PNL-9450-2
UC-721

INTERNATIONAL NUCLEAR WASTE MANAGEMENT FACT BOOK

C. W. Abrahms
M. D. Patridge
J. E. Widrig

November 1995

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

Pacific Northwest National Laboratory
Richland, Washington 99352

PREFACE

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

The information contained in the *International Nuclear Waste Management Fact Book* has been obtained from many unclassified sources: contacts within the individual countries; nuclear trade journals and newsletters; reports of foreign visits and visitors; CEC, IAEA, and OECD/NEA activities reports; proceedings of conferences and workshops; and from the Internet. The data listed typically do not reflect any single source but represent a consolidation of information.

The organizations and agencies listed in this publication often have a much wider range of activities and many more facilities and staff than are described here. The intent of the Fact Book is to limit the listed information to that pertaining to the nuclear waste management area.

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

International Program Support Office
Pacific Northwest National Laboratory
P.O. Box 999
Richland, WA 99352
Tel: 509-375-6485
Fax: 509-372-4394

CONTENTS

INTRODUCTION

INTRODUCTION

The International Nuclear Waste Management Fact Book has been compiled to provide current data on fuel cycle and waste management facilities, R&D programs, and key personnel in 24 countries, including the U.S.; four multinational agencies; and 20 nuclear societies. This document, which is in its second year of publication, supersedes the previously issued International Nuclear Fuel Cycle Fact Book (PNL-3594), which appeared annually for 12 years. The content has been updated to reflect current information.

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

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

DIRECT DIALING

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

HOLIDAYS

The major holidays have been listed as they generally apply to the entire country. Regional holidays are not included although they might also be considered major in a particular area.

MAPS

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

PASSPORT/VISA

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

TIME

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

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 the DOE facility they wish to visit at least 45 days before the proposed visit. The itinerary should be based on prior arrangement with appropriate DOE or DOE contractor staff.

NATIONAL SUMMARIES

ARGENTINA


BOLIVIA
PARAGUAY
BRAZIL
Belo Horizonte
Sao Paulo
Santos
Rio de Janeiro
Salta
San Miguel de Tucumán
Resistencia
Corrientes
Posadas
Porto Alegre
Santiago del Estero
San Juan
Santa Fe
Córdoba
Concordia
URUGUAY
Mendoza
Rosario
Mercedes
Ezeiza
Buenos Aires
(CNEA)
La Plata
ARGENTINA
Mar del Plata
Bahía Blanca
Arroyito
Pilcaniyeu
Chubut
Comodoro Rivadavia
Río Gallegos
Falkland Islands
Tierra del Fuego
0
400
800 km
0
500 mi
N

ARGENTINA

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year	Jun	24	Flag Day
Apr	13	Holy Thursday	Jul	9	Independence Day
Apr	14	Good Friday	Aug	17	Gen. San Martin
May	1	Labor Day	Oct	12	Columbus Day
May	25	Revolution Anniversary	Dec	8	Immaculate Conception
Jun	10	Sovereignty	Dec	25	Christmas

TIME

Standard Time Washington, D.C. (Buenos Aires) **+ 2 hours**
Standard Time Period: **03/06 - 10/15/95**

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S. Business-related travel to Argentina currently does not require a visa; however, it is recommended to consult a travel agency for up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. $ = 1.00 Peso

per Wall Street Journal, 10/01/95. Because 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: 54-1-772-1041
Fax: 54-1-772-0673

Science Counselor — Kenneth D. Cohen

Population	1994	33.9	million

ENERGY

Electric Power Capacity	1993	14.3	GWe
		7%	**nuclear**
	1996	17.4	GWe
		9%	**nuclear**
	2000	20.1	GWe
		8%	**nuclear**
Electric Power Production	1993	51.2	TWh
		14%	**nuclear**
	1996	62.0	TWh
		17%	**nuclear**
	2000	79.4	TWh
		13%	**nuclear**

NUCLEAR POWER

Policy: Pressurized heavy water reactors (PHWR) with natural uranium and indigenous fuel cycle. Two pressurized vessel reactors, Atucha I (1974) and Atucha II (startup 1996); one CANDU-type reactor, Embalse de Rio Tercero (1984). The government currently owns and operates all nuclear power plants (other options being evaluated); developing nuclear plants and services export capability.

Nuclear Power Capacity	1993	1.0	GWe
	1996	1.5	GWe
	2000	1.6	GWe

INDUSTRIAL FUEL CYCLE

Policy: Develop all phases of the PHWR fuel cycle, gaseous diffusion capability for U enrichment (Pilcaniyeu), and D_2O production. Interim AR and AFR storage of spent fuel.

Waste Management Strategy: Options for reprocessing spent fuel analyzed, including vitrification of HLW and disposal of HLW glass canisters in granite host-rock repository, but no decision made. Disposal of reduced volumes of LLW and short-lived ILW in near-surface engineered facilities. No decision made yet on disposal of long-lived ILW.

Cumulative SF Arisings (HWR)	1993	1,900 t HM
	2000	3,300 t HM

Demonstration/Production Activities

- D_2O production (200 t/yr): D_2O enrichment plant started October 1994.
- Uranium mining and milling (t/yr): 1987, 100; 1993, 130.
- Uranium enrichment (kg/yr): Capacity being redefined.
- Conversion of yellow cake to UO_2 and fabrication of UO_2 fuel (t/yr): 1993, 200; 1995, 180.
- Fuel fabrication: The first of three planned fabrication lines started up in 1982, the second in 1985; they produce 400 elements/yr for Atucha I and 5,580 elements/yr for Embalse; the third will produce Atucha II fuel elements.

Major Milestones

• Dry SF interim storage (Embalse, Córdoba)	1993
• HLW geologic repository (under study)	
• MLW interim storage plant (Ezeiza Atomic Center)	1995
• Atucha II Nuclear Power Plant (commissioning)	1998
• MLW near-surface engineered disposal facility	1998

INTERNATIONAL RELATIONSHIPS

Member of IAEA; has not signed nonproliferation treaty (NPT); Treaty of Tlatelolco has been signed and ratified.

ORGANIZATION

- **CNEA** (Comisión Nacional de Energia Atómica), National Atomic Energy Commission, owns and operates all nuclear facilities.

CNEA (National Atomic Energy Commission)

Comisión Nacional de
Energia Atómica (CNEA)
Avenida del Libertador 8250
1429 Buenos Aires, Argentina
Tel: 54-1-704-1201
Fax: 54-1-701-2436

President — Eduardo F. Santos
Directors — Jaime P. Campa
Tel: 54-1-704-1345
Horacio A. Osuna
Roberto G. Moritan
Guillermo Padin
Agustin Blanco

General Manager — Marta O. De Eppenstein
Tel: 54-1-1470-1870
Fax: 54-1-704-1186

Technology Manager — Santiago Harriague
Tel: 545-1-704-1143

Manager, Centro Atomico Bariloche — Francisco Lovey
Tel: 54-944-61002
Fax: 54-944-61006

Manager, Centro Atomico Constituyentes — Miguel Audero
Tel: 54-1-754-7260 or 755-3137
Fax: 54-1-754-7371

Manager, Centro Atomico Ezeiza — Angel Mehlich
Tel: 54-1-379-8284
Fax: 54-1-379-8570

(contd next page)

CNEA (National Atomic Energy Commission) (contd)

Manager, Cooperation and Technology Transfer	Horacio A. Osuna Tel: 54-1-704-1045 Fax: 54-1-704-1161
Director de Administracion	Ricardo Deza Tel: 54-1-704-1203 Fax: 54-1-704-1159
Deputy, Radioisotopos y Radiaciones	Roberto Marques Tel: 54-1-704-1418/1818 Fax: 54-1-704-1153
Deputy, de Ciclo de Combustible	Jose E. Gregui Tel: 54-1-704-1217 Fax: 54-1-704-1165
Manager, Complejo Minero Fabril Cordoba	Eduardo Perez Tel: 54-51-703450/639679 Fax: 54-51-703679
Manager, Minero Fabril San Rafael	Carlos Martin Tel: 54-627-30833/30087 Fax: 54-627-30833/30087
Manager, Minero Fabril Malargue	Gualberto A. Cadena Tel: 54-627-71712 Fax: 54-627-71159
Manager, Public Relations	Luis J. Colangelo Tel: 54-1-704-1209 or -1011, or -1230 Fax: 54-1-704-1154

EMPRESAS ASOCIADAS

President, CONUAR S.A.	Hugo Erramuspe Tel: 54-1-704-1308 Fax: 54-1-704-1169
President, FAESA	Hugo Erramuspe Tel: 54-1-704-1308 Fax: 54-1-704-1169

(contd next page)

EMPRESAS ASOCIADAS (contd)

President, ENSI — Anibal Nunez
Tel: 54-1-704-1319

President, Nuclear Mendoza S.E. — Guillermo Ariza
Tel: 54-61-224675/223099
Fax: 54-61-350313

Ente Nacional Regulador Nuclear (ENREN)

Avda. Libertador 8250 1' PISO
1429 Capital Federal
Buenos, Aires, Argentina

President — Dan Beninson
Tel: 54-1-704-1218
Fax: 54-1-704-1177

General Manager — Elias Palacios
Tel: 54-1-704-1348
Fax: 54-1-704-1151

INVAP E. E.

