Tel: 31-2246-4949
Netherlands Fax: 31-2246-4480

Chairman, Governing Board Dr. G. M. V. van Aardenne

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

**Research Center**

Managing Director Prof. Dr. H. H. van den Kroonenberg
Nuclear Energy Research Dr. A. M. Versteegh
Nuc. Waste/Geologic Disposal Dr. Klaas A. Duijves
Exp. Underground Disp. Program J. R. van Seuren
Safety Assessment Dr. J. Prij
Radionuclide Migration Dr. A. van Dalen

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

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

NL.3
NETHERLANDS

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
Dr. C. Standt

Deep Subsurface Dept.
Dr. H. M. van Montfrans

KEMA (Research and Testing Electrochemical Materials Company)

N.V. Tot Keuring van Elektrotechnische Materialen Arnhem
Utrechtseweg 310
Postbus 9035
6800 ET Arnhem
Netherlands
Tel: 31-85-457057
Fax: 31-85-421625

Deputy Director, Research
Dr. J. H. Blom
Research Technology
Dr. J. Kuypers
Nuclear Waste Research
Dr. H. Boekschoten
Acid Digestion/Incineration
Dr. J. Matteman

Function: Development and engineering services for utilities.
Waste Management R&D: Volume reduction and storage of reactor station wastes.

MINISTRY OF ECONOMIC AFFAIRS

Ministerie van Economische Zaken
Postbus 20101
2500 EC Gravenhage
Netherlands
Tel: 31-70-798911
Fax: 31-70-796358

Dir. Electricity/Nuclear Energy
Dr. H. F. G. Geyzers
31-70-796471

Radioactive Waste
Dr. E. D. A. Dankums
31-70-797849

NL.4
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: 31-70-209367
Fax: 31-70-279868

Director, Rad. Protection
Radioactive Waste
Dr. W. J. K. Brugman
Dr. A. Cornelissen

MINISTRY OF SOCIAL AFFAIRS

Ministry of Social Affairs
Postbus 6g
2270 MA Voorburg
Netherlands
Tel: 31-70-624611
Fax: 31-70-714357

Nuclear Safety
Dr. J. Versteeg

RIVM (National Institute of Public Health and Environment Protection)

Rijksinstituut voor Volksgezondheid en Milieuhygiene
Antonie van Leeuwenhoeklaan 9
Postbus 1
3720 BA Bilthoven
Netherlands
Tel: 31-30-749111
Fax: 31-30-742971

Safety Assessment of Underground Disposal Studies
Dr. Peter Glasbergen
31-30-743397
PAKISTAN

MAJOR PUBLIC HOLIDAYS (1990)

Jan. 1       New Year
Mar. 23      Pakistan Day
Mar. 28      Start of Ramadan
Apr. 27-28   Ramadan
May 1        May Day
July 2       Bank Holiday
July 4-5     Sacrifice Feast
Aug. 14      Independence Day
Sept. 6      Defense of Pakistan
Sept. 11     Death of Quaid-i-Azam
Oct. 3       Prophet's Birthday
Nov. 9       Iqbal Day
Dec. 25      Birthday of Quaid-i-Azam

TIME

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

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 21.25 Rupees
per Wall Street Journal, 01/31/90. 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      Tel: 92-51-826161
Islamabad, Pakistan Fax: 92-51-822004

Economic Section      Lawrence N. Benedict
PAKISTAN

ENERGY

Population 1986 103.6 million

Electric Power Plant Capacity 1986 5.7 GWe

Electric Power Production 1988 33.0 TWh 0.6% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>0.1 GWe</td>
</tr>
<tr>
<td>1997</td>
<td>0.1 GWe</td>
</tr>
<tr>
<td>2000</td>
<td>0.1 GWe</td>
</tr>
</tbody>
</table>

Reactor Mix 1988 HWR: 1 (1972)

INDUSTRIAL FUEL CYCLE

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

Cumulative Spent Fuel Arisings

<table>
<thead>
<tr>
<th>Year</th>
<th>Spent Fuel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>49 tU</td>
</tr>
<tr>
<td>1985</td>
<td>110 tU</td>
</tr>
<tr>
<td>1990</td>
<td>170 tU</td>
</tr>
<tr>
<td>2000</td>
<td>440 tU</td>
</tr>
</tbody>
</table>

INTERNATIONAL RELATIONSHIPS

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

ORGANIZATION

- Pakistan Atomic Energy Commission—control of nuclear matters.

- Pakistan Institute of Science and Technology (Rawalpindi)—fuel cycle R&D, including lab-scale reprocessing facility.

PK.1
PAKISTAN

PAEC

Pakistan Atomic Energy Commission
P.O. Box 1114
Islamabad, Pakistan
Tel: 92-51-811030-9
Tlx: 5725 ATCOM PK
Chairman
Dr. Munir Ahmad Khan

PINTECH

Pakistan Institute of Science & Technology
Islamabad, Pakistan
Director
I. H. Qureshi

PK.2
SOUTH AFRICA

MAJOR PUBLIC HOLIDAYS (1989)

Jan. 1 New Year
Apr. 6 Founder's Day
Apr. 8 Family Day
Apr. 13 Good Friday
May 4 Worker's Day
May 24 Ascension
May 31 Republic Day
Oct. 10 Kruger Day
Dec. 16 Day of the Vow
Dec. 25 Christmas
Dec. 26 Day of Goodwill

TIME

Standard Time Washington D.C.: + 7 hours

PASSPORT/Visa

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 2.55 Rand
per Wall Street Journal, 01/31/90. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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

U.S. CONSULATE GENERAL - JOHANNESBURG

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

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

Science Officer
Robert J. McSwain
ENERGY

Population 1988 37 million

Electric Power Plant Capacity
- 1988 33.2 GWe
  7% nuclear
- 1995 34.1 GWe
  5% nuclear
- 1998 37.9 GWe
  5% nuclear

Electric Power Production 1988 140.5 TWh
- 89% coal
- 7% nuclear
- 2% other
- 2% hydro
- 5% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity
- 1989 1.8 GWe
- 2000 1.8 GWe


INDUSTRIAL FUEL CYCLE


Waste Management Strategy: Interim storage of reactor wastes (LLW/ILW) at the reactor, followed by disposal at Vaalputs about 400 miles north of Cape Town.
SOUTH AFRICA

Cumulative Spent Fuel Arisings (LWR)

<table>
<thead>
<tr>
<th>Year</th>
<th>1985</th>
<th>1990</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>22 tU</td>
<td>254 tU</td>
<td>714 tU</td>
</tr>
</tbody>
</table>

Major Milestone

- Dry spent fuel storage facility (Vaalputs) 1994

ORGANIZATION

Ministry of Economic Affairs and Technology

--Department of Mineral & Energy Affairs

<table>
<thead>
<tr>
<th>--Atomic Energy Corporation (AEC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>--Pelindaba National Nuclear Research Center</td>
</tr>
<tr>
<td>• R&amp;D</td>
</tr>
<tr>
<td>• Research Reactor</td>
</tr>
<tr>
<td>• Isotope Production</td>
</tr>
<tr>
<td>• Fuel Fabrication</td>
</tr>
<tr>
<td>• LLW Disposal</td>
</tr>
</tbody>
</table>

--Vaalputs National LLW Disposal Facility

| • LLW/ILW Disposal |
| • Site Characterization |

--Valindaba Site

| • Uranium Enrichment |
| • Uranium Conversion |

--Gouriqua Research Site

| • R&D |

--Council for Nuclear Safety

| • Independent Regulatory Agency |

Eskom

| • Electricity Production |
ATOMIC ENERGY CORPORATION

Atomic Energy Corporation
of South Africa Ltd.
P.O. Box 582
Pretoria 0001
South Africa
Tel: 27-12-316-4911
Fax: 27-12-323-7731

Chief Executive Officer
Dr. W. E. Stumpf

Senior General Managers:
- Nucl. Fuel Production
  Dr. J. J. Wannenburg
- Research and Development
  Dr. D. M. Kemp
- Engineering
  L. S. Snyders
- Marketing/Commercial Svcs.
  Dr. A. G. M. Jackson

Manager, Nuc. Waste Technology
H. J. Van der Westhuizen

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

Facilities:

- Pelindaba National Nuclear Research Center
  Mission: Performs nuclear R&D; operates research reactor, isotope production line, food irradiation facility; performs fuel fabrication; operates LLW treatment and shallow-land disposal facilities.
  Tel: 27-12-324-2811

- Vaalputs National LLW Disposal Facility
  Mission: Operates LLW/ILW shallow-land disposal facilities; performs site characterization and environmental studies.
  Design Basis: 1,470 m³/a LLW/ILW disposal.

- Valindaba Uranium Enrichment and Conversion Plants
  Mission: Performs enrichment R&D and operates semi-commercial enrichment and pilot-scale conversion plants.
  Design Basis: 300,000 SWU/a enrichment plant
  700 tU/a conversion plant

- Gouriqua Research Site

SF.3
SOUTH AFRICA

Council for Nuclear Safety

Council for Nuclear Safety
7106 Hennopsmeer 0046
South Africa
Tel: 27-12-663-5500
Fax: 27-12-663-5513

Chairman
Prof. J. B. Martin
Vice-Chairman
L. D. Hobbs
Exec. Off./Gen. Mgr., Licensing
J. O. Tattersall
Dep. Gen. Mgr., Licensing
B. C. Winkler

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

ESKOM

ESKOM
P.O. Box 1091
Johannesburg 2000
South Africa
Tel: 27-11-800-8111
Fax: 27-11-800-4983

Chief Executive/C.O.B.
I. C. McRae
Chairman, Electricity Council
Dr. John B. Maree
Senior General Manager
J. L. Rothman

Function: Provide electricity for public use.
SPAIN

MAJOR PUBLIC HOLIDAYS (1989)

<table>
<thead>
<tr>
<th>Date</th>
<th>Holiday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 1</td>
<td>New Year</td>
</tr>
<tr>
<td>Jan. 6</td>
<td>Epiphany</td>
</tr>
<tr>
<td>Mar. 19</td>
<td>St. Joseph</td>
</tr>
<tr>
<td>Apr. 12</td>
<td>Holy Thursday</td>
</tr>
<tr>
<td>Apr. 13</td>
<td>Good Friday</td>
</tr>
<tr>
<td>May 1</td>
<td>Labor Day</td>
</tr>
<tr>
<td>June 14</td>
<td>Corpus Christi</td>
</tr>
<tr>
<td>June 24</td>
<td>King's Birthday</td>
</tr>
<tr>
<td>July 25</td>
<td>St. James</td>
</tr>
<tr>
<td>Aug. 15</td>
<td>Assumption</td>
</tr>
<tr>
<td>Nov. 1</td>
<td>All Saints</td>
</tr>
<tr>
<td>Dec. 8</td>
<td>Immaculate Concept.</td>
</tr>
<tr>
<td>Dec. 25</td>
<td>Christmas</td>
</tr>
</tbody>
</table>

TIME

Standard Time Washington D.C.: +6 hours
Daylight Saving Time Period: 03/25 - 09/29/90

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 109.28 Peseta
per Wall Street Journal, 01/31/90. 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
Madrid, Spain
Tel: 34-1-577-4000
Fax: 34-1-577-5735
Tx: 27-763

Science Attaché
Ishmael Lara
ENERGY

Population
1987  38.7 million

Electric Power Plant Capacity
1987  42.1 GWe
        16% nuclear
1988  44.5 GWe
        17% nuclear
1990  43.2 GWe
        18% nuclear

Electric Power Production
1987  133.1 TWh
        42% coal
        31% nuclear
        21% hydro/geoth.
        5% oil
        1% gas
1988  36% nuclear
1990  35% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity
1989  7.5 GWe
1990  7.5 GWe

Reactor Mix
1988  GCR: 1 (1972)
        PWR: 7 (1969-88)
        BWR: 2 (1971-85)

INDUSTRIAL FUEL CYCLE

Policy: Once-through fuel cycle for LWR; no domestic
reprocessing and no further contracts for foreign reprocessing,
except GCR fuel (Vandellos I).
Waste Management Strategy: Store spent fuels at the reactor sites for at least 10 years. Reracking taking place in some reactor pools and other alternatives under consideration in order to provide additional capacity until geologic repository is ready to receive "high-level wastes" (spent fuels). Granite, salt and clay are being considered as host rock for repository. Shallow-land burial of LLW in fully engineered structures. Some low-level radioactive wastes are currently placed in a temporary storage facility (bays) at El Cabril (province of Córdoba).

| Cumulative Spent Fuel Arisings (LWR) |
| 1985 | 202 tU |
| 1990 | 950 tU |
| 1995 | 1800 tU |
| 2000 | 2800 tU |

Industrial-Scale Activities

- Uranium mining and milling: 270 tU/a.
- Uranium enrichment: 11.1% interest in Eurodif.
- Fuel fabrication: 200 tU/a.
- Intermediate spent fuel storage: 3000 tU.

INTERNATIONAL RELATIONSHIPS

DOE/JEN (now: CIEMAT) Memorandum of Understanding for Cooperation in Energy Research and Development

Term: 6-6-86 to 6-5-91.
Scope: Includes nuclear safety technology and radioactive waste management.
Emphasis: General information exchange.
**CIEMAT (Energy Research Center)**

Centro de Investigaciones Energéticas, Medio Ambientales y Tecnológicas
Avenida Complutense 22
Ciudad Universitaria 28040 Madrid, Spain

President Victor Pérez Pita
General Director Jose Angel Azuara Solis
Director, Nuclear Technology Manuel Montes
Waste Management Armando Uriarte

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

Facility:
- Juan Vigon National Nuclear Energy Center, Madrid

**CSN (Council of Nuclear Safety)**

Consejo de Seguridad Nuclear
Justo Dorado, 11
28020 Madrid, Spain

President Donato Fuejo Lago
Commissioners Enrique Echavarri Lozano
Fabio Sarmiento Almeida
Rafael Caro Manso
Eduardo Gonzalez Gomez

Function: Independent body responsible to Parliament with powers on nuclear safety and radiation protection matters.
ENRESA (National Waste Management Company)

Empresa Nacional de Residuos Radiactivos S.A.
Emilio Vargas, 7
28043 Madrid, Spain
Tel: 34-1-519-52-55
Fax: 34-1-519-52-68

President
Juan M. Kindelán
34-1-279-26-67

Director General
Alberto Lopez
34-1-279-28-58

Director, Engineering
Aurelio M. Ulibarri
Carlos Melches
34-1-519-5314

Function: Supply waste management services and disposal facilities to all Spanish nuclear companies and radwaste producers. Responsible to Ministries of Industry and Economy. Shared by CIEMAT (80%) and the National Institute of Industry (20%).

Facility:
• LLW Surface Storage Facility, El Cabril, Córdoba

ENUSA (National Fuel Cycle Company)

Empresa Nacional del Uranio S.A.
Santiago Rusinol 12
28040 Madrid, Spain
Tel: 34-1-533-6207
Fax: 43042 URAN E

President
José Manuel Jiménez Arana

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

Facility:
• LWR Fuel Fabrication Plant
  Commissioned late 1985.
  Capacity: 200 tU/a, can be expanded to 500 tU/a.
<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minister</td>
<td>José Claudio Aranzadi Martinez</td>
</tr>
<tr>
<td>Secretary General,</td>
<td>Victor Pérez Pita</td>
</tr>
<tr>
<td>Energy/Mineral Resources</td>
<td>Ramon Pérez Simarro</td>
</tr>
<tr>
<td>Director General, Energy</td>
<td></td>
</tr>
</tbody>
</table>
SWEDEN

MAJOR PUBLIC HOLIDAYS (1990)

Jan. 1    New Year
Jan. 6    Epiphany
Apr. 13   Good Friday
Apr. 15-16 Easter
May 1     Labor Day
May 24    Ascension Day
June 3-4  Pentecost
June 22   Midsummer Day
Nov. 1    All Saints
Dec. 25-26 Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time Period: 03/25 - 09/29/90

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 6.20 Krona (SEK)
per Wall Street Journal, 01/31/90. 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
Tlx: 12060 AMEMB S
ENERGY

Population 1987 8.5 million

Electric Power Plant Capacity

<table>
<thead>
<tr>
<th>Year</th>
<th>GWe</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>33.0</td>
</tr>
<tr>
<td>1988</td>
<td>33.1</td>
</tr>
<tr>
<td>1990</td>
<td>33.4</td>
</tr>
<tr>
<td>1995</td>
<td>35.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>GWe</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>9.6</td>
</tr>
<tr>
<td>2000</td>
<td>9.6</td>
</tr>
</tbody>
</table>

Reactor Mix

<table>
<thead>
<tr>
<th>Year</th>
<th>BWR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>9 (1972-85)</td>
</tr>
<tr>
<td>PWR</td>
<td>3 (1975-83)</td>
</tr>
</tbody>
</table>

Electric Power Production

<table>
<thead>
<tr>
<th>Year</th>
<th>TWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>147.2</td>
</tr>
<tr>
<td>1988</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td></td>
</tr>
</tbody>
</table>

NUCLEAR POWER

Policy: Phase out all nuclear plants at the latest by the year 2010. Change of this policy would require a new decision by Parliament.

Nuclear Power Plant Capacity

<table>
<thead>
<tr>
<th>Year</th>
<th>GWe</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>9.6</td>
</tr>
<tr>
<td>2000</td>
<td>9.6</td>
</tr>
</tbody>
</table>

INDUSTRIAL FUEL CYCLE

Policy: Direct disposal of spent fuel. No Pu recycle is planned. Costs for waste management and for future decommissioning of nuclear power plants are paid by fees collected from the nuclear utilities.
SWEDEN

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.

New facilities: 3000 t AFR (completed 1985); spent fuel encapsulation plant; repositories for spent fuel, reactor, and other long-lived wastes.

<table>
<thead>
<tr>
<th>Cumulative Spent Fuel Arisings (LWR)</th>
<th>1985</th>
<th>1,330 tU</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1990</td>
<td>2,360 tU</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>7,800 tU</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cumulative Waste Arisings (conditioned and encapsulated - ready for disposal)</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spent fuel</td>
<td>5,600 canisters</td>
</tr>
<tr>
<td>TRU waste</td>
<td>6,000 m³</td>
</tr>
<tr>
<td>Reactor waste</td>
<td>95,000 m³</td>
</tr>
<tr>
<td>Core comp.</td>
<td>19,000 m³</td>
</tr>
<tr>
<td>D&amp;D waste</td>
<td>113,000 m³</td>
</tr>
</tbody>
</table>

Industrial-Scale Activities:

- LWR fuel fabrication: 400 tU/a.

Major Milestones (Spent Fuel Repository)

- Start characterization of three candidate sites 1993
- Perform detailed investigations of two sites 1996
- Submit license application 2003
- Start repository construction 2010
- Start repository operation 2020
INTERNATIONAL RELATIONSHIPS

DOE/SKB Umbrella Agreement for Waste Management Exchange
Term: 7-1-77 to 12-31-90.
Scope: Preparation and packaging of waste forms; storage; field and laboratory testing; geologic disposal; operations; safety and environment; institutional and public relations issues.
Emphasis: Collaboration in Stripa Mine test program (NEA coordination); U.S. participation in performance assessment computer model and code intercomparison sponsored by SKB.

Member of IAEA and OECD/NEA. Waste management cooperative agreements with Canada, EEC, Finland, France, Spain, Switzerland. Host country for NEA Stripa Project.

ORGANIZATION

• Waste Management
  - SKB (Swedish Nuclear Fuel and Waste Management Company)—executes spent fuel and waste management program for the utilities; manages waste disposal R&D programs.
  - SKN (National Board for Spent Nuclear Fuel)—administers waste management fund collected from the nuclear utilities; oversees back-end of the fuel cycle activities.

• Licensing Responsibilities
  - SKI (Swedish Nuclear Power Inspectorate)—constructs/operates 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).

• Coordination
  - KASAM (Consultative Committee for Nuclear Waste Management)—11 member expert committee; coordinates R&D activities between SKI, SSI, and SKN.
CHALMERS (TECHNICAL UNIVERSITY)

Chalmers Tekniska Hoegskola
412 96 Goeteborg
Sweden
Tel: 46-31-72-10-00
Fax: 46-31-16-84-94

Nuclear Chemistry
Jan-Olof Liljenzin

Waste Management R&D: Radionuclide transport by groundwater, sorption on natural clays and rock minerals.

KEMAKTA

Kemakta Konsult AB
Luntmakargatan 94
113 51 Stockholm
Sweden
Tel: 46-8-54-06-80
Fax: 46-8-52-16-07

Bertil Grundfelt

Function: Computer calculations on hydrology/nuclide migration.

KTH (Royal Institute of Technology)

KTH
100 44 Stockholm
Sweden
Tel: 46-8-790-60-00
Fax: 46-8-109-199

Chemical Engineering
Ivars Neretnieks
Inorganic Chemistry
I. Grenthe

NUCLEAR SAFETY AND TRAINING CENTER

Kärnkraftssäkerhet och Utbildning AB
Box 5864
102 48 Stockholm  Tel: 46-8-665-28-00
Sweden  Fax: 46-8-782-95-28

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
Vretgrand 18
Box 670
751 28 Uppsala  Tel: 46-18-15-64-20
Sweden  Fax: 46-18-14-02-10

Geology, Site Investigations  Kaj Ahlbom
Hydrogeology  Leif Carlsson
Geologic Waste Disposal  Otto Brotzen

Waste Management R&D: Evaluation of rock formations for use as waste disposal sites (permeability, groundwater behavior, age and chemistry).

SKB (Nuclear Fuel and Waste Management Company)

Svensk Kärnbränslehantering AB
Box 5864
102 48 Stockholm  Tel: 46-8-665-28-00
Sweden  Fax: 46-8-661-57-19

President  Sten Bjurström
R&D, Director  Per-Eric Ahlström
R&D, Dep. Dir./Safety Analysis  Tönis Papp
Geoscience  Göran Bäckblom
Hard Rock Laboratory (SFR)  Tommy Hedman  46-8-665-28-01
Function: Coordinate and arrange for nuclear fuel supply and reprocessing services for all Swedish nuclear power reactors; manage and fund R&D for the back-end of the fuel cycle. Responsible for design, construction, and operation of all necessary storage and disposal facilities. Demonstrate that spent nuclear fuel and fuel reprocessing wastes can be disposed of safely and permanently.

Owners: Utilities.

Facilities:

- CLAB (Central Storage for Spent Fuel, located at Simpevarp adjacent to Oskarshamn Power Station)
  Mission: AFR storage facility.
  Design Capacity: Initially, 3000 t.

- SFR (Subseabed Forsmark Repository for LLW and ILW, located in rock 50 m below seabed, 1 km outside Forsmark harbor on Gulf of Bothnia).
  Design: Concrete silos inside cylindrical rock caverns isolated by layer of bentonite clay backfill between silo and rock for ILW. Conventional tunnel rooms for LLW. 1 km-long tunnels leading to repository to be plugged with concrete.
  Capacity: 90,000 m$^3$.
  History: Startup Phase 1 construction, 1983; startup operation, 1988; startup Phase 2 construction, late 1990s.
SKB (contd)

- Stripa Mine

Stripa Mine Service AB
717 00 Stora
Sweden
Tel: 46-581-414-20
Fax: 46-581-419-19

Stripa Project Manager: Bengt Stillborg
Mine Operations: Gunnar Ramqvist

(Near Kopparberg, 15 km north of Lindesberg and about 250 km west of Stockholm. Site of the NEA Stripa Project)

Function: Research in realistic environment of matters connected to disposal in crystalline rock. Development of investigation methods and instruments; measurement of radionuclide migration/supporting studies.

Description: Granite body, about 350-400 m below surface, at the Stripa iron mine.

SKI (Nuclear Power Inspectorate)

Statens Kärnkraftinspektion
Box 27106
102 52 Stockholm
Sweden
Tel: 46-8-663-55-60
Fax: 46-8-661-90-86

Director: Olof Hörmander
Waste Management: Soeren Norrby

Function: Responsible for licensing nuclear facilities.
SKN (National Board for Spent Nuclear Fuel)

Statens Kärnbränsle Nämnd
Skepsistadsgratan 9
115 28 Stockholm
Sweden
Tel: 46-8-667-98-20
Fax: 46-8-661-67-35

Director Olof Söderberg
Chief Engineer Nils Rydell

Function: Evaluate and supervise nuclear industry's development program on the management and disposal of spent nuclear fuel and on decommissioning of nuclear power plants; administer the Swedish nuclear waste financing system; provide information to the public on spent fuel management and disposal.

SSI (National Institute of Radiation Protection)

Statens Strålskyddsinstitut
Box 60204
104 01 Stockholm
Sweden
Tel: 46-8-729-71-00
Fax: 46-8-729-71-08

Director Gunnar Bengtsson
Radwaste Group Ragnar Boge

Function: Responsible for enforcing radiation protection regulations.

STUDSVIK AB (Energy Technology Company)

Studsvik Energiteknik AB
611 82 Nyköping
Sweden
Tel: 46-155-210-00
Fax: 46-155-630-44

Director, Nuclear Division Stig Bergstroem
Waste Technology Karin Brodén
Power Plant Services Claes Harfors

Function: Nuclear energy R&D and service to support Swedish power programs (contract research).

Owner: Government (Ministry of Industry).

SW.8
STUDSVIK AB (contd)


SWEDISH STATE POWER BOARD

Statens Vattensfallsverk
162 87 Vaellingby
Sweden
Tel: 46-8-739-50-00
Fax: 46-8-737-01-70
Tlx: 19653 SVTELVXS S

President: Carl-Eric Nyquist
Vice President, Production: Lars Gustafsson
Nuclear Power: Stig Sandklef
Low- and Medium-Level Wastes: Stig Pettersson

Function: Operate the power distribution grid in Sweden, produce power (owner of Ringhals Power Plants).

Owner: Government (Ministry of Industry).
SWITZERLAND

MAJOR PUBLIC HOLIDAYS (1990)

Jan. 1-2  New Year
Apr. 13  Good Friday
Apr. 15-16  Easter
May 1  Labor Day
May 24  Ascension
June 3-4  Pentecost
Aug. 1  Independence Day
Sept. 19  Day of Prayers
Dec. 25-26  Christmas

TIME

Standard Time Washington D.C.:  + 6 hours
Daylight Saving Time Period:  03/25 - 09/29/90

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 1.5 Franc
per Wall Street Journal, 01/31/90. 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
Jubilaeumstrasse 93
3005 Bern  Tel:  41-31-43-70-11
Switzerland  Fax:  41-31-43-73-44

Economics Officer  Joan Corbett
SWITZERLAND

ENERGY

Population 1987 6.5 million

Electric Power Plant Capacity 1987 15.3 GWe
1988 15.3 GWe
1990 15.4 GWe
1995 16.8 GWe

Electric Power Production 1987 59.9 TWh
60% hydro/geoth.
38% nuclear
1% coal/solids
1% oil/gas
1988 37% nuclear
1990 36% nuclear
1995 34% nuclear

NUCLEAR POWER

Policy: Government is neutral but believes nuclear power has a role to play in the future.

Nuclear Power Plant Capacity 1989 2.9 GWe
2000 2.9 GWe

Reactor Mix 1989 BWR: 2 (1972/84)
PWR: 3 (1969-79)

INDUSTRIAL FUEL CYCLE

Policy: Foreign reprocessing of spent fuels and Pu recycle to either LWRs or FBRs.

SZ.1
SWITZERLAND

Waste Management Strategy: Develop two waste repositories: a horizontally accessed rock cavern in a geologic host rock with considerable overburden for LLW/ILW, and a deep repository in crystalline rock or sedimentary formations for HLW glass or unreprocessed spent fuel elements and alpha wastes. Sea-dumping of LLW discontinued 1982.

Cumulative Spent Fuel Arisings (LWR)
- 1980: 380 tU
- 1985: 650 tU
- 1990: 1,090 tU
- 2000: 2,000 tU

Cumulative Waste Arisings
[Planning basis: after 40 yr operation (total 4 GWe)]
- LLW/D&D Waste: 95,000 m³
- LLW/ILW: 80,000 m³
- HLW glass: 750 m³
- or
- Spent fuel: 2,500 m³

Major Milestones
- Initial receipt of HLW glass from COGEMA (France) >1993
- Intermediate-depth repository for LLW/ILW 2000
- Geologic repository for HLW or spent fuels and alpha wastes After 2020

INTERNATIONAL FUEL CYCLE RELATIONSHIPS

DOE/NAGRA Umbrella Agreement for Cooperation in Radioactive Waste Management
Term: 4-19-85 to 4-19-90.
Scope: Preparation and packaging of wastes; field and laboratory testing; storage; geologic disposal; environment and safety; design and operational issues; transportation requirements; public acceptance issues.
Emphasis: Information exchange and direct cooperation, in particular, concerning Grimsel Pass URL activities.

SZ.2
NRC/NAGRA Agreement on Cooperation in Radioactive Waste Management Safety Research

Term: 9-26-86 to 9-25-91.
Scope: Experimental/analytical studies relating to safety research.
Emphasis: General information exchange.

Member of IAEA and OECD/NEA. Cooperative agreements with SKB (Sweden), CEA (France), Euratom (EEC), ONDRAF (Belgium), PNC (Japan), and TVO (Finland).

ORGANIZATION

- NAGRA--National Cooperative for the Disposal of Radioactive Waste--formed by utilities/government to handle fuel cycle/waste management activities.
- PSI--Paul Scherrer Institute--newly formed (1987) through merger of EIR (Federal Institute for Reactor Research) and SIN (Swiss Institute for Nuclear Research).
- Federal Energy Office--sets criteria for waste management practices, including geologic disposal.

BEW (Federal Office for Energy)
Bundesamt für Energiewirtschaft
Nuclear Safety Inspectorate (HSK)
5303 Würenlingen            Tel:  41-56-98-28-53
Switzerland                  Fax:  41-56-99-39-07

Waste Management Section    Dr. U. Niederer

Function: Licensing and inspection of nuclear installations.
NAGRA/CEDRA (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 (CEDRA)

Parkstrasse 23
5401 Baden
Switzerland
Tel: 41-56-20-55-11
Fax: 41-56-20-52-07

President Dr. Hans Issler
Director, Science/Technology Dr. Charles McCombie
Geology Dr. Marc F. Thury
Field Operations/Testing Dr. Ch. Sprecher
Engineering Andreas L. Nold
Nuclear Technology Dr. Piet Zuidema
Director, Repository Projects Dr. E. Kowalski

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

Owners: Utilities and government.

Facility:

• URL at Grimsel Pass—operational since 1984.
  (Tests/experiments in crystalline rock.)

PSI (Paul Scherrer Institute)

Paul Scherrer Institute
5303 Würenlingen
Switzerland
Tel: 41-56-99-2111
Fax: 41-56-98-2327

Director Prof.-Dr. A. Menth
Manager, Waste Mgt. Project Dr. J. Hadermann

Owner: Federal government—Department of Interior.
PSI (contd)

Waste Management R&D: Incineration of TRU wastes, modeling of radionuclide migration through heterogeneous geologic media, chemical behavior of radionuclides during migration, transport of radionuclides through the biosphere, natural analogues, hydrological studies, sorption constants on different rocks, immobilization of LLW and ILW in cements, leaching rates on LLW and ILW forms, and long-term corrosion tests on waste package materials.

Facilities:

• Hot Cells, Active Laboratories, Incinerator

• ADA (Acid Digestion Plant) for TRU wastes.
  Design Basis: Carbonization/digestion in H_2SO_4/HNO_3 at 0°C; capacity, 1 kg/h solid wastes.

ZWILAG (Interim Waste Storage Facility)

Zwischenlager Würenlingen AG
Parkstrasse 23
5401 Baden
Switzerland
Tel: 41-56-203-111
Fax: 41-56-203-755

Director R. Véya
Tech. Project Manager Dr. C. Vuilleumier

Function: Provide interim storage for 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 and to cost ca. U.S. $4.8 million.

Owner: Consortium of Swiss nuclear utilities.
TAIWAN

MAJOR PUBLIC HOLIDAYS (1990)

<table>
<thead>
<tr>
<th>Date</th>
<th>Holiday</th>
<th>Date</th>
<th>Holiday</th>
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</thead>
<tbody>
<tr>
<td>Jan. 1-3</td>
<td>Commemoration Day</td>
<td>Oct. 15</td>
<td>Confucious' Birth</td>
</tr>
<tr>
<td>Jan. 27-28</td>
<td>Chinese New Year</td>
<td>Oct. 17</td>
<td>Double Ten Day</td>
</tr>
<tr>
<td>March 29</td>
<td>Youth Day</td>
<td>Oct. 25</td>
<td>Taiwan Restoration</td>
</tr>
<tr>
<td>April 5</td>
<td>Tomb Sweeping Day</td>
<td>Oct. 31</td>
<td>Chiang Kai-Shek's Birthday</td>
</tr>
<tr>
<td>May 28</td>
<td>Dragon Boat Festival</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept. 28</td>
<td>Teacher's Day</td>
<td>Nov. 12</td>
<td>Dr. Sun Yat-Sen's Birthday</td>
</tr>
<tr>
<td>Oct. 3</td>
<td>Moon Festival</td>
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</tr>
</tbody>
</table>

TIME

Standard Time Washington D.C.: + 13 hours

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 25.95 Taiwan Dollar

per Wall Street Journal, 01/31/90. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Taiwan are complete as listed, after dialing international access code: 011. Country code is 886; listed local numbers include city code.