F. P. Moreno 1089
C.C. 961
8400 San Carlos de Bariloche
PCIA. DE RIO NEGRO
Tel: 54-944-22121
Fax: 54-944-26451

President — Guillermo Padin

Nucleoelectrica Argentina B.A.

Arribenos 3619
1429 Capital Federal
Buenos Aires, Argentina
Tel: 54-1-701-0407
Fax: 54-1-701-0407

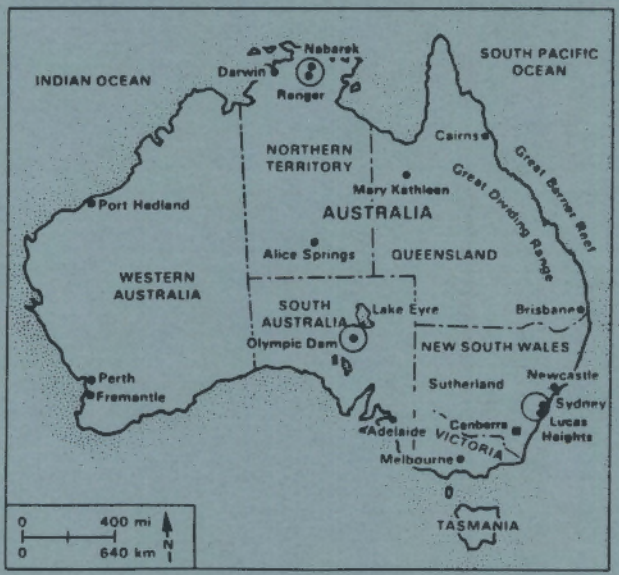
President — Eduardo Blanco

(contd next page)

Nucleoelectrica Argentina B.A. (contd)

General Manager	Oscar J. Guihillalt Tel: 54-1-701-6389 Fax: 54-1-701-0407
Manager, Central Nuclear Atucha I (NFF)	Miguel A. Joseph Tel: 54-487-2461 a1 76 Fax: 54-953-0370
Manager, Central Nuclear Embalse (NPP)	Eduardo Diaz Tel: 54-571-22000/22434 Fax: 54-51-244577

AUSTRALIA


INDIAN OCEAN
SOUTH PACIFIC OCEAN
Nabarek
Darwin
Ranger
NORTHERN TERRITORY
Cairns
Great Barrier Reef
Great Dividing Range
Mary Kathleen
AUSTRALIA
Port Hedland
Alice Springs
QUEENSLAND
WESTERN AUSTRALIA
SOUTH AUSTRALIA
Lake Eyre
Brisbane
Olympic Dam
NEW SOUTH WALES
Sutherland
Newcastle
Perth
Fremantle
Sydney
Lucas Heights
Canberra
Adelaide
VICTORIA
Melbourne
TASMANIA
0 400 mi
0 640 km
N

AUSTRALIA

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1-2	New Year	Apr	25	ANZAC Day
Jan	26	Australia Day	Jun	12	Queen's Birthday
Apr	14	Good Friday	Oct	2	Labor Day
Apr	17	Easter Monday	Dec	25	Christmas
			Dec	26	Boxing Day

TIME

Standard Time Washington, D.C. (New South Wales) **+ 15 hours**
Standard Time Period: **03/26 - 10/28/95**

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S. $ = 1.26 Australian Dollar
per Wall Street Journal, 10/1/95. Since 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

United States Consulate General
Level 59, MLC Centre
19-29 Market Place
Sydney NSW 2000
Australia

Tel: 61-2-373-9200
Fax: 61-2-221-0573

Scientific Attaché — Zachary Z. Teich

Population	1994	18	million

ENERGY

Electric Power Capacity	1993	34.6	GWe
	1995	36.3	GWe
	2000	37.9	GWe
Electric Power Production	1993/94	156.6	TWh
		80.9%	coal
		10.5%	hydro
		8.2%	gas
		0.4%	oil

NUCLEAR POWER

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

INTERNATIONAL RELATIONSHIPS

Member of IAEA and OECD/NEA; cooperative agreements for radioactive waste management R&D (including development of the SYNROC process) with Japan, Italy, U.K., France, China, and Russia.

Bilateral nuclear safeguards agreements (controlled use of Australian-derived uranium) with Japan, Republic of Korea, Philippines, U.S., Canada, U.K., France, Switzerland, Sweden, Finland, Egypt, Russian Federation, Euratom (EU), Mexico, Singapore.

ORGANIZATION

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

ANSTO - LUCAS HEIGHTS

Australian Nuclear Science
and Technology Organisation
New Illawarra Rd, Lucas Heights
Private Mail Bag 1
Menai NSW 2234 Tel: 61-2-717-3111
Australia Fax: 61-2-543-5097

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

Executive Director	Helen Garnett (A)
Chairman	C. Ralph Ward-Ambler
General Manager, Scientific	Helen Garnett
Environmental Science	Wally Zuk
	Fax: 61-2-543-9260
Environmental Chemistry	Richard Lowson
Environmental Physics	Ian Ritchie
Chemical Waste Engineering	Des Levins
Economic Impacts	Peter Airey
Advanced Materials	Adam Jostsons
	Tel: 61-2-717-3265
	Fax: 61-2-543-7179
Materials Assessment	Robert Harrison
Waste Conditioning	E. R. Vance
Operations	Alan Ridal
Materials Science	C. J. Ball
Engineering	Don. J. Mercer
Nuclear Technology	George Malosh
	Fax: 61-2-543-9263
Nuclear Services	Patrick Bull

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

(contd next page)

ANSTO - LUCAS HEIGHTS (contd)

Facilities

- **Non-radioactive SYNROC Demonstration Plant**
  Mission: Engineering-scale tests of SYNROC process to provide data for a conceptual radioactive SYNROC plant design.

  Design Basis: 10 kg/h SYNROC; all operations compatible with remote handling; highly instrumented and partly automated.
  History: Startup, 5/88, upgraded in 1990.

- **SYNROC Glove Box Line**
  Mission: Produce SYNROC containing actinides/^{99}Tc.
  Process Scale: Hundreds of grams/batch.
  History: Startup, 1984. Refurbished, 1991.

- **Hot-Cell Processing Line for SYNROC**
  Mission: Produce SYNROC containing beta/gamma-active fission products.
  Process Scale: Hundreds of grams/batch.
  History: Startup, 1984.

ANU

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

Tel: 61-6-249-4228
Fax: 61-6-249-5989

Director Sue Kesson

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

BELARUS


LATVIA
RUSSIA
Vitebsk
Smolensky
LITHUANIA
Vilnius
Minsk
Mogilev
BELARUS
Gomel
Brest
Chernobyl
Kiev
UKRAINE
L'vov
POLAND
N
0
160 km
100 Mi

BELARUS

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year	May	1	Labor Day
Jan	7	Christmas (Orthodox)	May	9	Victory Day
Mar	8	Women's Day	Jul	27	Independence Day
Apr	18	Radunica	Nov	2	Memorial Day
			Dec	25	Christmas

TIME

Standard Time Washington, D.C. **+ 8 hours**
Daylight Savings Time Period: **03/26 - 09/23/95**

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S. In addition, a visa is currently required for a visit to Belarus. A visa is available, with certain prerequisites, at the Minsk airport upon entry into the country; however, it is advisable to obtain the visa prior to departure from the U.S. It is recommended to consult a travel agency for up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

Local currency, the Belarus ruble (note of National Bank of Belarus), is only available upon entry into Belarus. Exchange rates cannot be quoted because of continuing fluctuations. Payment in U.S. currency is apparently acceptable in many places. It is strongly recommended to consult with the U.S. embassy for up-to-date information.

DIRECT DIALING

Individual numbers for direct dial to Belarus are complete as listed, after dialing international access code: **011**. Country code is **7**; listed local numbers include city code.

U.S. EMBASSY - MINSK

American Embassy
ul. Starovilenskaya 46
Minsk, Belarus

Tel: 375-017-234-7761
375-017-234-6537
375-017-231-5000
Fax: 375-017-234-7853

Economic Section

George Krol

Population	1994	10.5	million

ENERGY

Electric Power Capacity	1992	7.0	GWe
	2000	6.2-10.9	GWe
		0%	**nuclear**
	2005	6.4-12.1	GWe
		>8%	**nuclear**
Electric Power Production	1992	38.7	TWh
		55%	oil
		40.6%	gas
		0.1%	hydro/geothermal
		<2.5%	coal/peat
		<1.8%	solids
		0%	**nuclear**
	2005	60%	TWh
		5%	**nuclear**

NUCLEAR POWER

Although Belarus currently produces no nuclear power, approximately 25% of its total electricity consumption is provided by nuclear power plants at Ignalina in Lithuania and Smolensk in Russia. Construction of a nuclear power plant at Minsk, with projected capacity of 2,000 MWe and planned additional capacity of 6,000 MWe, was halted in 1986 due to the events at Chernobyl. The current government states that nuclear power is a necessity in the future of Belarus.