AIT - TAIPEI

American Institute in Taiwan
7 Lane 134
Hsin Yi Road, Sec. 3
Taipei, Republic of China

Tel: 886-2-709-2000
Fax: 23890 USTRADE

Science Officer
Christopher Marut
ENERGY

Population 1987 19 million

Electric Power Plant Capacity 1987 16.6 GWe
31% nuclear

Electric Power Production 1986 59.0 TWh
44% nuclear
31% coal
13% hydro
12% oil

1988 41% nuclear

NUCLEAR POWER

Policy: Look to nuclear power to meet rapidly growing demand for electric energy.

Nuclear Power Plant Capacity 1989 4.9 GWe
1997 4.9 GWe
2000 6.9 GWe

Reactor Mix 1989 BWR: 4 (1978-83)
PWR: 2 (1984/85)

INDUSTRIAL FUEL CYCLE

Policy: Develop indigenous fuel production capability: UF₆ conversion; UO₂ pellets; fuel hardware; fuel assembly.

Waste Management Strategy: Evaluating spent fuel/HLW interim storage options; may reprocess (in other countries); LLW going to National Waste Storage Facility on nearby Orchid Island.

Cumulative Spent Fuel Arisings (LWR) 1980 70 tU
1985 430 tU
1990 1,140 tU
2000 2,600 tU

TW.1
TAIWAN

ORGANIZATION

- **TAIPOWER** (Taiwan Power Company)—operation of nuclear power plants (owned by the government).

- **AEC** (Atomic Energy Council)—regulatory functions. **RWA** (Radwaste Administration)—radwaste disposal.

- **INER** (Institute of Nuclear Energy Research)—nuclear R&D.

**AEC**

Atomic Energy Council
65, Lane 144
Keelung Road, Section 4
Taipei 107, Taiwan
Republic of China

Tel: 886-2-392-4180
Fax: 886-2-341-5377
or 886-2-321-5448
Tx: 26554 SINOATOM

Secretary General
Prof. Yu-Hao Lee

Director, Radwaste Admin.
Dr. Chao-Ming Tsai
886-2-396-4324

Director, Planning Division
Chao-Chin Tung

Director, Rad. Protection Div.
Dr. Yi-Ching Yang

Director, Nuc. Regulatory Div.
Yi-Ching Yang

**INER**

Institute of Nuclear Energy Research
P.O. Box 3
Lung-Tan, Taiwan 325
Republic of China

Tel: 886-2-381-4014
Fax: 886-2-381-2300
Tx: 34154 CAEC

Deputy Directors
Sung-Ling Ho
886-2-381-2300

Sen-I Chang
886-2-381-2302

Radwaste Mgt. Tech. Program
Dr. Tise-Sheng Chou
886-2-381-2525

Radwaste Mgt. Division
Dr. Chia-Pao Tung
886-2-381-2524

TW.2
TAIWAN

INER (contd)

Nuc. Materials Res. Division Dr. Yaw-Nan Chen
886-2-381-2422
Fuel Engineering Division Chung-Jyi Wu
886-2-381-2418
Health Physics Division Dr. Wei-Li Chen

Fuel Cycle R&D: Solvent extraction technology; yellowcake conversion to UO₂; 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 Tel: 886-2-396-7777
Taipei 107, Taiwan Fax:
Republic of China Tlx: 2564 TPCAPD

President S. M. Chang
Director, Nuclear Engineering Eng Lin
886-2-396-2521
Deputy Dir., Nuc. Engineering Peng-Chang Chen

TW.3
UNITED KINGDOM

MAJOR PUBLIC HOLIDAYS (1990)

Jan. 1  New Year  May 28  Spring Holiday
Apr. 13  Good Friday  June 9  Queen's Holiday
Apr. 15-16  Easter  August 27  Summer Holiday
May 7  Bank Holiday  Dec. 25-26  Christmas

TIME

Standard Time Washington D.C.:  + 5 hours
Daylight Saving Time Period:  03/25 - 10/27/90

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S.$ = 0.59 Pound
per Wall Street Journal, 01/31/90. 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  Tel:  44-1-499-9000
West 1A 1AE London  Fax:  44-1-409-1637
United Kingdom  Tlx:  26-6777

Science Counselor  James B. Devine
UNITED KINGDOM

ENERGY

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<tr>
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<tbody>
<tr>
<td>Population</td>
<td>56.7 million</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Electric Power Plant Capacity</td>
<td>69.0 GWe</td>
<td>71.3 GWe</td>
<td>73.8 GWe</td>
<td>78.4 GWe</td>
</tr>
<tr>
<td></td>
<td>13% nuclear</td>
<td>15% nuclear</td>
<td>16% nuclear</td>
<td>14% nuclear</td>
</tr>
<tr>
<td>Electric Power Production</td>
<td>302.5 TWh</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>71% coal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18% nuclear</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9% oil</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>2% hydro</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>19% nuclear</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>20% nuclear</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>21% nuclear</td>
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NUCLEAR POWER

Policy: Substantial development of nuclear power based, to date, on gas-cooled reactors but now diversifying to PWRs; eventual active FBR pursuit expected.

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<tr>
<th></th>
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<tbody>
<tr>
<td></td>
<td>12.3 GWe</td>
<td>12.3 GWe</td>
<td>12.8 GWe</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Reactor Mix</th>
<th>1989</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCR:</td>
<td>24</td>
</tr>
<tr>
<td>(1956-72)</td>
<td></td>
</tr>
<tr>
<td>AGR:</td>
<td>12</td>
</tr>
<tr>
<td>(1976-88)</td>
<td></td>
</tr>
<tr>
<td>PWR:</td>
<td>1</td>
</tr>
<tr>
<td>(1994)</td>
<td></td>
</tr>
<tr>
<td>FBR:</td>
<td>1</td>
</tr>
<tr>
<td>(1976)</td>
<td></td>
</tr>
<tr>
<td>HWR:</td>
<td>1</td>
</tr>
<tr>
<td>(1968)</td>
<td></td>
</tr>
</tbody>
</table>

Reactors Development Currently PWR's; long-term LMFBR development.

UK.1
UNITED KINGDOM

INDUSTRIAL FUEL CYCLE

Policy: Reprocess and recycle U to AGR and LWR systems; develop and maintain complete fuel cycle capability (UF₆ conversion, enrichment, UO₂ and MOX fuel fabrication, spent fuel reprocessing); sell fuel cycle services abroad.

Waste Management Strategy: Reprocess spent magnox fuels as rapidly as plant capacity permits; reprocess other thermal reactor fuel after several years' cooling; vitrify HLW (French process); long-term interim storage of HLW glass for at least fifty years before disposal; shallow-land burial of LLW currently; future deep-land disposal of LLW and ILW.

Cumulative Spent Fuel Arisings (AGR)
1987  750 tU
1990  1,300 tU
2000  3,250 tU

Industrial-Scale Activities

- Uranium conversion (Springfields)
  - UF₆ production: 9000 t/a
  - UF₆-UO₂ conversion: 650 t/a.

- Uranium enrichment (Capenhurst)
  - centrifuge plant: 700 tSWU/a.

- Fuel fabrication
  - Springfields
    U metal (Magnox): 1300 tU
  - Sellafield
    MOX fuels capacity, 1987: 6 t/a (FBR)

- Fuel reprocessing
  - Magnox fuels (Sellafield): up to 1500 t/a
  - UO₂ fuels (THORP,®): 1200 t/a (1992)
  - FBR fuels (PFR reprocessing pilot plant, Dounreay): 50 kgHM/d

- HLW vitrification
  - Sellafield Vitrification Plant (1988)
INTERNATIONAL RELATIONSHIPS

DOE/UKAEA Umbrella Agreement in the Field of Radioactive Waste Management Technology

Term: 10-30-86 to 10-29-91.
Scope: LLW/ILW, TRU waste and D&D technology; treatment/geol. disposal; transportation; storage; environment/safety and public acceptance issues; performance assessment; packaging.


Member of EC, IAEA and OECD/NEA. Agreements/partnerships with various nations.

ORGANIZATION

- AEA Technology: nuclear research; laboratories at Harwell, Risley, Sellafield, Springfields, Dounreay
- DOE (Department of Environment): develops waste management strategy, funds and coordinates generic waste management R&D
- BNFL (British Nuclear Fuels plc): commercial fuel cycle for domestic and foreign customers
- NIREX (government-owned public company): LLW and ILW disposal
- BGS and IOS (British Geological Survey and Institute of Oceanographic Sciences): supporting R&D for the waste management program
- NRPB (National Radiological Protection Board): environmental R&D
- NII (Nuclear Installations Inspectorate): licensing
- MAFF (Ministry of Agriculture, Fisheries and Food): regulation of waste management.
UNITED KINGDOM

NUCLEAR FUEL CYCLE RESPONSIBILITIES

National Government

-- Department of Environment (DOE)
  -- H.M. Inspectorate of Pollution (HMIP)
  -- Rad. Waste Mgmt. Advisory Committee (RWMAC)
  -- Building Research Establishment (BRE)

-- Department of Health/Social Services
  -- National Radiological Protection Board (NRPB)

-- Department of Education and Science (DES)
  -- Nat. Environment Research Council (NERC)
    -- British Geological Survey (BGS)
    -- Inst.of Oceanographic Sciences (IOS)

-- Department of Energy (DEN)
  -- Nuclear Electricity Authorities
  -- NIREX
  -- British Nuclear Fuels plc (BNFL)
  -- AEA Technology

-- Health and Safety Executive (HSE)
  -- Nuclear Installations Inspectorate (NII)

-- Ministry of Defense (MOD)
  -- Atomic Weapons Research Establishment (AWRE)

-- Ministry of Agriculture, Fisheries and Food (MAFF)
  -- Fisheries Laboratories

UK.4
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
    • Uranium Conversion
    • UO₂ Production
  -- Capenhurst
    • Uranium Enrichment

-- AEA Technology
  -- AEA Decommissioning and Radwaste
  -- AEA Nuclear Fuel Cycle Technology
  -- AEA Thermal Reactors
  -- AEA Fast Reactors
  -- AEA Fusion
  -- AEA Risk Management Technology
  -- AEA Industrial Technology
  -- AEA Environmental Protection
  -- AEA Oil & Gas Technology

-- NIREX

UK.5
UNITED KINGDOM

AEA

AEA Technology
11 Charles II Street
London SW1Y 4QP
United Kingdom
Tel:  44-1-930-5454
Fax:  44-1-930-5454 x 274

Chairman
John G. Collier
Managing Dir., Businesses
Brian L. Eyre
Dep. Managing Dir., Businesses
R. Stuart Nelson
Managing Dir., Site Operations
Graeme G. E. Low
Member for Corp. Develop.
Charles C. S. Chapman
Chief Technologist, Nuclear
Dr. Ron H. Flowers

Government-owned nuclear research 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 DECOMMISSIONING AND RADWASTE

AEA Decommissioning and Radwaste
Winfrith Technology Center
Dorchester, Dorset DT2 8DH
United Kingdom
Tel:  44-305-2-5188 x 3374
Fax:  44-305-25-1140

Chief Executive
Dr. Mel H. Wood
Head, Business Development
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.
UNITED KINGDOM

AEAO ENVIRONMENTAL PROTECTION

AEA Technology Harwell
Harwell
Upson OX11 ORA
United Kingdom
Tel: 44-235-82-1111 x 2029
Fax: 44-235-43-2923

Chief Executive
Dr. J. Rae
Contact
Dr. P. B. Taylor

Activities: R&D and consulting services to industry and regulatory bodies covering pollution control technology, waste management, and regional and global environmental impacts.

Facility:

- **Harwell Ceramic Melter Test Unit (nonradioactive)**
  Mission: Develop ceramic melter capability for AEA.
  Design Basis: Liquid-fed ceramic melter; capacity, 700 kg/d glass; product, borosilicate glass.
  History: Initial studies in 1/3 (linear) scale unit 1982-84.
  Startup, (full scale) 1986.

AEA FAST REACTORS

Dounreay Technology Center
Thurso, Caithness KW14 7TZ
Scotland
Tel: 44-847-6-2121
Fax: 44-847-6-2121 x 666

[From London by air to Wick (via Aberdeen), then ~30 miles by car to Dounreay; or by train from London to Thurso (via Inverness), then ~10 miles by car to Dounreay.]

Chief Executive
A. M. Broomfield
Contact
Dr. G. E. I. Smith

Function: Manages U.K. fast reactor program and participates in international fast reactor programs, especially European Fast Reactor.
UNITED KINGDOM

**AEA FUSION**

Culham Laboratory  
Culham  
Abingdon, Oxfordshire  
OX14 3DB, United Kingdom  
Tel: 44-235-2-1840  
Fax: 44-235-46-3682

Chief Executive  
Dr. D. R. Sweetman  
Contact  
I. M. Pollard

**Function:** Management of U.K. participation in international fusion programs, in particular the Joint European Torus (JET).

**AEA INDUSTRIAL TECHNOLOGY**

AEA Technology Harwell  
Oxon OX11 ORA  
United Kingdom  
Tel: 44-235-82-1111 x 2138  
Fax: 44-235-42-2105

Chief Executive  
Dr. R. S. Nelson  
Contact  
Dr. S. J. Curl

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

**AEA NUCLEAR FUEL CYCLE TECHNOLOGY**

AEA Fuel Cycle Technology  
Dounreay Technology Center  
Caithness KW14 7TZ  
United Kingdom  
Tel: 44-847-6-2121 x 674  
Fax: 44-847-6-2121 x 666

Chief Executive  
O. Pugh  
Contact  
Dr. R. Anderson

**Activities:** Fuel reprocessing, special fuel manufacturing and testing, laser enrichment, waste conditioning, R&D in radioactive handling equipment and safeguards.
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 U.S. $8.84 million)

- **Marshall Laboratory**
  Fuel-processing research, opened in 1986.

---

**AEA RISK MANAGEMENT TECHNOLOGY**

AEA Safety and Reliability
Directorate
Wigshaw Lane, Culcheth
Warrington WA3 6AT
United Kingdom
Tel: 44-925-3-1244 x 4241
Fax: 44-925-7-6681

Contact: A. 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 companies and manufacturing and engineering companies.
UNITED KINGDOM

**AEA THERMAL REACTORS**

AEA Thermal Reactors  
Risley, Warrington  
Cheshire WA3 6AT  
United Kingdom  
Tel: 44-925-3-1244 x 2504  
Fax: 44-925-78-2514

Chief Executive  
Dr. D. Pooley

Contact  
Dr. N. M. Irvine

**Function:** Design and operational techniques for thermal reactors aimed at improving the economies of existing plants and improvements for new plant designs.

**AWRE**

Atomic Weapons Research  
Establishment  
Aldermaston, Reading RG7 4PR  
United Kingdom  
Tel: 44-73-56-4111  
Fax: 44-73-56-4111

Waste Management  
Ms. D. Hunter

**BGS**

British Geological Survey  
Nicker Hill, Keyworth  
Nottingham, NG12 5GG  
United Kingdom  
Tel: 44-60-77-6111  
Fax: 44-60-77-6602

Director  
G. I. Lumsden

British Geological Survey  
Harwell Laboratory  
Building 151  
Harwell, Oxon OX11 ORA  
United Kingdom  
Tel: 44-235-2-4141  
Fax: 44-235-2-4141

UK.10
UNITED KINGDOM

BNFL: CAPENHURST

British Nuclear Fuels plc
Capenhurst Works
CHESTER
Cheshire CH1 6ER Tel: 44-51-339-4101
United Kingdom Fax: 44-51-339-5541

Dir., Enrichment Division Dr. Peter C. Upson

Function: Enrichment of U by centrifuge process (URENCO).

BNFL: RISLEY

British Nuclear Fuels plc
Risley, Warrington Tel: 44-925-83-2502
Cheshire WA3 6AS Fax: 44-925-82-2711
United Kingdom Verif: 44-925-83-2369

[About 20 miles by official car or taxi from Manchester
International Airport; or train from London to Warrington
(approx. 3 hours), then 6 miles by official car or taxi to
Risley.]

Chairman Christopher G.F. Harding
44-925-83-5000

Chief Exec. Officer Neville L. Chamberlain
44-925-83-5006

Dep. CEO Dr. Wm. L. Wilkinson
44-925-83-5008

Dir., Corp. Marketing Douglas S. B. Marr
Dir., Fuel/Engineering Peter F. P. Roberts
Dir., Reprocess/Reactors Dr. Greg G. Butler

Engineering Division, Director Dr. Anthony D. Stevens
44-925-83-5416

Dir., External Business Trevor Edwards
44-925-83-4616

Dir., Projects Cedric Mogg
Dir., Technical Services Bill Heafield

UK.11
UNITED KINGDOM

BNFL: RISLEY (cont’d)

Function: Provision of spent nuclear fuel handling/waste management technology and engineering services, including R&D feasibility studies, process design, equipment supply, safety assessment and criticality, construction/commissioning of plants.

Intn'l Nuc. Fuels Ltd., Gen. Mgr. Derek May 44-925-83-3108

Transport Division, Director W. A. MacLaughlan 44-925-83-2090

Function: Spent fuel transportation; development, design, licensing/procurement of transport packages; consultation, design/safety studies including monitoring emergency response/recovery.


BNFL, Inc.
1776 I Street NW Tel: 202-785-2635
Washington, DC 20006 Fax: 202-785-4037

President R. "Landy" Langley

BNFL: SELLAFIELD

British Nuclear Fuels plc
Sellafield, Seascale
Cumbria CA20 1PG Tel: 44-9402-8333
United Kingdom Fax: 44-9467-28987

[By train from London-Euston Station to Carlisle Station (4 hours); transport can be arranged by BNFL from Carlisle to site (approx. 1-1/2 hours). From Manchester International Airport to site by car is approx. 3 hours.]

Dir., Magnox Reprocessing Grahame K. Smith 44-9402-74245
Dir., Oxide Reprocessing Peter F. P. Roberts 44-9402-71274
Dir., THORP Div. Ken G. Jackson

UK.12
BNFL: SELLAFIELD (cont'd)

Dir., Waste Mgt./Decom. Div. Stuart Donn
Mgr., Vitrification Plant Alan Dobson
Dir., Reactor Division A. D. Evans

Function: Provides spent fuel management services, including storage, reprocessing and waste management. In addition, transport of spent fuel/wastes and complete fuel cycle service.

Facilities:

- **B205**
  Mission: Reprocess Magnox (magnesium-clad, U metal) fuels from U.K. GCRs.
  Design Basis: Magnox fuels—mechanical declad; PUREX flowsheet; "no-maintenance" concept; nominal capacity, 1500 t/a. HLLW storage—SS tanks, 70 m³ and 150 m³, in SS-lined concrete cells.
  History: Magnox fuels—B205 startup, 1964; annual throughput of Magnox fuels, 1000-1200 tHM. Oxide head-end (installed in B204), operated 1969-1973 and processed 90 t oxide fuel, before plant was shut down after a contamination release incident.

- **Magnox Fuel Handling Plant**
  - Storage and decanning of magnox fuel.
  - Storage and dismantling of AGR fuel.

- **THORP (Thermal Oxide Reprocessing Plant)**
  Mission: Reprocess AGR, domestic and foreign LWR fuels.
BNFL: Sellafield (cont’d)

- Drigg Waste Disposal Facility (300-acre site, 4 miles from Sellafield)
  Mission: LLW disposal.
  Design Basis: Shallow-land disposal, clay-based trenches and concrete vaults.
  Capacity: 650,000 m$^3$ LLW disposed of through 1989.

- MOX Fuel Fabrication Facilities
  - Pilot plant, capacity~6 t/a FBR fuels.
  - Production plants (planned), capacity~100 t/a; startup, 1995.

Waste Treatment Facilities:

- Vitrification Plant
  Mission: Solidify Sellafield HLW.
  Design Basis: AVM process; product, borosilicate glass blocks.
  Capacity: 250-300 t/a glass.
  Milestone: Startup, 1990.

- Waste Treatment Complex
  Mission: Prepare TRU waste for disposal.
  History: Plant is currently on stand-by.


- EARP (Enhanced Actinide Removal Plant)
  Mission: Remove actinides from liquid effluents by ultrafiltration and flocculation.
  Capacity: 1000 m$^3$/d.

UK.14
UNITED KINGDOM

BNFL: SPRINGFIELDS

British Nuclear Fuels plc
Springfields Works
Salwick, Preston
Lancashire PR4 OXJ
United Kingdom
Tel: 44-772-72-8262
Fax: 44-772-72-5607

Director, Fuel Division
Dr. J. R. Smith


BRE

Building Research Establishment
Department of the Environment
Building Research Station
Garston, Watford WD2 7JR
United Kingdom
Tel: 44-9273-74040
Fax: 92-3220

Seabed Disposal
Continental Disposal
Dr. J. B. Menzies
T. Freeman
Ms. C. M. Cooling

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

DOE

Department of the Environment
H.M. Inspectorate of Pollution
43 Marsham Street
London SW1 3PY
United Kingdom
Tel: 44-1-276-3000
Fax: 44-1-276-8100

Director
Dr. Frank S. Feates
44-1-276-8080

Chief Inspector
Dr. Alan Duncan
44-1-276-8129

Research
Dr. Steven Brown

UK.15
UNITED KINGDOM

DOE (cont'd)

Waste Management Responsibility: Administer U.K. waste management programs; fund and coordinate waste treatment and waste isolation R&D at Harwell, BGS, NRPB, etc.; regulate discharge of radioactive materials to the environment.

IOS

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

Tel: 44-42-879-4141
Fax: 85-8833

Director
Nuclear Waste

Function: Modelling radionuclide transport in the ocean.

MAFF

Ministry of Agriculture, Fisheries and Food
Fisheries Laboratories
Pakefield Road
Lowestoft, Suffolk NR33 OHT
United Kingdom

Tel: 44-502-62244
Fax: 97470

Director, Fisheries Research
D. J. Garrod

Function: Regulation of waste management.

NII

Nuclear Installations Inspectorate
Baynards House
1 Chepstow Place
London W2 4TF
United Kingdom

Tel: 44-1-243-6000
Fax: 44-1-727-4116
Tx: 25-683

Chief Inspector/Nuc.Installations
Overseas Liaison

E. A. Ryder
J. S. MacLeod

UK.16
UNITED KINGDOM

NIREX

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

Managing Director
Technical Program

P. Tom McInerney
Maurice E. Ginniff

Tel: 44-235-83-5153
Fax: 44-235-83-1239

Function: Locate, develop and operate facilities and sites for disposal of LLW and ILW.

State-owned public company: Nuclear Electric, Scottish Nuclear, BNFL, and AEA as partners, with the Secretary of State for Energy having absolute powers of veto.

NRPB

National Radiological Protection Board
Chilton Didcot
Oxfordshire OX11 ORQ
United Kingdom

Director
Secretary
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

Tel: 44-235-83-1600
Fax: 44-235-83-3891

Function: As an independent board (established in 1970 as a result of the Radiological Protection Act, members appointed by the Health Ministry) advises governmental and industrial organizations on radiological protection matters and standards. Also carries out contract research to improve radiological protection and provides some technical services.
USSR

MAJOR PUBLIC HOLIDAYS (1990)

Jan. 1  New Year
Mar. 8  Women’s Day
May 1-2 Solidarity Days
May 9  Victory Day
Oct. 9 Constitution Day
Nov. 7-8 October Revolution

TIME

Standard Time Washington D.C.: (Moscow)  + 8 hours
Daylight Saving Time Period: 03/25 - 09/29/90

PASSPORT/VISA

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

CURRENCY

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

DIRECT DIALING

Individual numbers for direct-dial to the USSR are complete as listed, after dialing international access code: 011. Country code is 7; listed local numbers include city code. Please note that not all telephones in the USSR are accessible for international calls.

U.S. EMBASSY - MOSCOW

American Embassy
Ulitsa Chaykovskogo 19/21/23 Tel: 70-95-252-2451
Moscow Fax:
USSR Tlx: 41-3160 USGSO SU

Science Attaché Jack Cosnell
ENERGY

Population 1988 286 million

Electric Power Plant Capacity 1988 327 GWe

Electric Power Production 1988 1712 TWh
\[ \sim -12.6\% \text{ nuclear} \]
1991 21\% nuclear

NUCLEAR POWER

Policy: Major program to develop nuclear power, to avoid transport of fossil fuels from east of the Ural Mountains to European Russia.

Nuclear Power Plant Capacity

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>33.86 GWe</td>
</tr>
<tr>
<td>1992</td>
<td>55 GWe</td>
</tr>
<tr>
<td>2000</td>
<td>100 GWe</td>
</tr>
</tbody>
</table>

Reactor Mix 1988

- LGR: 22 (1958-86)
- 6 (1991-94)
- PWR: 25 (1964-88)
- 16 (1989-94)
- BWR: 1 (1966)
- FBR: 2 (1973/81)
- 1 (1993)

Reactor Development LMFBRs, 1500-MWe PWRs

INDUSTRIAL FUEL CYCLE

Policy: Complete domestic fuel cycle capability, including enrichment, fuel fabrication (UO$_2$ and MOX); develop commercial reprocessing capability; provide complete fuel cycle services, including spent fuel storage and waste disposal to foreign buyers of USSR reactors and fuel. Shift to future PWRs since Chernobyl accident in 1986.

UR.1
Waste Management Strategy: Spent nuclear fuels are stored 3-10 years, followed by reprocessing. Reprocessing is done to allow for recycle of fissile materials, and separation of a number of other specific radionuclides for beneficial uses and separate disposition. HLW is vitrified for disposal in geologic repository. Geologic characterization is currently underway in at least eight unidentified sites in the Soviet Union.

LLW from nuclear reactor operations is currently evaporated, incorporated into bitumen or cement and stored and/or disposed of at reactor complexes and at about 35 other regional disposal facilities. Several sites for LLW burial "are expected to be selected in one or two years" (according to the USSR State Committee for the Utilization of Atomic Energy, 5/88). The Institute of Inorganic Materials is responsible for the LLW management program and is campaigning to cut liquid LLW volumes by 30% through more precise methods of sampling from the primary circuit, organizational methods, and recycling of soluble salts.

Dry waste, compacted at the site, is also stored/disposed of at reactor sites. Regional burial facilities are considered to minimize transportation-related risk.

INTERNATIONAL RELATIONSHIPS

Member of IAEA, CMEA and WANO.

ORGANIZATION

Nuclear Program Control

• State Committee for Safe Working Practices in Industry and the Nuclear Power Sector

• Ministry for Atomic Power and Industry

Research and Development

• Institute of Physical Chemistry, Moscow, a branch of the USSR Academy of Sciences (geologic waste disposal; waste form properties)

• V. G. Khlopin Radium Institute, Leningrad (chemical separation; fuels reprocessing; geochemistry)
• All-Union Scientific Research Institute for Inorganic Materials, Moscow (properties of solid waste forms)

• Chemical Plant Research Institute, Sverdlovsk (vitrification pilot plants)

• I. V. Kurchatov Institute of Atomic Energy

ALL-UNION SCIENTIFIC RESEARCH INSTITUTE FOR INORGANIC MATERIALS

All-Union Scientific Research Institute for Inorganic Materials
Ferganskaya 25
109507 Moscow, USSR
Tel: 70-95-377-0104
Tlx: 411026 UKLON SU

Director

A. S. Nikiforov

I. V. KURCHATOV INSTITUTE OF ATOMIC ENERGY

I. V. Kurchatov Institute of Atomic Energy
Kurchatov Square 1
123182 Moscow, USSR
Tel: 70-95-194-2969
Tlx: 411594 Shuga

Nuclear Safety

Ilya V. Elkin
Yuri P. Buzulukov

V. G. KHLOPIN RADION RADIUM INSTITUTE

V. G. Khlopin Radium Institute
Ul. Rentgena 1
197022 Leningrad, USSR
Tel: 70-812-247-5737
Fax: 70-812-534-7752

Director

S. L. Faddeev
Deputy Director
A. A. Rimsky-Korsakov
Chief of Laboratory
Yergeniy Shashukov
Radiochemical Technology
Valeriy N. Romanovskiy
Environmental Laboratory
Albert S. Aloy
V. G. KHLOPIN RADIUM INSTITUTE (contd)

Waste Management R&D: Develop processes for spent fuel (reprocessing, thermal decladding, meltdown of hulls), improved partitioning of HLW wastes, waste immobilization technology, handling off-gases, and storing $^{85}$Kr.

Facilities:\(^{(a)}\)

- **Reprocessing Research & Development Facility**
  - Owner: Khlopin Radium Institute, Leningrad
  - Mission: Develop LWR fuel reprocessing technology.
  - Design Basis: Chop-leach head-end; PUREX flowsheet; capacity, 3 kg/d uranium.

Ministry for Atomic Power and Industry (MINATOMENERGOPROM)

Ministry for Atomic Power and Industry
7, Kitaisky Troezd
103074 Moscow, USSR

Tel: 70-95-220-6402

- Minister: Vitaly Konovalov
- Dep. Minister, Nuclear Power: Viktor Sidorenko
- Dep. Minister, Nuclear Fuel Cycle: Boris Nikipelov

Function: Management of all aspects of nuclear power industry.

Facilities:\(^{(a)}\)

- **Cold Pilot Plant-Vitrification**
  - Mission: Develop waste vitrification technology.
  - Design Basis: Liquid-fed ceramic melter, two-chamber unit; 100 liters/h HLLW; 25 liters/h glass; product, phosphate glass in crucibles.
  - History: Startup, ca. 1974.

\(^{(a)}\) Because there is only limited information available, it is not always known for which nuclear agency a facility is operated and where it is located.
MINISTRY FOR ATOMIC POWER AND INDUSTRY
(MINATOMENERGOPROM) (contd)

- KS-KT-100 (cold pilot plant-vitrification)
  Location: Chemical Plant Research Institute, Sverdlovsk.
  Design Basis: Fluid bed calciner; in-crucible melter (two-stage process); capacity, 100 liters/h HLLW, 20 kg/h glass; 160-180 kg glass/batch; product, phosphate glass crucibles.
  History: Startup ca. 1975.

- Reprocessing of Power Reactor Fuel
  Location: Kyshtym site, Chelyabinsk

- Fully Radioactive HLW Vitrification
  Location: Kyshtym site, Chelyabinsk

STATE COMMITTEE FOR SAFE WORKING PRACTICES IN INDUSTRY AND THE NUCLEAR POWER SECTOR
(GOSPROMATOMNADZOR)

State Committee for Safe Working Practices in Industry & the Nuclear Power Sector
34, Taganskaya
Moscow, USSR
Tel: 70-95-272-4710
Chairman: Vadim M. Malyshev

Function: Monitoring the operational safety of technical installations.
UNITED STATES

MAJOR PUBLIC HOLIDAYS (1990)

<table>
<thead>
<tr>
<th>Date</th>
<th>Holiday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 1</td>
<td>New Year</td>
</tr>
<tr>
<td>Jan. 15</td>
<td>Martin Luther</td>
</tr>
<tr>
<td>Jan. 15</td>
<td>King Day</td>
</tr>
<tr>
<td>Feb. 19</td>
<td>Presidents Day</td>
</tr>
<tr>
<td>May 28</td>
<td>Memorial Day</td>
</tr>
<tr>
<td>July 4</td>
<td>Independence Day</td>
</tr>
<tr>
<td>Sept. 3</td>
<td>Labor Day</td>
</tr>
<tr>
<td>Oct. 8</td>
<td>Columbus Day</td>
</tr>
<tr>
<td>Nov. 11</td>
<td>Veterans Day</td>
</tr>
<tr>
<td>Nov. 22</td>
<td>Thanksgiving Day</td>
</tr>
<tr>
<td>Dec. 25</td>
<td>Christmas</td>
</tr>
</tbody>
</table>

STATE ABBREVIATIONS

AL - Alabama
AK - Alaska
AZ - Arizona
AR - Arkansas
CA - California
CO - Colorado
CT - Connecticut
DE - Delaware
FL - Florida
GA - Georgia
HI - Hawaii
ID - Idaho
IL - Illinois
IN - Indiana
IA - Iowa
KS - Kansas
KY - Kentucky
LA - Louisiana
ME - Maine
MD - Maryland
MA - Massachusetts
MI - Michigan
MN - Minnesota
MS - Mississippi
MO - Missouri
MT - Montana
NE - Nebraska
NH - New Hampshire
NJ - New Jersey
NM - New Mexico
NY - New York
NC - North Carolina
ND - North Dakota
OH - Ohio
OK - Oklahoma
OR - Oregon
PA - Pennsylvania
RI - Rhode Island
SC - South Carolina
SD - South Dakota
TN - Tennessee
TX - Texas
UT - Utah
VT - Vermont
VA - Virginia
WA - Washington
WI - Wisconsin
WV - West Virginia
WY - Wyoming

FOREIGN NATIONAL VISITS TO U.S. DOE FACILITIES

Foreign visitors to U.S. DOE facilities must complete and submit an IA-473 form (OMB 1910-2100) "Request for Foreign National Unclassified Visit or Assignment" to the laboratory or site to be visited at least 45 days before the proposed visit. The itinerary should be based on prior arrangement with appropriate DOE or DOE contractor staff.