Nuclear Power Capacity	2005	1.0	GWe
Reactor Mix	2005	PWR	1 (2005)

INDUSTRIAL FUEL CYCLE

Policy: Because Belarus has no uranium natural resources, no uranium enrichment is foreseen, nor is fuel reprocessing.

Waste Management Strategy: A waste management concept and strategy for disposal of waste from the planned first Belarus NPP is now being developed. LLW generated during operation and from decommissioning of a research LWR (IPEP) was managed in accordance with known regulations in the former Soviet Union. This waste was stored in an engineered structure in an underground facility near Sosny that is also used for spent radioactive sources. Spent fuel from decommissioning the research LWR was sent to Russia for reprocessing.

INTERNATIONAL RELATIONSHIPS

Member of IAEA; Belarus has signed (in 1992) and ratified (in 1993) the NPT.

ORGANIZATION

Government Responsibilities - Nuclear Fuel Cycle/Waste Management

- **Ministry of Power Engineering** - controls all electric power production and its industrial consumption; operates electric power network; provides and conducts the National Power Development Program.

- **Atompromnadzor** (Committee on Supervision of Industrial and Nuclear Safety) - regulations, control of radiation-emitting facilities, licensing of nuclear installations, inspections.

- **Goscomchernobyl** (Chernobyl Committee) - responsible for National Chernobyl Program.

INDUSTRIAL/UNIVERSITY RESPONSIBILITIES

- **BelNIPI Energoprom** (Belarus Research and Design Institute of Power Industry) - technical policy in the field of electric power/energy resources.

- **GSP POLESJE** (State Specialized Enterprise POLESJE/Chernobyl Committee) - decontamination of contaminated zone in southern Belarus.

- **IPEP** (Institute of Power Engineering Problems/Academy of Sciences) - waste management R&D and reactor physics/engineering.

- **IREP** (Institute of Radio-Ecological Problems/Academy of Sciences) - research related to radionuclide migration in biosphere, nuclear medicine, radiochemistry.

- **DD&PM** (Design Department and Pilot Manufacture/Academy of Sciences) - design/production of pilot installations related to nuclear power plant, engineering, and waste management technologies.

BEL NIPI ENERGOPROM

Belarus Research and Design
Institute of Power
Industry
ul. Romanovskaja Sloboda 5A — Tel: 375-017-226-5277
220048 Minsk, Belarus — Fax: 375-017-226-5317

Director — Leonid Y. Kulebiakin

Function: Development of technical policy in the field of electric power/energy resources and of electric power network installations.

ATOMPROMNADZOR

Committee on Supervision
of Industrial/Nuclear Safety
ul. Chkalova 6 — Tel: 375-017-224-5119
220039 Minsk, Belarus — Fax: 375-017-224-3700

Chairman — Vladimir I. Iatzevich
Nuc./Rad. Safety Inspection — Peter V. Bulyga

Function: Responsible for regulations, control, and licensing of nuclear installations and radiation-emitting facilities.

GOSCOMCHERNOBYL

State Chernobyl Committee
ul. Lenin 14
220030 Minsk, Belarus

Tel: 375-017-227-4987
Fax: 375-017-229-3439

Chairman	Ivan A. Kenik
Dep. Chairman, WM/Science/ R&D, Internatl. Relations	Igor V. Rolevich 375-017-227-0770
Board on Protective Measures/D&D/WM	Gennady V. Antzypov 375-017-227-0762

Function: Regulate, control, and finance the National Chernobyl Program; license decontamination/waste management activities for area affected by the Chernobyl fallout.

GSP POLESJE

State Specialized Enterprise "POLESJE"
ul. Karpovich 11
246017 Gomel, Belarus

Tel: 375-017-253-1584
Fax: 375-017-253-7486

Function: Decontamination of affected zone in southern Belarus; treatment and conditioning of waste generated as a result of decontamination.

IPEP

Institute of Power Engineering Problems
Belarus Academy of Sciences
Sosny
220109 Minsk, Belarus

Tel: 375-017-226-0698
Fax: 375-017-226-7055

Director	A. A. Mikhalevich
Material Properties/ WM Technologies	Alexandre J. Grebenkov 375-017-246-7542

(contd next page)

IPEP (contd)

Nuclear Reactor Physics — Igor A. Savushkin, 375-017-246-7434

Function: Research reactor operation and engineering; isotope application/production; waste management R&D, LLW/ILW immobilization, liquid LLW treatment, thermal/chemical processing of radioactive wood waste.

Facilities

- **Pilot Plant for LLW/ILW Immobilization**
- **Pilot Installations for Liquid LLW Treatment/Conditioning**
- **Pilot Gas Generator with off-gas treatment system for radioactive wood waste conditioning**

IREP

Institute of Radio-Ecological Problems
Sosny
220109 Minsk, Belarus
Tel: 375-017-246-7253
Fax: 375-017-246-7615

Director — George A. Sharovarov
Radiochemistry — Yuri P. Davydov
375-017-246-7215

Function: R&D on radionuclide migration in biosphere, decontamination, conditioning of liquid LLW (generated after remediation of contaminated site), nuclear medicine, radiochemistry.

DD & PM

Design Department with
Pilot Manufacture
Sosny
220109 Minsk, Belarus

Tel: 375-017-246-7538
Fax: 375-017-246-7403

Director — Vladimir A. Kosterov

Function: Design/production of pilot installations related to nuclear power plant/engineering/WM technologies

SOSNY (Academic Research Association)

ANTK Sosny
Belarus Academy of Sciences
Sosny
220109 Minsk, Belarus

Tel: 375-017-246-7512
Fax: 375-017-246-7712

Director General — Sergey E. Chigrinov

Location: 24 km southwest of Minsk, 2 km from Sosny settlement.

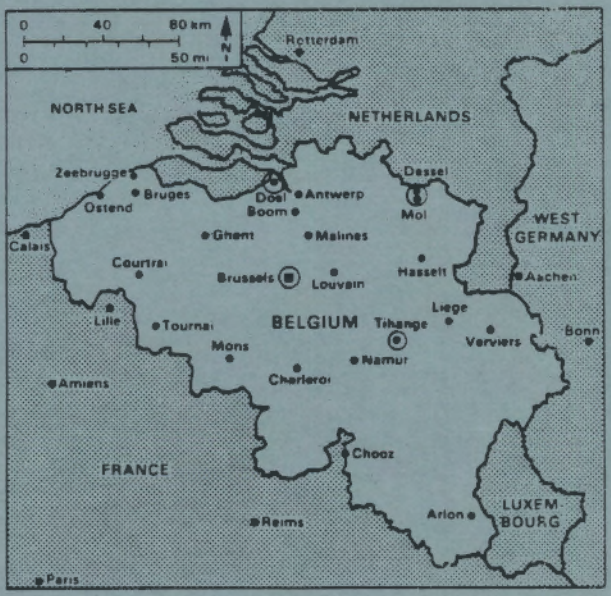
Function: Academic research association, includes IPEP, IREP, IRPCP, DD&PM. Former Nuclear Power Engineering Institute of the BSSR Academy of Sciences (1965-1992).

Specialized Enterprise "Sosny" — Tel: 375-017-246-7539

Director — Victor B. Ivanov

Function: Spent nuclear materials storage in engineered shallow-ground facility.

BELGIUM


0 40 80 km
0 50 mi
N
Rotterdam
NORTH SEA
NETHERLANDS
Zeebrugge
Bruges
Ostend
Doel
Antwerp
Boom
Dessel
Mol
WEST GERMANY
Calais
Ghent
Malines
Courtrai
Brussels
Louvain
Hasselt
Aachen
Lille
Tournai
BELGIUM
Tihange
Liege
Verviers
Bonn
Mons
Namur
Charleroi
Amiens
Chooz
FRANCE
Arlon
LUXEMBOURG
Reims
Paris

BELGIUM

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year	Jul	21	National Day
Apr	17	Easter	Aug	15	Assumption
May	1	Labor Day	Nov	1	All Saints
May	12	Ascension	Nov	11	Armistice
May	23	Pentecost	Dec	25	Christmas

TIME

Standard Time Washington, D.C. **+ 6 hours**
Daylight Savings Time Period: **03/26 - 09/23/95**

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S. $ = 29.45 Franc
per Wall Street Journal, 10/01/95. Because 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

Economics Section

Jerry Breese

Population	1994	10	million
ENERGY			
Electric Power Capacity	1993	14.2	GWe
		39%	**nuclear**
	1995	14.7	GWe
		38%	**nuclear**
	2000	16.1	GWe
		35%	**nuclear**
Electric Power Production	1993	71.4	TWh
		59%	**nuclear**
		26%	coal
		10%	gas
		2%	oil
		<1%	hydro
	1995	**52%**	**nuclear**
	2000	**56%**	**nuclear**

NUCLEAR POWER

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

Nuclear Power Capacity	1993	5.6	GWe
	2000	5.6	GWe
Reactor Mix	1994	PWR	7 (1975-85)

INDUSTRIAL FUEL CYCLE

Policy: Well-rounded capability; uranium enrichment (share in Eurodif); MOX and UO_2 fuel fabrication; purchase of foreign reprocessing services; decision made to dismantle former Eurochemic reprocessing plant.