In addition, for visits requested under a bilateral waste management agreement, notification of the visit should be made by the Principal Coordinator of the visitor's country to the U.S. Principal Coordinator for that agreement. The U.S. Principal Coordinator will assist, if necessary, in making the arrangements for the visit.
UNITED STATES

ENERGY

Population 1987 235 million

Electric Power Plant Capacity

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity (GWe)</th>
<th>Nuclear (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>662</td>
<td>13%</td>
</tr>
<tr>
<td>1988</td>
<td>674</td>
<td>14%</td>
</tr>
<tr>
<td>1990</td>
<td>683</td>
<td>15%</td>
</tr>
<tr>
<td>1995</td>
<td>696</td>
<td>15%</td>
</tr>
</tbody>
</table>

Electric Power Production

<table>
<thead>
<tr>
<th>Year</th>
<th>Production (TWh)</th>
<th>Coal (%)</th>
<th>Nuclear (%)</th>
<th>Gas (%)</th>
<th>Hydro/Geoth (%)</th>
<th>Oil (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>2,732.5</td>
<td>57%</td>
<td>18%</td>
<td>11%</td>
<td>9%</td>
<td>5%</td>
</tr>
<tr>
<td>1988</td>
<td></td>
<td></td>
<td>20%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td></td>
<td></td>
<td>18%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td></td>
<td></td>
<td>18%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NUCLEAR POWER GENERATION

Policy: Encourage construction and operation of nuclear power stations by private and public utilities under close regulatory control by NRC and State Public Review Commissions; continue R&D emphasizing LWR safety and small, modular concepts.

Nuclear Power Plant Capacity

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity (GWe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>99.9</td>
</tr>
<tr>
<td>1995</td>
<td>104.1</td>
</tr>
<tr>
<td>2000</td>
<td>103.9</td>
</tr>
</tbody>
</table>

Reactor Mix

<table>
<thead>
<tr>
<th>Year</th>
<th>Reactor</th>
<th>1989</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PWR:</td>
<td>74 (1961-89)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 (1990-1992)</td>
</tr>
<tr>
<td></td>
<td>BWR:</td>
<td>38 (1960-89)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 (1990)</td>
</tr>
<tr>
<td></td>
<td>HTR:</td>
<td>1 (1979)</td>
</tr>
</tbody>
</table>
NUCLEAR FUEL CYCLE

Policy: Current U.S. commercial nuclear fuel cycle activities include all phases: uranium mining, milling, and enrichment; fuel fabrication; interim spent fuel and waste storage; transportation, conditioning, and disposal of radioactive waste; except spent fuel reprocessing. Mining, milling, fabrication of UO₂ fuel, and LLW disposal are done predominantly by private firms; enrichment and HLW/spent fuel disposal are the responsibilities of the federal government. While permitted by law, commercial reprocessing is not envisioned in the near future because of economic considerations.


Cumulative Spent Fuel Arisings 1988 17,600 MTIHM
1990 21,500 MTIHM
2000 40,100 MTIHM

Major Milestones

• Start Demonstration Project at Waste Isolation Pilot Plant (defense TRU waste) 1990

• Candidate sites identified for MRS facility 1993

• Startup of MRS Facility
  - Limited waste acceptance 1998
  - Design waste acceptance 2000

• Start construction for geologic repository 2004

• Startup of first repository for civilian waste (spent fuel and HLW) 2010
INTERNATIONAL RELATIONSHIPS

Member of OECD/NEA and IAEA. Bilateral agreements for cooperation with Belgium, Canada, CEC, China, Germany/FR, France, Japan, Spain, Sweden, Switzerland and the United Kingdom. A brief outline of the agreements is provided in the appropriate country's section. 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 waste generated by federal activities, and for disposal of all high-level waste, spent fuel, TRU waste, and Greater-Than-Class-C LLW. Responsible also for ensuring availability of adequate technology for safe and efficient management of nuclear waste from both civilian and federal activities.

  HQ (Headquarters) - Provides policy and guidance for nuclear waste management and fuel cycle programs. Specific responsibilities are divided among the offices of:

  - EM (Environmental Restoration & Waste Management) - Environmental cleanup, compliance and waste management activities identified in the Environmental Restoration & Waste Management Five-Year Plan. Includes previous responsibilities of NE (Nuclear Energy) and DP (Defense Programs): R&D technologies for treatment of DOE and civilian low-level radioactive waste; remedial action to treat or stabilize DOE radioactive waste; D&D demonstrations of selected facilities; safe management of radioactive nuclear waste generated primarily by federal facilities, except HLW, which will be disposed together with commercial spent fuel in a geologic repository.

  - RW (Civilian Radioactive Waste Management) - Storage and disposal of spent nuclear fuel and HLW; development of MRS facilities; development of transportation systems for spent fuel and HLW.
DOE ORGANIZATION (cont'd)

- **IE (International Affairs and Energy Emergencies)** - Coordination of DOE's international activities.

- **F.O. (Field/Operations Offices)** - Implement HQ policy and directives, issuing orders to specific sites. Direct efforts of DOE contractors.

- **Contractors** - Operate DOE facilities in accordance with HQ and F.O. guidance and orders.

- **DOI (Department of the Interior)**
  - **USGS (U.S. Geological Survey)** - Laboratory and field geologic investigations.

- **DOT (Department of Transportation)** - Development, issuance and enforcement of safety standards, governing aspects of radioactive and hazardous materials transport.

- **EPA (Environmental Protection Agency)** - Establishment and enforcement of standards for the protection of the general environment.

- **NRC (Nuclear Regulatory Commission)** - Issuance of regulations and licenses for commercial nuclear activities and for disposal of DOE HLW, in compliance with the general environmental standards issued by the EPA.
DOE (DEPARTMENT OF ENERGY) PARTIAL ORGANIZATION

Secretary
Deputy Secretary
Under Secretary

-- EM - Environmental Restoration and Waste Management
-- RW - Civilian Radioactive Waste Management
  • YMPO
-- IE - International Affairs and Energy Emergencies

-- Field/Operations Offices

• AL - Albuquerque
  -- LANL -- MOUND -- RFP -- SNL -- WIPP
• CH - Chicago
  -- ANL -- BNL -- BATTELLE
• ID - Idaho
  -- INEL -- WVNS -- WINCO -- TMI
• NV - Nevada

• OR - Oak Ridge
  -- ORNL
• RL - Richland
  -- PNL -- WHC
• SAN - San Francisco
  -- EPRI -- GA -- LLNL -- ROCKETDYNE
• SR - Savannah River
  -- WSRC

US.5
UNITED STATES

NRC (NUCLEAR REGULATORY COMMISSION) PARTIAL ORGANIZATION

Chairman
Commissioners

-- GPA - Governmental and Public Affairs
-- Executive Director for Operations

-- NMSS - Nuclear Material Safety and Safeguards
-- RES - Nuclear Regulatory Research

-- NRR - Nuclear Reactor Regulation
-- Regional Offices
  • Region I (Philadelphia)
  • Region II (Atlanta)
  • Region III (Chicago)
  • Region IV (Dallas)
  • Region V (San Francisco)
UNITED STATES

DOE-Headquarters

U.S. Department of Energy  Tel:  202-586-5000
Forrestal  FTS:  896-5000
Washington, DC 20585  Twx:  710-822-0176
Fax:  896-8134
Verif:  5049 or 4529
  896-5100

U.S. Department of Energy  Tel:  202-586-5000
Germantown  FTS:  896-5000
Washington, DC 20545  Twx:  710-828-0475
Fax:  233-3888
Verif:  2866 or 3870
  233-5465

Secretary  James D. Watkins

Civilian Radioactive Waste Management

RW-1  Director  John Bartlett  586-6842
  Dep. Director  Samuel Rousso  586-9116
  Dep. Director  Franklin G. Peters  586-6850
  Quality Assurance  Lake H. Barrett  586-2277
RW-10  Resource Mgt.  Samuel Rousso  586-6842
  Dep. Associate Dir.  James C. Bresee  586-9175
RW-20  Facility Siting/Dev.  Stephen H. Kale  586-9694
  Dep. Associate Dir.  Jerome D. Saltzman  586-9692
RW-30  Sys. Integr./Regs.  Ralph Stein  586-6046
  Dep. Associate Dir.  Keith A. Klein  586-9433
RW-40  Ext. Relations/Policy  Thomas H. Isaacs  586-2277
  International Coord'n  Renee Jackson  586-2283
  Dep. Associate Dir.  Lake H. Barrett  586-2277

AREA CODES:  202 for prefix 586; FTS: 896
  301 for prefix 353; FTS: 233

US.7
UNITED STATES

DOE-HQ (contd)

International Affairs and Energy Emergencies

IE-1 Assistant Secretary
John J. Easton, Jr. 586-5800
Arlean I. Erdahl 586-5858
IE-10 Deputy Asst. Sec.
Thad Grundy, Jr. 586-5918
IE-12 Intematl. R&D Policy
Harold Jaffe 586-6770

Environmental Restoration and Waste Management

EM-1 Acting Director
Leo P. Duffy 586-7710
EM-1 Acting Dep. Dir.
Paul Grimm 586-7709
EM-10 Plan./Resource Mgt.
Acting Assoc. Dir.
Carl W. Guidice 586-2661
EM-20 Quality Assurance/Envir. Control
Acting Assoc. Dir.
Randal Scott 586-4419
EM-30 Waste Operations
Acting Assoc. Dir.
Jill E. Lytle 586-7709
EM-32 Site Operations
James E. Dieckhoner 353-3956
EM-33 Program Support
Stephan P. Cowan 353-3642
EM-34 Waste Mgt. Projects
Mark Frei 353-9469
EM-35 Technical Support
Joseph Coleman 353-4728
EM-40 Environ. Restoration
Acting Assoc. Dir.
R.P. (Pat) Whitfield 586-7705
EM-423 Decon/Decom.
Jim Fiore 353-4716
EM-50 Tech. Development
Acting Assoc. Dir.
Clyde W. Frank 586-7709
John E. Baublitz 586-5006
Internatl. Coord'n
Frank P. Falci, Jr. 353-3595
EM-51 Transportation Mgt.
- - -
Susan M. Prestwich 353-5543
EM-53 Program Support
Lawrence H. Harmon 353-3506
EM-54 R&D
Steve Lien 353-5246
Carl R. Cooley 353-5519

AREA CODES: 202 for prefix 586; FTS: 896
301 for prefix 353; FTS: 233

US.8
## DOE OPERATIONS OFFICES

### ALBUQUERQUE OPERATIONS (AL)

<table>
<thead>
<tr>
<th>U.S. Department of Energy</th>
<th>Tel:</th>
<th>505-845-4154</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albuquerque Operations Office</td>
<td>FTS:</td>
<td>845-4154</td>
</tr>
<tr>
<td>P.O. Box 5400</td>
<td>Fax:</td>
<td>-6058</td>
</tr>
<tr>
<td>Albuquerque, NM 87115</td>
<td>Verif:</td>
<td>-6319</td>
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</tbody>
</table>

Manager: Bruce G. Twining
Energy Tech./Waste Mgt.: Jim Bickel
Waste Isolation Pilot Plant: Arlen Hunt
Uranium Mill Tailings: Mark Mathews

DOE Rocky Flats Office (Denver Site)

<table>
<thead>
<tr>
<th>Tel:</th>
<th>303-966-7000</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTS:</td>
<td>320-7000</td>
</tr>
<tr>
<td>Fax:</td>
<td>-4092</td>
</tr>
<tr>
<td>Verif:</td>
<td>-2719</td>
</tr>
</tbody>
</table>

Manager: Robt. M. Nelson, Jr.
Deputy Manager: David P. Simonson
Acting Dir., Environmental Restoration Division: Rich Schassburger

### CHICAGO OPERATIONS (CH)

<table>
<thead>
<tr>
<th>U.S. Department of Energy</th>
<th>Tel:</th>
<th>708-972-2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago Operations Office</td>
<td>FTS:</td>
<td>972-2000</td>
</tr>
<tr>
<td>9800 South Cass Avenue</td>
<td>Tlx:</td>
<td>687-1701</td>
</tr>
<tr>
<td>Argonne, IL 60439</td>
<td>Fax:</td>
<td>972-2343 or 2206</td>
</tr>
<tr>
<td></td>
<td>Verif:</td>
<td>-2209</td>
</tr>
</tbody>
</table>

Manager: Hilary J. Rauch
Repos. Tech. Program (RTP): Richard C. Baker
Transportation Prog. (TPO): Jeffrey B. Roberts
Waste Operations-Materials Integration Office (MIO): Joel C. Haugen
UNITED STATES

IDAHO OPERATIONS (ID)

U.S. Department of Energy
Idaho Operations Office
785 DOE Place
Idaho Falls, ID 83402

Tel: 208-526-0111
FTS: 583-0111
Twx: 910-977-5915
Fax: 583-1405
Verif: -1503

Acting Manager
Phillip J. Hamric
-1322
Acting Asst. Mgr., Nucl. Prog.
James Solecki
-1989
Chief, Waste Management
Brenda J. Mikkola
-9316
Fuel Processing/Waste Mgt.
Jerry L. Lyle
-1148
Energy Tech. Div.
Wm. Thielbahr
-0682
Advanced Technologies
Stephen C.T. Lien
-1231

W. Valley Proj. (NY Site)
Willis W. Bixby
716-942-4312
Process Technology
Eli Maestas
716-942-4314

NEVADA OPERATIONS (NV)

U.S. Department of Energy
Nevada Operations Office
P.O. Box 98518
Las Vegas, NV 89193-8518

Tel: 702-295-1212
FTS: 575-1212
Fax: -1371 or -1372
Verif: -1369

Manager
Nick Aquilina
-3211
Environ't Protection
Don Elle
-0956

OAK RIDGE OPERATIONS (OR)

U.S. Department of Energy
Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, TN 37831

Tel: 615-576-5454
FTS: 626-5454
Twx: 810-572-1076
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Lester K. Price
-0710
Chief Energy Tech. Branch
Connor Matthews
-1373
Mgr., Fuel Reprocessing
Martha J. Rohr
-0717
Waste Mgt. Div. Director
Larry Radcliffe
-0732
Program Manager
Larry W. Clark
-2675
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U.S. Department of Energy Tel: 509-376-7411
Richland Operations Office FTS: 444-7411
825 Jadwin Avenue Twx: 510-770-5108
P.O. Box 550 Fax: 444-6540
Richland, WA 99352 Verif: 7317

Manager Michael J. Lawrence -7395
Deputy Manager Ed S. Goldberg -7397
Waste Management Ron E. Gerton -1366
Tech. Develop. Paula K. Clark -4718
Project Management Larry C. Williams -4131
Environmental Restoration Ronald D. Izatt -5441
Asst. Mgr., Oper./Res.(Acting) Kenneth W. Bracken -7434
Operations John R. Hunter -7471
R&D Joseph J. Sutey -7770
Asst.Mgr.,Safety/Secur./QA John J. Keating -7387
Quality Assurance R. Pierre Saget -2611
Safety/Environment Richard A. Holten -7461
Safeguards/Security Ken H. Jackson -7441

SAN FRANCISCO OPERATIONS (SAN)

U.S. Department of Energy Tel: 415-273-4237
San Francisco Operations Office FTS: 536-4237
1333 Broadway Fax: -6207
Oakland, CA 94612 Verif: -7956

Manager Donald Pearman -7111
Waste Management Daniel Nakahara 543-8394
Environ. Safety & Support Bill Holman 536-6370
UNITED STATES

SAVANNAH RIVER OPERATIONS (SR)

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

Tel: 803-725-6211
FTS: 239-6211
Twx: 810-771-2670
Fax: 239-2033

-1259 or -3626
Verif: -1720

Manager
P.W. (Bill) Kaspar -2277

Dep. Mgr., Defense Waste Process Facility (DWPF)
A. Lee Watkins 237-1055

Waste Management Process
Robt. L. Chandler 239-5530

Waste Ops. & Technology
Michael O'Rear -5541

YMPO

Yucca Mountain Project Office
U.S. Department of Energy
Phase 2, Suite 200
101 Convention Center Drive
Las Vegas, NV 89109

Tel: 702-794-7900
FTS: 544-7900
Fax: -7907 or -7908
Verif: -7919

Manager
Carl P. Gertz -7920

Deputy Project Manager
Ed L. Wilmot -7137

Intl. Programs Manager
Robert A. Levich -7946

Regulation/Site Evaluations
Max B. Blanchard -7939

Regulatory Interactions
David C. Dobson -7940

Site Investigations
Uel S. Clanton -7943

Tech. Analysis
Leo Little -7929

Engineering Development

Exploratory Shaft
Field Engineering
Systems
Project/Operations Control
Quality Assurance

Michael Cloninger -7947
Edgar H. Petrie -7961
Wendy R. Dixon -7947
Donald K. Horton -7913

US.12
DOE CONTRACTORS

ANL

Argonne National Laboratory
9700 South Cass Avenue
Argonne, IL 60439
Tel: 708-972-2000
FTS: 972-2000
Fax: 687-1701
708-972-2343
-2206 or -2528
Verif: -2209

Director
Alan Schriesheim
-3872
Waste Management
James E. Holt
-7335
Applied R&D
Stanley S. Borys
-6677
Adv. Comm. on Nucl. Waste
Martin J. Steindler
-4314
Natl. Energy Software Center
Margaret K. Butler
-7172
Special Projects Office
Charles E. Klotz
-6385
ANL-West (ID), Acting Mgr.
D.W. Cissel
583-7106

Fuel Cycle and Waste Management Activities:
UNITED STATES

ANL (cont’d)

Major Facilities:


BATTELLE

Battelle
505 King Avenue
Columbus, OH 43201
Tel: 614-424-4295
FTS: same
Tx: 24-5454
Fax: 424-5601
Verif: -4182

Nuclear Systems Group
V.P./General Manager Richard A. Nathan -4295
Transp. Syst./Planning (OTSP) William M. Knauf -3686
Nucl. Waste Isolation (SED) Wayne A. Carbiener -4507

Office of Waste Technology Development (OWTD)
7000 S. Adams Street
Willowbrook, IL 60521
Tel: 708-655-8600
Fax: -8619
Verif: -8618


Fuel Cycle and Waste Management Activities:
UNITED STATES

BATTELLE (contd)

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

Major Facilities:
Hot and Cold Development Laboratories - Hot Cells for both destructive and nondestructive examination for development programs.