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

Cumulative SF Arisings (LWR)	1990	1,290 t U
	2000	3,000 t U

Major Milestones

- Selection/characterization of site for LLW disposal facility 1990-97
- Storage facility for waste from Belgian fuel reprocessed abroad 1994
- Safety assessment/feasibility report for demonstration of HLW disposal operations in proposed clay repository 1995
- Construction start of HLW repository 2025
- Disposal start of HLW 2030

INTERNATIONAL RELATIONSHIPS

DOE/SCK Agreement in the Field of Radioactive Waste Management
Term: 01-19-81 to 01-19-94.
Scope: Final disposal in geologic formations; retrievable storage; waste processing; environmental effects; emphasis on technology information exchange.

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

ORGANIZATION

MINISTRY OF ECONOMIC AFFAIRS **PRIVATE INTERESTS**

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

- ONDRAF/NIRAS - BELGOPROCESS

----------> SYNATOM----------> 100%

BELGONUCLEAIRE

Belgonucleaire S.A.
Avenue Ariane 2-4 Tel: 32-2-774-0511
1200 Brussels, Belgium Fax: 32-2-774-0547

General Director Georges Cornet

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

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

MOX Plant
Europalaan 20 Tel: 32-14-33-0211
2480 Dessel, Belgium Fax: 32-14-31-7046

Manager Jean Van Vliet

Function: Produce MOX fuels (35 t/yr for LWR or 10 t/yr for FBR).

BELGOPROCESS

Belgoprocess
Gravenstraat 73 Tel: 32-14-33-4111
2480 Dessel, Belgium Fax: 32-14-31-3012

[Brussels National Airport (Zaventem): then by rental car or train (1.5 hr) to Mol.]

Managing Director	Robert Vandenplas
General Manager	Jef Claes
Deputy General Manager	Etienne Tranwaert
Operations	Paul Luycx
Decommissioning	Lucien Teunckens
Safety	Jean Paul Deworm

Activities: Maintenance/dismantling of ex-Eurochemic reprocessing facilities and obsolete waste treatment facilities formerly belonging to

(contd next page)

BELGOPROCESS (contd)

CEN/SCK; treatment/conditioning of all categories of low-, medium-, and high-level waste; from 1986 to 1991 joint operation of Pamela vitrification plant with WAK, now being kept in standby for potential future vitrification of HLLW from WAK pilot reprocessing plant at Karlsruhe, Germany.

Owner: ONDRAF/NIRAS

Facilities

- **Eurobitum** (bituminization plant)
  Mission: Immobilize ILW.
  Design Basis: Batch chemical pretreatment; screw extruder-evaporator (continuous); capacity, 650 m^3/yr ILW.
  History: Startup, 1978; on-line time, 87% through June 1983. Plant now operated as needed.

- **PAMELA HLLW Vitrification Plant** [built by FRG (see under WAK in Germany) and operated by WAK/Belgoprocess team]. In standby for future vitrification of HLLW from WAK pilot reprocessing plant at Karlsruhe. Presently used for treatment and conditioning of HLSW.

- **LLW Treatment Facilities** (formerly of CEN/SCK)

  Beta/Gamma Waste Incinerator: capacity of 100 kg/hr solid waste and 40 L/hr of liquids. Combustion temperature of 900°C. Overall mass reduction factor is 20; combustion efficiency >99.9%; >800 t of waste throughput since early 1960s. Planned shutdown, 1996.

  Water Treatment Facility: capacity of >200,000 m^3/yr; purification by flocculation; discharge of purified water to the river; conditioning of sludges into bitumen.

- **Low-Level Solid Waste Treatment Facility**
  Active startup June 1995; new integrated facility, including reception of waste and buffer storage, size reduction unit; supercompaction capacity of 220 drums per hour, incineration at 900°C, incineration capacity 100 kg/hr solid waste and 40 L/hr of liquids, supercompaction of ashes and cementation of all treated LLW in 400-L drums.

FBFC (Fuel Fabrication Company)

FBFC International
Europalaan 12
2480 Dessel, Belgium

Tel: 32-14-33-1211
Fax: 32-14-31-5845

Managing Director — Henri Potdevin
Plant Manager — Patrick Van Denhove

Function: Fabrication of fuel assemblies for LWR (capacity: 300 t/yr, uranium and MOX fuel). Belgian subsidiary of French-owned Société Franco-Belge de Fabrication de Combustibles.

MINISTRY OF ECONOMIC AFFAIRS

Ministry of Economic Affairs
Administration of Energy
E. Jacqumainluan 154
North Gate 3
1210 Brussels, Belgium

Tel: 32-2-206-4111
Fax: 32-2-206-5710

MINISTRY OF PUBLIC HEALTH AND ENVIRONMENT

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

Tel: 32-2-210-4966
Fax: 32-2-210-4967

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

Organisme National des Déchets
Radioactifs et des Matières
Fissiles (ONDRAF/NIRAS)
Place Madou 1, B.P. 24 Tel: 32-2-212-1011
1030 Brussels, Belgium Fax: 32-2-218-5165

Chair, Board of Directors	J. P. Poncelet
Chair, Perm. Tech. Committee	F. Deconinck
General Manager	F. Decamps

Owner: Government.

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

The organization is governed by a Board of Directors composed of a President, Vice-President, and board members representing various national ministries and local government executives. The Board is advised by a permanent technical committee.

SCK/CEN (Nuclear Energy Research Center)

Studiecentrum voor Kernenergie
Centre d'Étude de l'Énergie
Nucléaire
Laboratories
Boeretang 200 Tel: 32-14-33-2111
2400 Mol, Belgium Fax: 32-14-31-5021

Chairman of the Board	J. M. Strydio
General Manager	Paul Goovderts
Waste/Disposal	Bernard Nerdael
Decommissioning	Guy Collard

(contd next page)

SCK/CEN (Nuclear Energy Research Center)

Owner: Government, Ministry of Economic Affairs.

Waste Management R&D: Geologic waste isolation in clay formations, waste treatment (decontamination and recycling of boric acid, removal of plutonium from waste generated by fuel fabrication, etc.), decommissioning (decontamination, dismantling, restoration) of nuclear facilities.

Facilities

- **BR3 Decommissioning Project**
  Mission: Optimization of the decommissioning of PWRs; radiological, technical, and financial management of decommissioning, applied on an actual PWR; all components of a power plant and all techniques to be used in decommissioning.
  Process: Internals are being dismantled; comparison of immediate and delayed decommissioning; optimum application.

- **HADES Underground Research Laboratory**
  Mission: In situ investigation to demonstrate the feasibility, construction, safety, and acceptability of disposal of ILW, TRU waste, and HLW in a deep clay formation.
  Description: Access shaft to 230-m level, 2.65 m useful diameter; laboratory gallery, 3.5 m useful dia. by 30 m length; cast iron liner. Demo/test gallery: 3.5 m dia., concrete-lined, 65 m length for large-scale integrated tests.
  Test Program: Migration of radionuclides and gas, near-field studies, thermohydraulic behavior, hydrogeochemistry of Boom clay and surrounding water-bearing formation, in situ tests on waste package components, characterization and compatibility studies of conditioned HLW, performance studies, including shallow-land burial of LLW.
  History: Laboratory operational, late 1984.

SYNATOM

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

Tel: 32-2-505-0711
Fax: 32-2-505-0790

Chairman, Board of Directors	F. Aerts
Managing Director	J. Laurent
General Manager	Pierre Goldschmidt
Fuel Reprocessing Service	Jean Danguy

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

Owners: Belgian Utilities (100%).

BRAZIL


Bogota
VENEZUELA
GUYANA
SURINAM
FR. GUIANA
COLOMBIA
Boa Vista
Macapá
ATLANTIC OCEAN
Belém
Manaus
São Luís
Fortaleza
Teresina
Natal
Cruzeiro do Sul
Porto Velho
Rio Branco
BRAZIL
Recife
Maceió
Guajará-Mirim
PERU
Lima
Mato Grosso
Salvador
BOLIVIA
Cuiabá
Brasília
Las Paz
Corumbá
Belo Horizonte
Campo Grande
Vitória
PACIFIC OCEAN
PARAGUAY
Poços de Caldas
Campos
São Paulo
Rio de Janeiro
Santos
CHILE
ARGENTINA
Curitiba
Corrientes
Pôrto Alegre
Santiago del Estero
Uruguaiana
Santa Fe
URUGUAY
N
0 400 800 km
0 250 500 mi

BRAZIL

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year	Sep	7	Independence
Feb	27, 28	Carnival	Oct	12	N.S. Aparecida
Apr	14	Good Friday	Nov	2	All Souls
Apr	21	Tirdentes	Nov	15	Republic Proclamation
Jun	15	Corpus Christi	Dec	25	Christmas

TIME

Standard Time Washington, D.C. (Brasilia) **+ 2 hours**
Standard Time Period: **03/05 - 10/16/95**

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S. $ = 0.95 Real (R $)

per Wall Street Journal, 10/01/95. Because rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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

U.S. EMBASSY - BRASILIA

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

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

Science Counselor — Roy C. Simpkins

Population	1994	158.7	million

ENERGY

Electric Power Capacity	1993	63	GWe
		1%	**nuclear**
	1995	78	GWe
		1%	**nuclear**
	2000	98	GWe
		1%	**nuclear**
Electric Power Production	1993	220	TWh
		84%	hydro/thermal
		11%	coal/gas
		4%	oil
		1%	**nuclear**
	1995	**1%**	**nuclear**
	2000	**1%**	**nuclear**

NUCLEAR POWER

Policy: Complete nuclear industry with closed fuel cycle, based upon technology transfer from FRG and other countries.

Nuclear Power Capacity	1993	0.6	GWe
	2000	1.9	GWe
Reactor Mix	1994	PWR	1 (1985)
			2 (1998/04)

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

INDUSTRIAL FUEL CYCLE

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

Waste Management Strategy: Not yet defined for HLW; near-surface disposal for LLW, including the Cs-137 waste from the Goiania accident (1987). A final decision on thorium concentration has not yet been made, thorium is provisionally started in sheds. Isothorium CIPC will be placed in the local dam. A repository is planned for radioactive waste from Angra-1 and medical wastes; reprocessing of szrinte fuel has not been ruled out; it is currently started in pools.

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

Demonstration/Production Activities

- Uranium mining and milling: 300 t U_3O_8/yr, in operation.
- U_3O_8 to UF_6 conversion: (1984) 90 t U/yr; planned expansion delayed indefinitely.
- Uranium enrichment (gas centrifuge): small experimental demonstration (1987).
- Uranium enrichment (Becker nozzle process) at Resende:
  - First Cascade, 24 stages; 6 k SWU/yr (1985); interrupted in 1993.
- Fuel fabrication: 100 t U/yr (1982); design capacity, 400 tU/yr.
- Spent fuel reprocessing: 10 kg/d pilot plant (1986 startup originally scheduled, currently delayed indefinitely).

INTERNATIONAL RELATIONSHIPS

Joint Natural Analogue Studies - Pocos de Caldas Project
Joint study of migration of radionuclides from uranium ore deposits in Brazil by Sweden, Switzerland, U.K., and U.S.

Member of IAEA (has not signed NPT); dependence on nuclear technology transfer from other nations, principally from FRG. Quadripartite agreement signed in 1994 with Argentina, ABACC, and IAEA to implement full-scope safeguards.

ORGANIZATION

- **Federal Republic** -- President (Executive), Bicameral National Congress (Legislative), and Supreme Federal Tribunal (Judiciary).

  - **SAE** (Strategic Business Secretariat) - subordinated to the President, responsible for the planning, execution, and control of nuclear power program.

  - **Eletrobrás** (Centrais Eletricas Brasileiras) - planning/supervision of power plant construction and operation of transmission/distribution system. Established in 1961 to coordinate activities of state, municipal, and private utilities. Operates through regional subsidiaries, i.e., FURNAS. Also responsible for appropriate R&D.

- **ABACC** (Argentina/Brazil Agency for Accounting/Control of Nuclear Materials) - bilateral safeguards agency, established in 1994.

- **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.

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: 55-31-443-4744

Superintendent Fernando Lomeiras

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 22294-900 Tel: 55-21-546-2232
Rio de Janeiro, RJ, Brazil Fax: 55-21-546-2379

President	Jose Manro Esteves Dos Santos
Director, Nuclear Safety	Ayrton José Caubét da Silva
Head, Waste Disposal	Ana Maria Xavier
Manager, Waste Management	Paulo Heilbron

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

IEN (Nuclear Engineering Institute)

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

Superintendent Luiz Arrieta

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

(contd next page)

IEN (Nuclear Engineering Institute) (contd)

- 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, Tel: 55-11-211-6011
São Paulo, Brazil:

Superintendent Claudio Rodrigues

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

Facilities

- U_3O_8-UF_6 conversion plant at Iperó (90 t U/yr)
- SF reprocessing laboratory
- Small experimental gas centrifuge (uranium enrichment)
- Low-power PWR reactor
- 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 Tel: 55-21-442-9777
Rio de Janeiro, RJ, Brazil Fax: 55-21-442-2950

Director Eliana Amaral

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

Facilities

- Brazilian Secondary Standards Dosimetry Laboratory

CANADA


0
500 mi
0
800 km
N
YUKON
NORTHWEST TERRITORIES
CANADA
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
Hudson Bay
QUEBEC
NEW BRUNSWICK
Edmonton
Saskatoon
Calgary
Vancouver
Pinawa
Winnipeg
ONTARIO
Gentilly 2
Quebec
Montreal
Lepreau
Elliot Lake
Ottawa
Tiverton
Burlington
Chalk River
Pickering
Toronto
UNITED STATES

CANADA

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year	Sep	4	Labor Day
Apr	14	Good Friday	Oct	9	Thanksgiving
May	22	Victoria Day	Nov	11	Remembrance Day
Jul	1	Canada Day	Dec	25	Christmas
Aug	1	Civic Day	Dec	26	Boxing Day

TIME

Time zones correspond to those in the United States.
Daylight Savings Time period: **04/24 - 10/30/95**

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. $ = 1.33 Canadian Dollar
per Wall Street Journal, 10/01/95. Because rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct dial to Canada are complete as listed. Dial long distance access code: **1**, followed by three-digit area code plus seven-digit local number.

U.S. EMBASSY - OTTAWA

American Embassy
100 Wellington Street
Ottawa, ON
K1P 5T1 Canada

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

Science Counselor — Terry Jones

Population	1994	29.4	million

ENERGY

Electric Power Capacity	1993	108.6	GWe
		14%	**nuclear**
	1995	112.5	GWe
		14%	**nuclear**
	2000	114.5	GWe
		14%	**nuclear**
Electric Power Production	1993	501.5	TWh
		62%	hydro/geoth.
		17%	coal
		17%	**nuclear**
		3%	oil
		2%	gas
		1%	other
	1995	**17%**	**nuclear**
	2000	**20%**	**nuclear**

NUCLEAR POWER

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

Nuclear Power Capacity	1993	15.5	GWe
	1995	15.5	GWe
	2000	15.5	GWe
Reactor Mix	1994	PHWR	22 (1971-93)

INDUSTRIAL FUEL CYCLE

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

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

Cumulative Used Fuel (PHWR)	1991	1,060,478	bundles
	2000	20,520	t

Major Milestone

- Public hearings by review panel on Nuclear Fuel Waste Management Disposal Concept (AECL-prepared EIS) 1995/1996

INTERNATIONAL RELATIONSHIPS

DOE/AECL Agreement for Cooperation in Radioactive Waste Management

Term: 09-08-76 to 09-29-96

Scope: Waste treatment, storage, geological disposal, transportation requirements, operational considerations; environment and safety; public acceptance issues; information exchange in radioactive waste management, geological disposal, waste form characterization, waste/spent fuel storage, and intercomparison of performance assessment computer models and codes.

DOE/AECL Subsidiary Agreement # 2

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

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

Member of IAEA and OECD/NEA - Exchange agreements with the following agencies and countries: DOE/U.S.; SKB/Sweden; U.K./NIREX/U.K.; PNC, JAERI/Japan; KAERI/Korea; TVO, IVO, OH/Finland; ANDRA/France; ONDRAF/Belgium; ENRESA/Spain; EURATOM/Europe; PAKS NPP/Hungary; Radwaste Admin./Taiwan.

ORGANIZATION

- **AECB** (Atomic Energy Control Board) - federal nuclear control agency, answers to Parliament, responsible for health/safety regulation, compliance/licensing.

- **AECL** (Atomic Energy of Canada Limited) - Crown Corporation, answers to Parliament via Ministry of Natural Resources. R&D; design, engineering, and sale of CANDU and research reactors; proprietary rights on CANDU Nuclear Steam Supply Systems; waste management R&D at Whiteshell and Chalk River laboratories.

- **OH** (Ontario Hydro) - provincial public utility. Owns/operates 20 CANDU nuclear power plants, 15,340 MWe total capacity; responsible for developing interim fuel storage/transport technologies.

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

- **NBEPC** (New Brunswick Electric Power Commission) - provincial public utility. Owns/operates Point Lepreau Nuclear Generating Station, a 600-MWe CANDU.