BNL

Brookhaven National Laboratory Tel: 516-282-2123
Associated Universities, Inc. FTS: 666-2123
Upton, NY 11973 Tx: 685-2516
Fax: 666-3000
Verif: -2547

Director N. P. Samios -2772
HLW & NRC LLW Programs Peter Soo -4094
DOE LLW Programs Peter Colombo -3045

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

Major Facilities: Hot and Cold Development Laboratories

GA

General Atomics Tel: 619-455-3000
P.O. Box 85608 FTS: same
3550 General Atomics Court Tx: 910-335-1260
San Diego, CA 92138 Fax: 619-455-3621
Verif: -3457

Chairman/Chief Executive J. Neal Blue -2152
Transp./Utility Waste Mgt. Robert Grenier -2583

Fuel Cycle and Waste Management Activities:
HTGR spent fuel treatment - Transportation technology for commercial and defense waste.

US.15
UNITED STATES

INEL

Idaho National Engineering Laboratory  Tel:  208-526-0111
EG&G Idaho, Inc. FTS:  583-0111
P.O. Box 1625 Twx:  910-977-5915
Idaho Falls, ID 83415 Fax:  583-9591

Manager: James O. Zane Verif: (recipient)
Waste Management: Larry P. Leach -9671
National LLW Mgt. Program: Calvin B. Ozaki -6212
TMI-2 Program (TMI Site): Bill Franz -0004

Fuel Cycle and Waste Management Activities:
National LLW technology - D&D (EBR-II, MTR, OMRE, Spent Reactors) - TMI-2 R&D - Operation of stored waste examination pilot plant (SWEPP) for TRU waste - Operation of process experimental pilot plant (PREPP) for TRU waste - LLW disposal operation - Cask systems development - Cask transport and testing - Prototypical rod consolidation.

Major Facilities:
Radioactive Waste Management Complex (RWMC) - Processing Experimental Pilot Plant (PREPP) - Waste Experimental Reduction Facility (WERF) - Stored Waste Examination Pilot Plant (SWEPP) - Test Area North/Spent Fuel Storage Area (TAN).

LANL

Los Alamos National Laboratory Tel:  505-667-5061
University of California FTS:  843-5061
P.O. Box 1663 Twx:  910-988-1773
Los Alamos, NM 87545 Fax:  843-1754

Verif: -5113

Director: Siegfried Hecker -5101
Nuclear Waste Mgt. Richard J. Herbst -9286

Fuel Cycle and Waste Management Activities:
Fundamental studies of waste materials (BES) - Migration from low-level waste sites (BES) - D&D of various site facilities - Tuff repository support (NNWSI).

US.16
Major Facilities:
Waste Disposal Field Experimental Facility - Controlled Air Incinerator Demonstration Facility - Glove Box Reduction Facility - TRU Waste Assay Systems.

LLNL

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

Tel: 415-422-1100
FTS: 532-1100
Twx: 910-386-8339
Fax: 532-1370
Verif: -4546

Director John H. Nuckolls -5435
Dir., Yucca Mountain Project Leslie Jardine 543-5032
Technical Manager Lyndon Ballou 532-4911
Energy Programs Jesse L. Yow, Jr. -3521

Fuel Cycle and Waste Management Activities:

Major Facility:
• CLIMAX Spent Fuel Test Facility at NTS.

MOUND

EG&G Mound Applied Technologies
P.O. Box 3000
Miamisburg, OH 45343

Tel: 513-865-4020
FTS: 774-4020
Twx: 510-600-6643
Fax: 774-3742 or -4532
Verif: -3575

Director Donald E. Michel -5090
Nuclear Waste Technology Thomas K. Mills -4708
D&D Ralph R. Jaeger -3275
Waste Management Richard K. Blauvelt -3698
UNITED STATES

MOUND (cont’d)

Fuel Cycle and Waste Management Activities:
Solid waste volume reduction with glass melter - TRU waste technology/record systems - TRU waste treatment/liquid waste, incineration - tritium recovery from waste - D&D of Pu-238 facilities.

Major Facilities:

NRT

Nuclear Remediation Technologies
P.O. Box 85608
3550 General Atomics Court
San Diego, CA 92138
Tel: 619-455-3230
FTS: same
Fax: -3231
Verif.: -3381

President/CEO
Robert Burgoyne
-4122
V.P., Operations
S.P. Viani
-3232

Fuel Cycle and Waste Management Activities:
Nuclear and mixed waste site characterization - Soil and groundwater treatment - Process design - Transportation services and environmental engineering support.
Waste Management Activities:
Operate waste management facilities, including disposal - Develop TRU waste technology, including assay and package certification - Hazardous waste remedial actions - Sedimentary rock studies - Waste operations control center - UMTRA radiological survey - Environmental restoration and facilities upgrade - waste management R&D.

Major Facilities:

Fuel Cycle and Reprocessing Activities:
Develop reprocessing, remote systems, and safeguards technologies and facilities design optimizations.

Major Facilities:
Fuel Cycle and Waste Management Activities:
Waste systems integration (economic/contract analyses and implementation) - Commercial spent fuel management - Civilian nuclear waste treatment (HLW/TRU) - Monitored retrievable storage (MRS) - Materials characterization center (MCC) - International program support - NRC environmental studies on LLW and uranium mill tailing sites - Tuff repository and Performance Assessment Scientific Support (PASS) studies - HLW technology (SR, WV, Hanford) - TRU technology (TWSO, Hanford) - LLW technology (LLWMP, Hanford) - Remedial action planning and technology - Byproduct utilization - Transportation technology.

Major Facilities:
RFP

EG&G Rocky Flats, Inc.                Tel:  303-966-7000
Rocky Flats Plant                   FTS:  320-7000
P.O. Box 464                        Fax:  -4092
Golden, CO 80402-0464              Verif:  -2719

President            P. Warner     -4361
Waste Operations     H. H. Burlangame -6013
Waste Minimization   Ann C. Ficklin  -4293
Technology Development Ed R. Naimon  -7900

Fuel Cycle and Waste Management Activities:
Defense TRU waste technology - LLW technology development -
Waste treatment facilities operations.

Major Facilities:
Solid Waste Reduction Facility - LLW Incinerators - TRU Waste
Supercompaction (September 1990) - TRU Waste Assay - Liquid
Waste Treatment and Fixation Facilities - Microwave Melting of

ROCKETDYNE

Rockwell International Corporation    Tel:  818-700-8200
Atomics International Division        FTS:  same
Rocketdyne                           Tx:   69-8478
6633 Canoga Avenue            Fax:  818-710-2866
Canoga Park, CA 91303            Verif:  -2471

Director             D. Clark Gibbs  700-3303
Nuclear Products/Services  Robt. M. Musica  718-3355
Fuel Decladding      Thomas A. Moss   718-3326

Fuel Cycle and Waste Management Activities:
Decladding of fuels - Operation of Energy Technology and
Engineering Center (ETEC) - Remote handling development -
Large component fabrication.

Major Facilities:
Large Inert Hot Cell - ETEC.
SAIC

Science Applications International
Corporation
Suite 407
101 Convention Center Drive
Las Vegas, NV 89109
Tel: 702-794-7000
FTS: 544-7000
Fax: 7008
Verif: 7780

Technical Project Officer John H. Nelson - 7864

SNL

Sandia National Laboratories
P.O. Box 5800
Albuquerque, NM 87185-5800
Tel: 505-844-5678
FTS: 844-5678
Fax: 16-9012
Verif: 7091

President
Al Narath - 7261
A. W. Bill Snyder - 8203
Richard W. Lynch - 3763
Joe Stiegler - 845-8788
Wendell D. Weart - 4855
D.J. McClosky - 846-0834
Thomas O. Hunter - 9160

Fuel Cycle and Waste Management Activities:
Radioactive material transportation technology - Tuff repository support - Salt repository scientific support (WIPP) - Safety assessment of facilities for NRC - Advances in reactor technology.

Major Facilities:
Research reactors and numerous test facilities.

SRL/SRP (see WSRC)

US.22
UNITED STATES

WHC

Westinghouse Hanford Company
P.O. Box 1970
Richland, WA 99352
Tel: 509-376-7411
FTS: 444-7411
Fax: -4668
Verif: -5777

President: John E. Nolan
Exec. Vice President: Roger C. Nichols
Vice Pres., Defense Prog.: Ronald J. Bliss
Chemical Processing: J. Roger Knight
Defense Waste Management: Hugh F. Daugherty
Defense Reactor: Wallace G. Ruff
Vice Pres., Engin./Devel.: Michael K. Korenko
Projects: Carl M. Cox
Hanford W.V. Plant Project: Robert A. Smith
HWVP Technology: E. Tom Weber
Defense Waste Mgt. Projects: Michael A. Cahill
Environmental Division: Ronald E. Lerch

Fuel Cycle and Waste Management Activities:
Fuel reprocessing (PUREX) - HLW tank storage - Cs/Sr recovery and encapsulation - HLW concentration and solidification - LLLW treatment and fixation - TMI support - TRU waste assay - Hanford waste disposal - D&D Hanford reactors and fuel cycle facilities - Breeder fuel development and fabrication - Spent fuel integrity in storage - Surplus facilities program - Solid waste disposal operations.

Major Facilities:
UNITED STATES

WINCO

Westinghouse Idaho Nuclear Co., Inc. Tel: 206-526-0111
Idaho Chemical Processing Plant FTS: 583-0111
P.O. Box 4000 Twx: 910-977-5915
Idaho Falls, ID 83403 Fax: 583-3499

President W.C. Moffitt Verif: -3506
Production L. F. Ermold -4628
Technology Bert R. Wheeler -3373

Fuel Cycle and Waste Management Activities:
Operate associated spent fuel storage, fuel reprocessing, HLW
tank storage, and HLLW calcining facilities.

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

WIPP

WIPP Project
Westinghouse Electric Corporation Tel: 505-887-8100
Advanced Energy Systems Division FTS: 571-2100
P.O. Box 2078 Fax: 505-885-3276
Carlsbad, NM 88221 Verif: 885-8883

Westinghouse Mgr./Ops. A. L. Trego 571-2200

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

Major Facility: Waste Isolation Pilot Plant.
WSRC

Westinghouse Savannah River Co.  Tel:  803-725-6211
P.O. Box 616  FTS:  239-6211
Aiken, SC 29802  Twx:  669-1713
Fax:  239-2033
Verif:  -1259 or -3626

Savannah River Site (SRS)
V.P./Gen. Mgr., Operations  Ed W. Pottmeyer  -2701
Waste Mgt. Programs  Lucien Papouchado  -3320

Fuel Cycle and Waste Management Activities:

Major Facilities (existing and planned):

Savannah River Laboratory (SRL)
Vice Pres./Director  Richard T. Begley  803-725-3422
Defense Waste Processing  Dan L. McIntosh  -3113
Chemical Processing Tech.  Harry D. Harmon  -3701

Fuel Cycle and Waste Management Activities:

Major Facilities:
HLW Vitrification Pilot Plant - HLW Tank Mockup - HLW Caves for Process Development.

US.25
UNITED STATES

WVNS

West Valley Nuclear Services, Inc. Tel: 716-942-3235
P.O. Box 191 FTS: 473-3235
West Valley, NY 14171-0191 Fax: -4376
Verif: -4267

President Roy A. Thomas -4344

Fuel Cycle and Waste Management Activities:
Demonstration of HLW vitrification - Supernatant treatment by
ion-exchange - LLW treatment using cement solidification.

Major Facilities:
HLW Vitrification Facility - Integrated Radioactive Treatment
System (HLW Supernatant processing, evaporation, remote
cementation facility, product storage).

OTHER U.S. ORGANIZATIONS

EPA

Environmental Protection Agency Tel: 202-382-2090
401 M Street S.W. FTS: 382-2090
Washington, DC 20460 Tlx: 89-2758
Fax: 382-7883
Verif: -7884 or -7885

International Activities
Assistant Administrator Timothy B. Atkeson -4870
Multilat. Staff Director Alan Sielen -4875

Radiation Programs
Director Richard Guimond 475-9600
Criteria and Standards J. William Gunter 475-9603
Waste Mgt. Standards Floyd L. Galpin 475-9633

Solid Waste
Director Sylvia Lowrance 382-4627
Permit and State Programs Matthew Hale -4746

US.26
EPRI

Electric Power Research Institute
3412 Hillview Avenue
P.O. Box 10412
Palo Alto, CA 94303
Tel: 415-855-2000
FTS: same
Tlx: 82-977
Fax: 855-2954
Verif: 2717

President Richard Balzhiser
V.P./Director, Nuc. Power John J. Taylor
LWR Fuel/Spent Fuel Storage David Franklin
Low-Level Waste Robert Shaw

Fuel Cycle and Waste Management Activities:
Direct assay of low-level radioactive waste - Spent fuel rod consolidation equipment - On-site demonstration of spent fuel storage in metal casks/concrete silo - Conceptual designs for LLW disposal sites - Demonstration of transportable spent fuel metal storage cask - Fuel performance during load-following, high-temperature operation and extended burnup - Fuel performance computer models.

NRC

U.S. Nuclear Regulatory Commission
Washington, DC 20555
Tel: 301-492-7000
FTS: 492-7000
Tlx: 90-8142
Fax: 492-0259 or 0260
Verif: 0262

Governmental and Public Affairs (GPA)

Director Harold R. Denton
International Programs James R. Shea
International Security (Export/Import Regulations) Marvin R. Peterson
International Cooperation Ronald D. Hauber

US.27
**NRC (cont’d)**

**Nuclear Material Safety and Safeguards (NMSS)**

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director</td>
<td>Robt. M. Bernero</td>
<td>-3352</td>
</tr>
<tr>
<td>HLW Management</td>
<td>Robt. E. Browning</td>
<td>-3404</td>
</tr>
<tr>
<td>LLW Mgt./Decommissioning</td>
<td>Richard L. Bangart</td>
<td>-3340</td>
</tr>
<tr>
<td>Safeguards/Transportation</td>
<td>Robt. F. Burnett</td>
<td>-3365</td>
</tr>
<tr>
<td>Indust./Medical Nucl. Safety</td>
<td>R. E. Cunningham</td>
<td>-3426</td>
</tr>
</tbody>
</table>

**Nuclear Reactor Regulation (NRR)**

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director</td>
<td>Thomas E. Murley</td>
<td>492-1270</td>
</tr>
<tr>
<td>Reactor Projects I/II</td>
<td>Steven A. Varga</td>
<td>-1403</td>
</tr>
<tr>
<td>Reactor Projects III/IV/V</td>
<td>Gary M. Holahan</td>
<td>-1353</td>
</tr>
<tr>
<td>Systems Technology</td>
<td>Ashok C. Thadani</td>
<td>-0884</td>
</tr>
<tr>
<td>Engineering Technology</td>
<td>James Richardson</td>
<td>-0821</td>
</tr>
<tr>
<td>Operational Events Assess.</td>
<td>Charles E. Rossi</td>
<td>-1163</td>
</tr>
<tr>
<td>Reactor Inspection/Safeguards</td>
<td>Brian K. Grimes</td>
<td>-0903</td>
</tr>
<tr>
<td>Performance/Quality Eval.</td>
<td>Jack W. Roe</td>
<td>-1004</td>
</tr>
</tbody>
</table>

**Nuclear Regulatory Research (RES)**

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director</td>
<td>Eric S. Beckjord</td>
<td>-3700</td>
</tr>
<tr>
<td>Engineering</td>
<td>Lawrence C. Shao</td>
<td>-3800</td>
</tr>
<tr>
<td>Safety Issues Resolution</td>
<td>Warren Minners</td>
<td>-3900</td>
</tr>
<tr>
<td>Systems Research</td>
<td>Brian Sheron</td>
<td>-3500</td>
</tr>
<tr>
<td>Regulatory Applications</td>
<td>Bill M. Morris</td>
<td>-3750</td>
</tr>
</tbody>
</table>

**Regional Offices**

<table>
<thead>
<tr>
<th>Region</th>
<th>Name</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philadelphia - Region I</td>
<td>William T. Russel</td>
<td>215-337-5299</td>
</tr>
<tr>
<td>Atlanta - Region II</td>
<td>Stewart D. Ebneter</td>
<td>404-331-5500</td>
</tr>
<tr>
<td>Chicago - Region III</td>
<td>A. Bert Davis</td>
<td>708-790-5681</td>
</tr>
<tr>
<td>Dallas - Region IV</td>
<td>Robert D. Martin</td>
<td>817-860-8225</td>
</tr>
<tr>
<td>San Fran. - Region V</td>
<td>John B. Martin</td>
<td>415-943-3707</td>
</tr>
</tbody>
</table>

US.28
Fuel Cycle and Waste Management Activities:
Basic/applied research on hydrogeologic processes relevant to radioactive and toxic waste disposal - site characterization - geologic/hydrologic investigations to determine suitability of potential HLW repository site at Yucca Mountain - site investigations/research - consultant for EPA, DOE, DOD, Dept. of Agriculture, Bureaus of Land Mgt., of Mines, of Reclamation, and state agencies.
INTERNATIONAL

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 Industrial Affairs, Information Technologies, Research/Science, Joint Research Centres
Filippo Naria Pandolfi

Director General, Science/R&D
Paolo Fasella

Director, Nuclear R&D
Sergio Finzi

Division, Fuel Cycle
Serge Orlowski

Division, Nuclear Plant Safety
Emilio Lopez Menchero

Division, Radiological Protection
Georg Gerber

Director General, JRCs
Jean-Pierre Contzen

MEMBER STATES - EUROPEAN ECONOMIC COMMUNITY (EEC)

Belgium: Greece: Netherlands
Denmark: Italy: Portugal
France: Ireland: Spain
Germany (FRG): Luxembourg: United Kingdom

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 (by a tax on Member States), conducted by Joint Research Centre establishments at Ispra (Italy) and Karlsruhe (FRG).