FEDERAL GOVERNMENT RESPONSIBILITIES - FUEL CYCLE/WASTE MANAGEMENT

Ministry of Natural Resources Canada

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

ATOMIC ENERGY OF CANADA LIMITED - WASTE MANAGEMENT ORGANIZATION

AECL

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

AECB

Atomic Energy Control Board
270 Albert Street
Ottawa, ON
K1P 5S9 Canada

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

President and C.E.O.	Agnes J. Bishop
Director General, Fuel Cycle/Materials Regulations	Murray Duncan
Wastes/Impacts Div.	Cait Maloney
Compliance Serv./Laboratory Div.	Elizabeth Greaves (A)
Radioisotopes/Transportation Div.	Ross Brown
Uranium Facilities Div.	Tom Viglasky
Director, Research/Safeguards	Jim Harvie
Safeguards/Security Div.	John R. Coady
Director, Analysis/Assessment	John Waddington
Safety Evaluation (Analysis) Div.	Peter Wigfull
Safety Evaluation (Eng.) Div.	Kurt Asmis

AECL

Atomic Energy of Canada Ltd.
344 Slater Street
Ottawa, ON
K1A OS4 Canada

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

Chairman	Robert Nixon
President, C.E.O.	Reid Morden
Program Director, LLW Management	Robert W. Pollock

AECL-CRL

AECL
Chalk River Laboratories
Chalk River, ON
ROJ 1JO Canada

Tel: 613-584-3311
Fax: 613-589-4024

(contd next page)

AECL-CRL (contd)

Env. & Health Sciences, Dir.	Richard V. Osborne
Radiation Biology, Dir.	Colin Allan
Waste Management Systems	Colin Allan
Corporate Relations, V.P.	JoAnne Cohen Sulzenko

Facilities

- **WTC** (Waste Treatment Center)
  Mission: Development and operation of processes for treatment of LLW and ILW using incineration, compaction, micro-filtration/reverse osmosis evaporation, ion exchange, and solidification in bitumen.

- **IRUS** (Intrusion Resistant Underground Structure)
  Mission: LLW/ILW repository consisting of prototype vault. Capacity of 2,000 m^3 radwaste in drums or bales; when full, to be covered with backfill, roofed with concrete, and mounded with earth. Waste can be retrieved from the IRUS vault until concrete cap is placed.

AECL-WL

AECL Whiteshell Laboratories Pinawa, MB ROE 1L0 Canada	Tel: 204-753-2311 Fax: 204-753-2455
Underground Research Laboratory	Tel: 204-345-8625 Fax: 204-345-8868

Gen. Mgr., Phys. and Earth Sciences	Collin J. Allan
Dir., Nuc. Fuel WM. Program	Ken W. Dormuth
Applied Geoscience	Cliff Davison
Environmental and Safety Assessment	Alf Wikjord
Geotech. Science and Engineering	Mitch Ohta
Waste Technology	Keith Nuttal
Geochemistry Research	Peter Sargent
Fuel Waste Technology	Lawrence Johnson
Environmental Science	Reto Zach

(contd next page)

AECL-WL (contd)

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 ground surface in granitic rock.
  Design Basis: Stainless steel vertical test chamber to simulate a 10-m-long borehole section, 76-mm inside diameter. Temperature, pressure, flow rates, and water chemistry can be precisely controlled and monitored.
  History: Startup, 1983.

- **URL** (Underground Research Laboratory), located about 20 km northeast of WL in the Lac du Bonnet granite batholith.
  Mission: Operate facility ensuring compliance with regulatory stan dards and high level of safety/quality control; design and implement in situ and laboratory experiments/engineering demonstrations to investigate relevant issues.
  Design Basis: Access shaft and ventilation raised to 430-m depth with shaft stations at 130-, 240-, 300-, and 420-m depths. Licensed radioactive sources and tracers can be used, but no radioactive wastes can be employed. A series of nine experiments is in progress on the 240- and 420-m levels and in the surrounding rock mass.
  History: Underground access development complete in 1990; major experiments in solute transport, rock mass response, characterization method, and engineered sealing systems began in 1988.

- **IFTF** (Immobilized Fuel Test Facility)
  Mission: Test the effects of water, heat, and pressure on used fuels, container materials, buffer, and rock in the presence of a radiation field.
  Design Basis: A high-level radiation source is used in heated concrete canisters to provide a gamma radiation source. Pressure vessels adjacent to the source contain the material to be studied. Adjacent "warm cells" are available for experiments involving moderate levels of radiation.
  History: First canister loaded August 1984.

(contd next page)

AECL-WL (contd)

- **LBRMF** (Large Block Radionuclide Migration Facility)
  Mission: Study the migration of reactive and nonreactive contaminants, including radionuclides, over a distance up to 1 m through natural fractures in quarried, intact rock; determine the spatial distribution of sorbed radionuclides on fracture surfaces and in the rock matrix at the end of the migration experiments.
  Design Basis: The facility consists of an experimental section equipped with moveable active fume hoods to hold quarried rock; an analysis section equipped with a 2-D gamma scanner, active fume hoods, and equipment to handle blocks of rock up to 2000 kg.
  History: Joint migration experiment with U.S. DOE using uranine (tracer dye), ^{131}I, and ^{137}Cs has been completed and results published. Second experiment, using uranine, ^{3}H, ^{85}Sr, ^{95m}Tc, ^{137}Cs, and ^{144}Ce has been completed; third experiment, using ^{85}Sr, ^{131}I, ^{137}Cs, ^{144}Ce, ^{152}Eu, ^{237}Np and ^{239}Pu has been carried out for PNC, Japan; colloid migration experiments are under way; migration experiments in fractures with simple, uniform geometrics are planned in cooperation with LANL (U.S).

NATURAL RESOURCES CANADA

Natural Resources Canada
Science and Technology
580 Booth Street
Ottawa, ON
K1A OE4 Canada

Tel: 613-995-1240
Fax: 613-996-9094

Electricity Branch, Dir. General — R. W. Morrison, 613-992-3370

Radioactive Waste/Radiation, Mgr. — Peter Brown, 613-996-2395

NATURAL RESOURCES CANADA-CANMET

Natural Resources
Canada Centre for Mineral
and Energy Technology
555 Booth Street
Ottawa, ON
K1A 0G1 Canada

Tel: 613-995-4194
Fax: 613-996-9673

Mineral Technology, Dir.	Roy Sage
Waste Mgmt., Elliot Lake, Dir.	J. E. Udd
Sudbury Laboratories Manager	Parviz Mottahed

NATURAL RESOURCES CANADA-GSC

Natural Resources
Geological Survey of Canada
601 Booth Street
Ottawa, ON
K1A 0E8 Canada

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

Assistant Deputy Minister	E. A. Babcock
Chief Scientist	Jim Franklin

ONTARIO HYDRO

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

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

Nuclear Fuel Supply	E. G. Bazeley
Design/Development Div., Director	Hugh S. Irvine
Nuclear Engineering	Don W. Souther
Radioactive Mtls. Management	Peter Stevens-Guille
Rad. Waste Storage/Disposal	P. J. Armstrong
Rad. Mlts. Transportation	Joe F. Tanaka
SF Management/Decommissioning	Syed J. Naqvi
Fuel Cycle, Isotope	R. A. McEachran

(contd next page)

ONTARIO HYDRO (contd)

RWOS (Radioactive Waste Operations Site)
Bruce Nuclear Power Development
Box 1540
Tiverton, ON
NOG 2T0 Canada

Tel: 519-361-2673
Fax: 519-361-4345

Waste Operations

Keith Mombourquette
Tel: ext. 4844

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

Facilities

- **WVRF** (Waste Volume Reduction Facility)
  Processing Equipment: Two-chamber pyrolysis incinerator with a capacity of 30 kg/hr; box compactor with a compaction force of 2×10^6 N low force drum crusher. Startup, 1977 (box compactor replaced baler in 1993).

- **LLW Storage Facilities**
  - **Five above-ground warehouse-type buildings**. Waste with a radiation field of <1 R/hr at 30 cm is stored in stackable containers with a storage capacity of 8000 m^3 each.

  - **15 trenches**. Reinforced concrete structures ~3 m below ground; designed for waste with radiation fields >1 R/hr but <15 R/hr; 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; storage capacity ranges from 1 to 18 m^3.

(contd next page)

ONTARIO HYDRO (contd)

- **358 in-ground containers**. Welded steel liners concreted into augered holes; designed for storage of waste with radiation fields >15 R/hr, e.g., ion exchange resins, filters and reactor core components. In-ground storage consists of 224 1-m^3 capacity tile holes and 134 in-ground containers; capacity ranges from 2 to 18 m^3 (54 were added in 1993).

- **Paved area**. 4700 m^2 for storage of contaminated tooling in 6.1-m-long marine cargo containers stacked two high.

- **27 in-ground containers**. Various diameters/depths containing scrap heat exchangers; augered holes with crushed limestone backfill. Storage capacity ranges from 2 to 18 m^3 each.

CHINA
(People's Republic of China)

CHINA

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year
Feb	19-21	Spring Festival
Mar	8	Women's Day
May	1	Labor Day
Oct	1-2	National Day

TIME

Standard Time Washington D.C. **+ 13 hours**

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S. $ = 8.14 Renminbi
per Wall Street Journal, 10/01/95. Because rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

U.S. EMBASSY - BEIJING

American Embassy
Xiu Shui Bei Jie 3
Beijing 100600
People's Republic of China

Tel: 86-10-532-3831 Ext. 453
Fax: 86-10-532-6423

Science Counselor — Marco S. Di Capua

Population	1994	1.19	billion

ENERGY

Electric Power Capacity	1993	183	GWe
		<1%	**nuclear**
	1994	200	GWe
		1.05%	**nuclear**
	1995	210	GWe
		<1%	**nuclear**
	2000	285	GWe
		<1%	**nuclear**
Electric Power Production	1993	836	TWh
		77%	coal
		18%	hydro
		5%	oil
		<1%	**nuclear**
	1994	928	TWh
		75.9%	coal
		18%	hydro
		4.7%	oil
		1.5%	**nuclear**
	1995	990	TWh
		<1%	nuclear

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	1993	0.3	GWe
	1995	2.1	GWe
	2000	6.0	GWe
Reactor Mix	1994	PWR	3 (1994)
		PWR	2 (2000/01)
Reactor Development	PWR, HTGR, FBR, LTR		

INDUSTRIAL FUEL CYCLE

Policy: Activities include uranium mining, milling, and diffusion enrichment; isotope separation; fuel fabrication; future spent fuel reprocessing.

Waste Management Strategy: Interim storage of spent fuel in pools for 5-8 years if greater than 1,000 t U, in transport/storage casks if less than 1,000 t U; interim storage, reprocessing, vitrification, and disposal all to be at one site, to be selected, located in northwest China or the Gobi Desert; final disposal in deep geologic formation; plan for a small pilot reprocessing plant, followed by a commercial-size facility, about 500 t U/yr.

INTERNATIONAL AGREEMENTS

Member of IAEA. Cooperative agreements have been signed with Argentina, Canada, France, Germany, Italy, Japan, Republic of Korea, and the U.S. (nuclear safety).

ORGANIZATION

- **CNNC** (China National Nuclear Corporation) - fuel cycle development
  - **CIAE** (China Institute of Atomic Energy)
  - **CNEC** (China Nuclear Engineering Corporation) - handles import and export
  - **China Zhongyuan Engineering Corporation** - provides technical services and engineering work; contracts building projects.
  - **Southwest Institute of Physics** - nuclear R&D.

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

- **INET** (Institute of Nuclear Energy Technology), Tsinghua University

BINE

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

Tel: 86-10-842-3311
Fax: 86-10-841-8086

Director	Huang Pumin	Ext. 2187
Director, Nuclear Waste Mgmt.	Zheng Jifu	Ext. 2802
Director, International Affairs	Liu Dinggin	Ext. 5067

CIAE

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

Tel: 86-10-935-7676
Fax: 86-10-935-7008

Honorary Director	Wang Ganchang
Director	Sun Zuxun
Director, Radiochemistry	Luo Shanggeng

Function: Large comprehensive nuclear R&D institute. FBR development.

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

CNEIC

China Nuclear Energy
Industry Corporation
P.O. Box 822
Beijing 100037, PRC

Tel: 86-10-851-2211
Fax: 86-10-851-2393

General Manager	Zhou Yuanquan

Function: Import/export company for the nuclear industry.

CNNC

China National Nuclear Corporation
P.O. Box 2102 Tel: 86-10-851-2211
Beijing 100822, PRC Fax: 86-10-851-2393

President Jiang Xingxiong
Nuclear Fuel Department Director Zhang Zhifeng
Nuclear Radiation Protection,
Environment/Health Department Director Pan Ziqiang

Conglomerate of over 200 enterprises and institutions. Plans to construct four regional final LLW/ILW disposal facilities in northwest (Gansu), east, south, and southwest China for waste from nuclear facilities, including Qinshan and Daya Bay nuclear power stations.

INET

Institute of Nuclear Energy Technology
Tsinghua University
P.O. Box 1021 Tel: 86-10-259-4533
Beijing 100084, PRC Fax: 86-10-256-4177

Director Wu Zongxin
Dep. Director Xu Yuanhui
Academic Committee Director Zhu Yongjun

Designed/built low-temperature reactor (5 MWth), which provides central heating for the institute's off-campus research facility.

NFC

Nuclear Fuel Complex
P.O. Box 508
Lanzhou 732850, PRC Tel: 86-931-841-7584

Director Liu Qizhao

NFF

Nuclear Fuel Fabrication
P.O. Box 257
Yibin, Sichuan 644000

Tel: 86-831-22-1811
Fax: 86-831-22-3622

Factory Director — Chen Baoshan

Function: Production of fuel for the 300 MWe PWR being built at Pinshan (near Shanghai) and the two 900 MWe PWRs at Daya Bay (near Hong Kong).

NNSA

National Nuclear Safety Administration
P.O. Box 8088
Beijing 100088, PRC

Tel: 86-1-225-8583
Fax: 86-1-225-7804

Director General — Huang Qitao

Function: Responsible for standards/regulations, construction permits/operating licenses; monitoring plant operations; joint safety research with other nations; cooperation with U.S. (NRC)

NPIC

Nuclear Power Institute of China
P.O. Box 436
Chengdu 610041, PRC

Tel: 86-28-558-2199
Fax: 86-28-558-2223

Director — Zhao Chengkun

Function: Designing Qinshan II (600 MWe PWR); R&D on advanced PWRs.

SNERDI

Shanghai Nuclear Engineering
and Design Institute
29 Hongcao Lu
P.O. Box 233-008
Shanghai 200233, PRC

Tel: 86-21-6436-4700
Fax: 86-21-6439-0846

Director
Foreign Affairs

Geng Qirui
Du Li
Tel: 86-21-6470-5415

Function: Designing (300 MWe) PWRs for export; designed Qinshan I.

FINLAND


0 160 km
0 100 mi
N
NORWAY
Murmansk
Ivalo
FINLAND
SWEDEN
Rovaniemi
Luleå
Kemi
Pitea
Kuusamo
USSR
Oulu
Vilhelmina
Kem
Gulf of Bothnia
Umeå
Kajaani
Kokkola
Pietarsaari
Sundsvall
Vaasa
Kuopio
Joensuu
Jyvaskyla
Varkaus
Savonlinna
Tampere
Mikkeli
Pori
Gavle
Rauma
Stockholm
ALAND ISLAND
Hämeenlinna
Lahti
Lappeenranta
Turku
Vantaa
Espoo
Kotka
Mariehamn
Helsinki
Hanko
Leningrad
Gulf of Finland

FINLAND

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year	May	25	Ascension
Jan	6	Epiphany	Jun	23-24	Midsummer Eve/Day
Apr	14	Good Friday	Nov	4	All Saints
Apr	16-17	Easter	Dec	6	Independence Day
May	1	May Day	Dec	24-26	Christmas

TIME

Standard Time Washington D.C. **+ 7 hours**
Daylight Saving Time Period: **03/26 - 09/22/95**

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S. $ = 4.30 Markka (FIM)
per Wall Street Journal, 10/01/95. Because 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
Itaeinen Puistotie 14A
Helsinki
Finland

Tel: 358-0-17-1931
Fax: 358-0-65-6846

Economic Section

Robert W. Boehme

Population	1994	5	million
ENERGY			
Electric Power Capacity	1993	12.6	GWe
		18%	**nuclear**
	1995	15.0	GWe
		17%	**nuclear**
	2000	15.5	GWe
		15%	**nuclear**
Electric Power Production	1993	58.1	TWh
		32%	**nuclear**
		26%	hydro
		15%	solids
		14%	coal
		9%	gas
		2%	oil
	1995	**29%**	**nuclear**
	2000	**23%**	**nuclear**
NUCLEAR POWER			
Nuclear Power Capacity	1993	2.3	GWe
	2000	2.3	GWe
	1994	PWR	2 (1977/81)
		BWR	2 (1979/82)

INDUSTRIAL FUEL CYCLE

Policy: Purchase fuel from other countries' domestic waste management services.

Waste Management Strategy: Spent fuel from TVO's power plants will be stored for at least 40 years, then disposed of in crystalline bedrock; IVO returns spent fuel from its (Russian-built) reactors to Russia until the end of 1997; thereafter will operate with the same principle as TVO; a joint company for the final disposal of TVO and IVO spent fuel will start its operation in January 1996; operating wastes are conditioned, stored above

ground, and disposed of in crystalline bedrock at the nuclear power station sites; decommissioning wastes will be disposed of in extended operating waste repositories.

Cumulative SF Arisings (LWR), t U removed + cores		TVO	IVO
	1990	450 + 177	330 + 75
	2000	855 + 177	580 + 75

Major Milestones

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

INTERNATIONAL RELATIONSHIPS

Member of IAEA and OECD/NEA; collaboration with Sweden, Canada, Denmark, Norway, and Switzerland in waste management studies. Purchase of fuel-cycle services: uranium from Canada, Australia, Niger, China, and Russia; uranium conversion/enrichment from Canada, France, Germany, Russia, and U.K.; fuel element fabrication from Sweden, Germany, and Russia; return of spent fuel to Russia (IVO) temporarily until 1997.

ORGANIZATION

- **Council of State** (Cabinet of Ministers) - grants licenses.
- **Nuclear Energy Commission** - advisory organization for matters connected with the use of nuclear energy.
- **Advisory Committee on Nuclear Safety** - advisory organization.
- **KTM** (Ministry of Trade and Industry) - Energy Department, formulates energy policies, grants licenses.
- **STUK** (Finnish Centre for Radiation and Nuclear Safety) - regulatory authority which also conducts research, particularly related to transport of radionuclides in biosphere.