- **Shared-cost action**—coordinated by Division Fuel Cycle, Brussels, and partly funded by CEC under cost-sharing contracts, conducted by research centers, universities, and industries in the Member States.
INTERNATIONAL

Cooperation with the U.S.:

**DOE/CEC UMBRELLA AGREEMENT FOR WASTE MANAGEMENT EXCHANGE**

*Term:* 10-6-82 to 10-6-92.

*Scope:* Characterization of waste forms; disposal in geologic formations.

*Emphasis:* R&D.

**CEC-JRC: ISPRA**

CEC Joint Research Center
Ispra Establishment
21020 Ispra (Varese)           Tel:  39-332-789-111
Italy                         Fax:  39-332-789-001

*Location:* Northern Italy; may be reached by air travel to Milan, ground transport to Ispra, about 50 km.

**Waste Management Programs**      Francesco Girardi

**CEC-JRC: KARLSRUHE**

Karlsruhe Establishment
(European Institute for Transuranium Elements)
Postfach 2266                 Tel:  49-7247-841
7500 Karlsruhe                 Fax:
Federal Republic of Germany   Tlx:  7825483 EU D

*Director:* Jacobus van Geel

*Function:* Basic research in the transuranium elements, especially plutonium, reactor fuels development.

**Fuel Cycle R&D:** Plutonium conversion and plutonium fuels, characterization of waste forms, notably spent fuel when considered as a waste.
CMEA

Council for Mutual Economic Assistance
Prospekt Kalinina 56
121205 Moscow
USSR

MEMBER STATES

Bulgaria  Hungary  USSR
Cuba      Mongolia  Yugoslavia
Czechoslovakia  Poland  Vietnam
Germany/DR  Rumania

FUNCTION

Promote economic and industrial cooperation among the Member States with centrally-controlled economies.

ORGANIZATION

• Standing Commission on the Use of Atomic Energy for Peaceful Purposes--reviews national waste management R&D programs and defines areas for additional cooperation.

IAEA

International Atomic Energy Agency
P.O. Box 200
1400 Vienna, Austria
Tel: 43-222-2360
Fax: 43-1-2345-64

Director General           Hans Blix
    Head, Waste Management
    Waste Mgt. U.S. Staff
    Head, Nuc. Mtls./Fuel Cycle
    Technology
Dep. Dir. Gen., Safeguards     Alexander Nechaev
Dep. Dir. Gen., Research/Isotopes  bin Muslim Noramly
Dep. Dir. Gen., Administration  Maurizio Zifferero

William J. Dirks
INTERNATIONAL

IAEA (contd)

MEMBER STATES

113 nations (U.N. members, including the U.S.).

FUNCTION

Develop the peaceful use of atomic energy: safeguards, nuclear safety and standards, information exchange, and technical cooperation and assistance.

Intergovernmental organization, established 1957, directed by a Board of Governors (composed of representatives from 34 member states) and a General Conference (consisting of the entire membership).

WASTE MANAGEMENT ACTIVITIES

• Collection, review and dissemination of technical, scientific, and regulatory information in the area of:
  - handling, treatment, storage, and conditioning of waste, including uranium mill tailings
  - decontamination and decommissioning of nuclear facilities
  - underground disposal of waste
  - assessment of environmental consequences due to effluent discharges and other releases of radionuclides.

• Development of internationally acceptable guidelines, standards, and codes of practice for use by national authorities.

• Protection of the environment by fulfilling responsibilities under international conventions.

• Promotion and sponsorship of research work and development of data and technology in promising areas.

• Technical cooperation, assistance, and training to Member States upon request.
INTERNATIONAL

U.S. Mission to IAEA (UNVIE)
Obersteinergasse 11
1190 Vienna
Austria
Waste Management

Dr. Maurice Katz

ICRP

International Commission on Radiological Protection
Clifton Avenue
Sutton, Surrey SM2 5PU
United Kingdom
Chairman, Main Commission
Scientific Secretary
Committee Chairman, Radiation Effects

Dr. D. Beninson
Dr. Hylron Smith
Dr. A. C. Upton

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
Secretary General
Dep. Secretary General
Dep. Secretary General
U.S. OECD Mission
19 rue Franqueville
75016 Paris, France

Jean Claude Paye
Robert A. Cornell
Pierre Vinde
Frank J. Goldner

Tel: 33-1-45-24-82-00
Fax: 33-1-45-24-85-00
Tel: 33-1-45-24-74-77
Fax: 33-1-45-24-74-80
33-1-45-24-74-24
OECD/NEA

OECD Nuclear Energy Agency
38 Boulevard Suchet
75016 Paris, France
Tel: 33-1-45-24-82-00
Fax: 33-1-45-24-96-24

Director General
Kunihiko Uematsu
33-1-45-24-96-60

Deputy Director General
Pierre Strohl
33-1-45-24-96-50

Deputy Dir., Safety/Regulation
Klaus Stadie
33-1-45-24-96-54

Radiation Protection/Waste Mgt.
Jean-Pierre Olivier
33-1-45-24-96-95

Johnny Rosen
33-1-45-24-96-62

NEA Data Bank
Bâtiment 445
91191 Gif-sur-Yvette Cedex
Tel: 33-1-69-08-49-12
Fax: 33-1-69-41-39-65

MEMBER STATES

<table>
<thead>
<tr>
<th>Australia</th>
<th>France</th>
<th>Japan</th>
<th>Sweden</th>
</tr>
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<tbody>
<tr>
<td>Austria</td>
<td>Germany/FR</td>
<td>Luxembourg</td>
<td>Switzerland</td>
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<tr>
<td>Belgium</td>
<td>Greece</td>
<td>Netherlands</td>
<td>Turkey</td>
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<tr>
<td>Canada</td>
<td>Iceland</td>
<td>Norway</td>
<td>United Kingdom</td>
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</tr>
<tr>
<td>Finland</td>
<td>Italy</td>
<td>Spain</td>
<td></td>
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</tbody>
</table>

FUNCTION

Promote orderly development of peaceful uses of nuclear energy through cooperation among Member States. Initiate, encourage, and coordinate cooperative work in the following areas: reactor and nuclear fuel cycle studies, radiation protection and waste management, nuclear safety, regulatory matters, and nuclear data collection.

INTL.6
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)**
  - **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.


- **Probabilistic System Assessment Code (PSAC) User Group:** Taken over by the NEA from Canada in 1985, it provides a broad forum for discussion and development of probabilistic safety assessment codes and reports to the RWMC on the technical aspects of such codes.

- **Geochemical Modelling and Data Group (GMDG):** Created in 1988 to advise the RWMC on the collection and use of thermodynamic data to be used in performance assessment programs, particularly the Thermochemical Data Base (TDB).

- **Joint Technical Committee of the Stripa Project (Stripa Mine test program)**
  - **Participants:** Canada, Finland, Japan, Sweden, Switzerland, United Kingdom, United States.
  - **Term:** 5-1-80 to 1-1-87 for Phases 1 & 2; 7-1-86 to 12-31-91 for Phase 3.
  - **Scope:** In-situ investigations in fractured hard rock.
- **Liaison Committee for Co-operative Program on Decommissioning**
  Participants: Belgium, Canada, France, Germany, Italy, Japan, Spain, Sweden, United Kingdom, United States.
  **Term:** 1985-1990.
  **Scope:** Exchange of scientific and technical information concerning nuclear installation decommissioning projects.

- **Joint Technical Committee of the Alligator Rivers Analogue Project**
  Participants: Australia, Japan, Sweden, United Kingdom, United States.
  **Term:** 9-1-87 to 9-1-90.
  **Scope:** Research on natural analogues in uranium ore bodies for long-term prediction of radionuclide transport.

- **Committee on Radiation Protection and Public Health (CRPPH)**

  **Exec. Group:** *Coordinated Research and Environmental Surveillance Programme (CRESP)* related to sea disposal of radioactive waste.
  Participants: Belgium, Canada, Denmark, France, FRG, Italy, Japan, Netherlands, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States, IAEA. IMO is an associate member.
  **Term:** 1981-1990.
  **Scope:** Investigations into the oceanographic and biological characteristics of the northeast Atlantic disposal site and related scientific work. Extended to cover land-based discharges as of 1987.
Committee for Tech./Econ. Studies on Nuclear Energy Development and Fuel Cycle (NDC or FCC)

- Assess, review and evaluate technical and economic implications related to the nuclear fuel cycle.

- Participants: Open to NEA members, IEA, IAEA, CEC.

- Term: 10-26-77 - unspecified

- Scope: Present government and scientific communities with competent and reliable information, based on a very wide field of expertise and matured in international debate, in support of policy discussions.
NEA ORGANIZATION

Director General
Kunihiko Uematsu

Dep. Dir. General
Pierre Strohl

--Legal Affairs
P. Reyners

--Safety and Regulation
Klaus Stadie

  --Radiation Protection/Waste Mgmt
  Jean-Pierre Olivier
  Oswaldo Ilari
  Bertrand Ruégger
  Claes Thegerström
  Christer Wiktorsson
  Dan Galson (U.S. Staff)

--Nuclear Safety
G. Donald McPherson

--Committees
  • CRPPH - Radiation Protection/Public Health
  • RWMC - Radioactive Waste Management
  • CSNI - Safety of Nuclear Installations

--Nuclear Development
G. Stevens
  • NDC - Committee for Tech./Econ. Studies
    on Nucl. Ener./Devel. and Fuel Cycle (FCC)

--Science and Information Processing
J. Rosen
  --(Data Bank)

  • NEACRP - Reactor Physics
  • NEANDC - Nuclear Data

INTL.10
INTERNATIONAL

NUCLEAR SOCIETIES

AUSTRALIA

Australian Nuclear Association
P.O. Box 445
Sutherland, N.S.W. 2232
Australia

BELGIUM

Forum Nucléaire Belge (ASBL)
Place du Champ de Mars
5 Bte 9
1050 Bruxelles
Belgium
Tel: 32-2-512-29-80
Fax: 32-2-640-79-40

Belgian Nuclear Society (BNS)
Ravensteinstreet 3
1000 Brussels
Belgium
Tel: 32-2-513-97-00

CANADA

Canadian Nuclear Association (CNA)
111 Elizabeth Street
Toronto, Ontario M5G 1P7
Canada
Tel: 416-977-6152
Fax: 416-979-8356

Canadian Nuclear Society (CNS)
111 Elizabeth Street
Toronto, Ontario M5G 1P7
Canada
Tel: 416-977-7620
Fax: 416-979-8356

CHINA/PR

Chinese Nuclear Society (CNS)
P.O. Box 2125
Beijing 100822
China
Tel: 86-1-2211-4343
Tix: 222315 FACNCCN
DENMARK

Danish Nuclear Society (DKS)
Vester Farimagsgade 31
DK-1606 Copenhagen V
Denmark
Tel: 45-1-15-65-65

EUROPE

European Nuclear Society (ENS)
P.O. Box 5032
3001 Berne
Switzerland
Tel: 41-31-21-61-11
Fax: 41-31-22-92-03

Forum Atomique Europeen (FORATOM)
1 St. Albans St.
London SW1Y 4SL
United Kingdom
Tel: 44-1-930-6888
Fax: 44-1-839-3274

FINLAND

Finnish Nuclear Society (ATS)
Suomen Atomiteknillinen Seura-
Atomtekniska Sällskapet i Finland r.y.
c/o Technical Research Centre of
Finland Nuclear Eng. Laboratory
P.O. Box 112
01601 Vantaa
Finland
Tel: 358-0-508-2426
Fax: 358-0-708-2210

FRANCE

Forum Atomique Français
48 Rue de la Procession
75715 Paris
France
Tel: 33-1-45-67-07-70
Fax: 33-1-40-65-92-29

Section Française de l'ANS
c/o Framatome
Tour Fiat, Cedex 16
92084 Paris la Défense
France
Tel: 33-1-47-96-04-78
Fax:
FRANCE (cont’d)

Société Française d’Energie Nucléaire (SFEN)
48 Rue de la Procession
75015 Paris
France
Tel: 33-1-45-67-07-70
Fax: 33-1-40-65-92-29

World Association of Nuclear Operators (WANO)
35 avenue de Friedland
75008 Paris
France
Tel: 33-1-40-42-30-78
Fax: 33-1-40-42-92-77

GERMANY/FR

Deutsches Atomforum e.V. (DATF)
Heussallee 10
5300 Bonn
Federal Republic of Germany
Tel: 49-228-507-0
Fax: 49-228-507-219

Kerntechnische Gesellschaft e.V. (KTG) (Nuclear Society)
Heussallee 10
5300 Bonn 1
Federal Republic of Germany
Tel: 49-228-507-259
Fax: 8869444 DATF D

GREECE

Hellenic Nuclear Society
NRC/Demokritos
15310 Aghia Paraskevi
Attiki, Greece
Tel: 30-1-651-3111
Fax: 30-1-651-9180

ITALY

ANS Sezione Locale Italiana
c/o Ansaldo S.p.A.
Pianna Carignano 2
16128 Genoa
Italy
Tel: 39-10-28551
Fax: 216596 ansald i

INTL.13
ITALY (cont'd)

Forum Italiano dell-Energia
Nucleare (FIEN)
Via Paisiello 26-28
00198 Rome
Italy
Tel: 39-6-844-2587

Società Nucleare Italiana (SNI)
c/o Facoltà di Ingegneria
Viale Risorgimento 2
40136 Bologna
Italy
Tel: 39-51-644-3401
Fax: 39-51-644-3411

JAPAN

Atomic Energy Society of Japan (AESJ)
1-1-13, Shimbashi
Minato-ku, Tokyo
Japan 105
Tel: 81-3-508-1261
Fax: 81-3-581-6128

Japan Atomic Industrial Forum (JAIF)
6th Floor, Toshin Bldg.
1-1-13, Shimbashi 1-Chome
Minato-ku, Tokyo
Japan 105
Tel: 81-3-508-2411
Fax: 81-3-508-2094

World Association of Nuclear Operators (WANO)
c/o Komae Institute
Central Research Institute of Electric Power Industry
2-11-1 Iwato-Kita
Komae-shi, Tokyo
Japan
Tel: 81-3-480-4809
Tlx: 2422382

KOREA

Korea Atomic Industrial Forum, Inc. (KAIF)
Yeoeuido P.O. Box 1021
Seoul 150-610, Korea
Tel: 82-2-785-2570
Fax: 82-2-785-3975

INTL.14
KOREA (cont'd)

Korean Nuclear Society (KNS)
Cheong Ryang P.O. Box 7
Seoul 130-650, Korea
Tel: 82-2-972-2081

NETHERLANDS

Nederlands Atoomforum
Sceveningse Weg 112
The Hague
Netherlands
Tel: 31-70-5145-81

Netherlands Nuclear Society
c/o N.V. Kema
Utrechtsweg 310
6812 AR Arnhem
Netherlands
Tel: 31-85-5624-91
Fax: 31-85-4582-79

SPAIN

Forum Atomico Español
Boix y Morer, 6
28003 Madrid
Spain
Tel: 34-1-253-63-03
Fax: 43420 FAE E

Sociedad Nuclear Española (SNE)
(Spanish Nuclear Society)
Pinar, 6, bis
28006 Madrid
Spain
Tel: 34-1-431-86-17
Fax: 211634 INGBO

SWEDEN

Swedish Atomic Forum (SAFO)
Box 1704
111 87 Stockholm
Sweden
Tel: 46-8-85-5740
Fax: 46-8-85-3366
INTERNATIONAL

SWEDEN (cont'd)

Föreningen Kärnteknik
(Nuclear Society)
Box 1419
111 84 Stockholm
Sweden Tel: 46-8-613-80-00

SWITZERLAND

Schweizerische Vereinigung für
Atomenergie (SVA)
(Association for Atomic Energy)
Postfach 2613
3001 Bern Tel: 4-31-22-58-82
Switzerland Fax: 4-31-22-92-03

Schweizerische Gesellschaft der
Kernfachleute (Nuclear Society)
c/o Paul Scherrer Institute
5503 Würenlingen Tel: 41-56-99-21-11
Switzerland Fax: 41-56-98-23-27

UNITED KINGDOM

British Nuclear Energy Society
(BNES)
1-7 Great George Street Tel: 44-1-630-0726
London SW1P 3AA Fax:
United Kingdom

British Nuclear Forum (BNF)
1 St. Alban's Street Tel: 44-1-930-6888
London SW1Y 4SL Fax:
United Kingdom

Institution of Nuclear Engineers (INE)
1 Penerley Road Tel: 44-1-698-1500
London SE6 2LQ Fax: 8812093 nutron g
United Kingdom

INTL.16
INTERNATIONAL

UNITED KINGDOM (cont’d)

World Association of Nuclear Operators (WANO)
Chelsea Chambers
262a Fulham Rd.
London SW10 9EL
Tel: 44-1-352-3617
Fax: 44-1-351-9678

UNITED STATES

American Nuclear Society (ANS)
555 North Kensington Avenue
La Grange Park, Illinois 60525
Tel: 312-352-6611
Fax: 312-352-0499

U.S. Council for Energy Awareness
(Atomic Industrial Forum)
7101 Wisconsin Avenue
Bethesda, MD 20814
Tel: 301-654-0910
Fax: 710 824 9602

World Association of Nuclear Operators (WANO)
Suite 1500
1100 Circle 75 Parkway
Atlanta, GA 30339-3064
Tel: 404-953-7602
Fax: 404-953-7549

USSR

The Soviet Nuclear Society
c/o The I. V. Kurchatov Institute
for Atomic Energy
Kurchatov Square
123182 Moscow
USSR

World Association of Nuclear Operators (WANO)
c/o All Union Institute for Nuclear Power Plant Operation
Fergankaya 25
Moscow 109507
Tel: 70-95-377-01-04
Fax: 70-95-376-08-97

INTL.17
INTERNATIONAL

YUGOSLAVIA

The Professional Section of ETAN
for Nuclear Technique and
Technology (PSENTT)
c/o Institut Jozef Stefan
Jamova 39
Y-61000 Ljubljana
Yugoslavia

Tel: 61-214399
Fax: 31-296 yu jostin
ORGANIZATIONS, FACILITIES, AND TECHNICAL TERMS
APPENDIX

ORGANIZATIONS, FACILITIES, AND

TECHNICAL TERMS
<table>
<thead>
<tr>
<th>A</th>
<th>Page</th>
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<tbody>
<tr>
<td>AEA AEA Technology</td>
<td>UK.6</td>
</tr>
<tr>
<td>ADA Acid digestion plant</td>
<td>SZ.4</td>
</tr>
<tr>
<td>AEB Atomic Energy Bureau</td>
<td>JA.8</td>
</tr>
<tr>
<td>AEC Atomic Energy Commission</td>
<td>IN.5</td>
</tr>
<tr>
<td>AECB Atomic Energy Control Board</td>
<td>CA.6</td>
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<tr>
<td>AECL Atomic Energy of Canada Limited</td>
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<tr>
<td>AERB Atomic Energy Regulation Board</td>
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<tr>
<td>AERE Atomic Energy Research Establishment</td>
<td>UK.13</td>
</tr>
<tr>
<td>AESJ Atomic Energy Society of Japan</td>
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<tr>
<td>AGHFC Alpha-Gamma Hot-cell Facility</td>
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</tr>
<tr>
<td>AGIP Nuclear fuel company</td>
<td>IT.3</td>
</tr>
<tr>
<td>AMOS Waste treatment/interim storage project</td>
<td>SW.9</td>
</tr>
<tr>
<td>ANDRA Agence Nationale pour la Gestion des Déchets Radioactifs</td>
<td>FR.7</td>
</tr>
<tr>
<td>ANL Argonne National Laboratory</td>
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<tr>
<td>ANS American Nuclear Society</td>
<td>INTL.16</td>
</tr>
<tr>
<td>ANSTO Australian Nuclear Science and Technology Organization</td>
<td>AS.2</td>
</tr>
<tr>
<td>ANU Australian National University</td>
<td>AS.3</td>
</tr>
<tr>
<td>APM Reprocessing plant</td>
<td>FR.11</td>
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<tr>
<td>ASBL Forum Nucléaire Belge</td>
<td>INTL.10</td>
</tr>
<tr>
<td>ASSE Salt dome repository</td>
<td>GE.15</td>
</tr>
<tr>
<td>ATS Finnish Nuclear Society</td>
<td>INTL.11</td>
</tr>
<tr>
<td>4VH Ateliers de Vitrification de La Hague</td>
<td>FR.6</td>
</tr>
<tr>
<td>4VM Ateliers de Vitrification de Marcoule</td>
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<td>4WRE Atomic Weapons Research Establishment</td>
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<tr>
<td>3AM Bundesanstalt für Materialforschung und -prüfung</td>
<td>GE.8</td>
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<td>3ARC Bhabha Atomic Research Centre</td>
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<td>3EATE Reprocessing facility</td>
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<tr>
<td>3ES Waste materials studies</td>
<td>US.16</td>
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<td>3EW Bundesamt für Energiewirtschaft</td>
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<tr>
<td>3IS Bundesamt für Strahlenschutz</td>
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</tr>
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<td>BGR</td>
<td>Bundesanstalt für Geowissenschaften und Rohstoffe</td>
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<td>British Geological Survey</td>
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<td>BITF</td>
<td>Borehole Instrumentation Test Facility</td>
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<td>Bundesministerium für Forschung und Technologie</td>
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<td>British Nuclear Forum</td>
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<td>British Nuclear Fuels plc</td>
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<td>BRE</td>
<td>Building Research Establishment</td>
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<td>BRGM</td>
<td>Bureau de Recherches Géologiques et Minières</td>
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<td>CAMECO</td>
<td>Mining and energy corporation</td>
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<td>CANMET</td>
<td>Center for Mineral and Energy Technology</td>
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<td>Casaccia</td>
<td>ENEA nucl. research center</td>
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<td>CDTN</td>
<td>Centro de Desenvolvimento de Tecnologia Nuclear de Nuclebras</td>
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<tr>
<td>CEA</td>
<td>Commissariat a l’Énergie Atomique</td>
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<tr>
<td>CEC</td>
<td>Commission of the European Communities</td>
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<td>CECE</td>
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<td>CEDRA</td>
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<td>Nuclear research center</td>
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<td>CeTA</td>
<td>Center for Advanced Technologies</td>
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<td>CHALMERS</td>
<td>Chalmers Technical University</td>
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<td>CRIEPI</td>
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<td>DgD</td>
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DgV Diversification research ................. FR.5
DHI Deutsches Hydrographisches Institut ... GE.12
DISP Directorate for Nuclear Safety and
    Health Protection ................................ IT.2
DKS Danish Nuclear Society .................. INTL.11
DOE Department of Energy .................... US.7
DOE Department of the Environment ....... UK.15
DOI Department of Interior ................... US.4
DOT Department of Transportation .......... US.4
DP DOE-Defense Programs ..................... US.3
DPN Nuclear propulsion research .......... FR.5
Drigg Waste disposal facility .............. UK.14
DWPF Defense Waste Processing Facility ... US.25
DWK Deutsche Gesellschaft für Wiederaufarbeitung von Kernbrennstoffen mbH ... GE.12

EARP Enhanced Actinide Removal Plant ...... UK.14
EBES Belgian utility ........................... BE.8
EBR-II Experimental Breeder Reactor No. 2 US.14
EC European Communities .................... INTL.2
ECN Stichting Energieonderzoek
    Centrum Nederland .......................... NL.3
EdF Electricité de France .................... FR.4
EDF Engineering Demonstration Facility ... JA.19
EEC European Economic Community ........... INTL.1
Electrobas Construction/operation company .. BR.3
EM DOE Environmental Restoration &
    Waste Management ........................ US.3
EMR Energy, Mines and Resources ........... CA.10
ENEA Energia Nucleare e Delle Energie
    Alternative .................................. IT.3
ENEL Ente Nazionale per l'Energia Elettrica IT.6
ENI Ente Nazionale Idrocarburi ............. IT.6
ENRESA Empresa Nacional de Residuos
    Radioactivos .............................. SP.4
ENS European Nuclear Society ............... INTL.11
ENUSA Empresa Nacional del Uranio S.A. ... SP.4
EP-1, 2 Waste treatment facilities......... UK.14
EPA Environmental Protection Agency ....... US.26
EPB Electric Power Bureau .................... KS.4
EPRI Electric Power Research Institute .... US.27
ERS Effluent Recovery System ............... US.18
ESKOM South African company ............... SF.4
ETEC Energy Technology and Engineering
    Center .................................... US.21
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<td>ETF</td>
<td>Engineering Test Facility JA.20</td>
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<td>Eurobitum</td>
<td>Bituminization plant BE.4</td>
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<td>EURODIF</td>
<td>Commercial enrichment company FR.4</td>
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<td>Eurowatt</td>
<td>Solvent treatment hot pilot plant BE.4</td>
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<td>Euro-wetcomb</td>
<td>Acid digestion hot pilot plant BE.4</td>
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<td>Ezeiza</td>
<td>Argentine atomic center AR.3</td>
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<th>Abbreviation</th>
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<td>FBFC</td>
<td>Société Franco-Belge de Fabrication de Combustibles (Belgium and France) FR.15</td>
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<td>FCP</td>
<td>Fuel Cycle Plant US.23</td>
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<td>FEPC</td>
<td>Federation of Electric Power Companies JA.3</td>
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<td>FFTF</td>
<td>Fast Flux Test Facility US.23</td>
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<td>FIEN</td>
<td>Forum Italiano dell-Energia Nucleare INTL.13</td>
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<td>FIPS</td>
<td>Closed HLLW vitrification facility GE.16</td>
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<td>FMEF</td>
<td>Fuels Materials Examination Facility US.23</td>
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<tr>
<td>FLK</td>
<td>Radioactive slagging incinerator BE.5</td>
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<td>F.O.</td>
<td>DOE Field/Operations offices US.4</td>
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<td>FORATOM</td>
<td>Forum Atomique Europeen INTL.11</td>
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<td>FRAGEMA</td>
<td>COGEMA subsidiary FR.4</td>
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<td>FRG</td>
<td>Federal Republic of Germany GE.1</td>
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<td>FUSRAP</td>
<td>Remedial action program US.13</td>
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<th>Abbreviation</th>
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<td>GA</td>
<td>General Atomics US.15</td>
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<tr>
<td>GIRIO</td>
<td>Govt. Indus. Research Inst., Osaka JA.9</td>
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<td>GKAЕ</td>
<td>State Committee on the Utilization of Atomic Energy UR.4</td>
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<td>GMDG</td>
<td>Geochemical Modelling and Data Group INTL.7</td>
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<td>Gesellschaft für Nuklear-Service mbH GE.13</td>
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<tr>
<td>Gorleben</td>
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<td>Gouriqua</td>
<td>Research site SF.3</td>
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<td>GPA</td>
<td>Governmental and Public Affairs US.6</td>
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<td>GRS</td>
<td>Gesellschaft für Reaktorsicherheit mbH GE.14</td>
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<td>GSC</td>
<td>Geological Survey of Canada CA.10</td>
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<tr>
<td>GSF/IT</td>
<td>Gesellschaft für Strahlen- und Umweltforschung mbH/Institut für Tieflagerung GE.14</td>
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<thead>
<tr>
<th>Abbreviation</th>
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<td>HADES</td>
<td>Underground research laboratory BE.6</td>
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<td>HAZWRAP</td>
<td>Hazardous Waste Remedial Action Program US.13</td>
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<tr>
<td>HDB</td>
<td>Waste treatment project GE.17</td>
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<tr>
<td>HERMES</td>
<td>Head-End Research Facility on Mockup Engineering Scale</td>
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<tr>
<td>HFEF</td>
<td>Hot Fuel Examination Facility</td>
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<tr>
<td>HISS</td>
<td>Hydrogen Isotope Separation System</td>
</tr>
<tr>
<td>HITACHI</td>
<td>Hitachi, Ltd</td>
</tr>
<tr>
<td>HMIP</td>
<td>H.M. Inspectorate of Pollution</td>
</tr>
<tr>
<td>HQ</td>
<td>DOE-Headquarters</td>
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<tr>
<td>HSE</td>
<td>Health and Safety Executive</td>
</tr>
<tr>
<td>HTA/HBK</td>
<td>HTGR fuel cycle project</td>
</tr>
<tr>
<td>HTF</td>
<td>Hydrostatic Test Facility</td>
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<p>| IAE            | Institute of Atomic Energy                            | CH.3 |
| IAEA           | International Atomic Energy Agency                    | INTL.3 |
| ICPP           | Idaho Chemical Processing Plant                       | US.24 |
| ICRP           | International Commission on Radiological Protection  | INTL.5 |
| ICT            | Institute of Chemical Technology                      | GE.16 |
| IE             | DOE-Intl. Affairs/Energy Emergencies                  | US.3 |
| IEN            | Instituto de Engenharia Nuclear                       | BR.4 |
| IFEC           | Fuel element fabrication facility                     | IT.5 |
| IFTF           | Immobilized Fuel Test Facility                        | CA.8 |
| IGCAR          | Indira Ghandi Centre for Atomic Research              | IN.6 |
| IHI            | Ishikawajima-Harima Heavy Industries                  | JA.10 |
| IMO            | Intl. Maritime Organization                           | INTL.8 |
| INB            | Industrias Nucleares do Brasil                       | BR.3 |
| INE            | Institute for Nucl. Waste Technology                  | GE.17 |
| INE            | Institution of for Nucl. Engineers                   | INTL.15 |
| INEL           | Idaho National Engineering Laboratory                 | US.16 |
| INER           | Institute of Nuclear Energy Research                  | TW.2 |
| INET           | Institute of Nuclear Energy Technology                | CH.3 |
| INTERCOM       | Belgian utility                                       | BE.8 |
| IOS            | Institute of Oceanographic Sciences                   | UK.16 |
| IPEN           | Instituto de Pesquisas Energeticas e Nucleares        | BR.5 |
| IPSN           | CEA-Institut de Protection et de Sûreté               | FR.8 |
| IRCh           | Institute for Radiochemistry                          | GE.17 |
| IRD            | Instituto de Radioproteção e Dosimetria               | BR.5 |
| IRUS           | Intrusion Resistant Underground Structure             | CA.7 |
| IRW            | Institute of Reactor Materials                        | GE.16 |
| ISAG           | In-Situ Research/Investigations for Geologic Disposal Advisory Group | INTL.7 |
| ISF            | Interim Storage Facility                              | IN.7 |</p>
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<tr>
<th>Code</th>
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<td>Improved Sand Trench</td>
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<td>ITREC</td>
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<td>IVET-1</td>
<td>Cold vitrification pilot plant</td>
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<td>IVET-2</td>
<td>Hot vitrification pilot plant</td>
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<td>HLW vitrification plant</td>
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<td>JAERI</td>
<td>Japan Atomic Energy Research Institute</td>
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<td>JGC Corporation</td>
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<td>Japan Nuclear Fuel Industries Company</td>
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<td>JNFS</td>
<td>Japan Nuclear Fuel Service Co., Ltd.</td>
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<td>JPDR</td>
<td>Japan Power Demonstration Reactor</td>
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<td>JRC</td>
<td>Joint Research Center (CEC)</td>
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<td>WERF</td>
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<td>AFR</td>
<td>Away-From-Reactor</td>
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<td>GCR</td>
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<td>GSP</td>
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