- **IVO** (government-owned power company) - operates two Russian-built PWRs.
- **TVO** (power company) - operates two Swedish-built BWRs.
- **N.N.** (spent fuel disposal company) - a joint company to be established by IVO and TVO starting January 1996.
- **VTT** (Technical Research Centre of Finland) - nuclear research, including waste management R&D.
- **Geological Survey of Finland** - bedrock-related research.
- **University of Helsinki** - basic research on radiochemistry.
- **Helsinki University of Technology** - basic research.

ADVISORY COMMITTEE ON NUCLEAR SAFETY

Advisory Committee on Nuclear Safety
P.O. Box 14
Laippatie 4
FIN-00881 Helsinki
Finland

Tel: 358-0-75-9881
Fax: 358-0-75988500

Chairman — Lasse Mattila
Secretary-General — Hannu Koponen

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

GEOLOGICAL SURVEY OF FINLAND

Geological Survey of Finland
Betonimiehenkuja 4
FIN-02150 Espoo, Finland

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

Director — Veikko Lappalainen
Nuclear Waste Disposal — Paavo Vuorela

R&D Activities: Geological studies for waste disposal in crystalline bedrock.

IVO (National Power Company)

Imatran Voima Oy
Rajatorpantie 8
FIN-01019 IVO, Finland

Tel: 358-0-85611
Fax: 358-0-563-6823

President, CEO — Kalevi Numminen
Exec. VP, Generation — Anders Palmgren
Director, Research — Pekka Salminen
Nuclear Waste — Jussi Palmu

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

Owner: Government.

NEC (Nuclear Energy Commission)

Nuclear Energy Commission
Pohjoinen Makasiinikatu 6
FIN-00130 Helsinki
Finland

Tel: 358-0-160-4832
Fax: 358-0-160-2695

Chairman — Pekka Silvennoinen
Secretary-General — Sakari Immonen

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

STUK

Finnish Centre for Radiation
and Nuclear Safety
P.O. Box 14
Laippatie 4 Tel: 358-0-759-881
FIN-001000 Helsinki, Finland Fax: 358-0-7598-8500

Director	Antti Vuorinen
Nuclear Safety Department	Jukka Laaksonen
Nuclear Fuel Cycle	Tero Varjoranta
Nuclear Waste	Esko Ruokola

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

TVO (Industrial Power Company)

Teollisuuden Voima Oy
Annankatu 42C Tel: 358-0-6180-1
FIN-00100 Helsinki, Finland Fax: 358-0-6180-2570

Director	Mauno Paavola
Director, Development	Ami Rastas
Nuclear Fuel	Ilkka Mikkola
Nuclear Waste	Veijo Ryhänen

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

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

Facilities

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

(contd next page)

TVO (Industrial Power Company) (contd)

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

VTT (Technical Research Centre of Finland)

VTT Energy
Nuclear Energy
Tekniikantie 4C, Espoo
FIN-2044 VTT, Finland

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

Nuclear Energy Research — Lasse Mattila
Reactor Physics — Riitta Kyrki-Rajamäki
Nuclear Waste Management — Seppo Vuori

R&D Activities: Reactor physics, nuclear power plant safety analyses; safety analysis of final disposal of wastes in bedrock, including groundwater flow modeling.

VTT Chemical Technology
Environmental Technology
Physics Bldg.
Otakaari 3A, Espoo
FIN-02044 VTT, Finland

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

Head — Markku Auer
Nuclear Waste — Arto Muurinen

R&D Activities: Dissolution of spent fuel and actinides; geochemical modeling; migration in barriers and bedrock; characterization of ILW forms.

(contd next page)

VIT (contd)

VTT Communities/Infrastructure
Rock/Environmental Engineering
Betonimiehenkuja 1, Espoo
P.O. Box 19041 Tel: 358-0-456-1
FIN-02044 VTT, Finland Fax: 358-0-467-927

Head, Waste Disposal Jukka Pöllä
Hydrology Petteri Pitkänen

R&D Activities: Hydrogeological and geomechanical measurements, characterization and performance of bedrock and engineered barriers.

VTT Manufacturing Technology
Materials/Structural Integrity
Kemistintie 3, Espoo
P.O. Box 1704 Tel: 358-0-456-1
FIN-02044 VTT, Finland Fax: 358-0-456-7002

Head Rauno Rintamaa
Nuc. Materials Research Pertti Aaltonen

R&D Activities: Corrosion of encapsulation materials in repository conditions, material research of reactor components.

UNIVERSITY OF HELSINKI

University of Helsinki
Laboratory of Radiochemistry
P.O. Box 55 (A.T. Virtasen aukio 1)
FIN-00014 University of Helsinki Tel: 358-0-191-1
Finland Fax: 358-0-191-40121

Director Timo Jaakkola

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

HELSINKI UNIVERSITY OF TECHNOLOGY

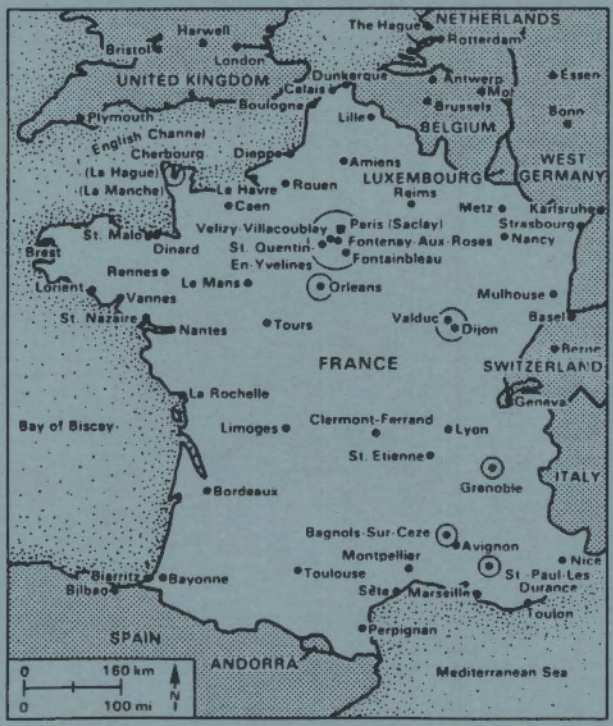
Nuclear Engineering Laboratory
Rakentaja aukio 2C
FIN-02150 Espoo, Finland

Tel: 358-0-451-1
Fax: 358-0-451-3195

Nuclear Energy/
Advanced Energy Systems

Rainer Salomaa
Tel: 358-0-451-3199
Fax: 358-0-451-3195

FRANCE


NETHERLANDS
The Hague
Rotterdam
Harwell
Bristol
London
UNITED KINGDOM
Dunkerque
Calais
Antwerp
Mol
Essen
Boulogne
Brussels
Bonn
Plymouth
Lille
BELGIUM
English Channel
Cherbourg
Dieppe
Amiens
WEST GERMANY
(La Hague)
(La Manche)
Le Havre
Rouen
LUXEMBOURG
Reims
Caen
Metz
Karlsruhe
Strasbourg
Nancy
St. Malo
Velizy-Villacoublay
Paris (Saclay)
Fontenay-Aux-Roses
Fontainbleau
Brest
Dinard
St. Quentin-En-Yvelines
Rennes
Le Mans
Orleans
Lorient
Vannes
Mulhouse
St. Nazaire
Nantes
Tours
Valduc
Dijon
Basel
Berne
FRANCE
SWITZERLAND
La Rochelle
Geneva
Bay of Biscay
Limoges
Clermont-Ferrand
Lyon
St. Etienne
ITALY
Grenoble
Bordeaux
Bagnols-Sur-Ceze
Avignon
Montpellier
Nice
Biarritz
Bayonne
Toulouse
St.-Paul-Les-Durance
Bilbao
Sète
Marseille
Toulon
Perpignan
SPAIN
ANDORRA
Mediterranean Sea
0 160 km
0 100 mi
N

FRANCE

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year	Jul	14	Bastille Day
Apr	17	Easter Monday	Aug	15	Assumption
May	1	Labor Day	Nov	1	All Saints
May	12	Ascension	Nov	11	Veterans Day
Jun	4-5	Whitsuntide	Dec	25	Christmas
Jun	23	Pentecost			

TIME

Standard Time Washington, D.C. **+ 6 hours**
Daylight Savings Time Period: **03/26 - 09/23/95**

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S.; in addition, a visa is currently required when traveling on an official passport to France, but not when a personal passport is used. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 U.S. $ = 4.888 Franc

per Wall Street Journal, 11/08/95. Because 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 Cedex 08
France

Tel: 33-1-42-96-12-02
Fax: 33-1-42-66-48-27

Science Counselor — Jerome J. Bosker

Population	1994	57.8	million

ENERGY

Electric Power Capacity	1993	107.0	GWe
		55%	**nuclear**
	1995	107.5	GWe
		54%	**nuclear**
	2000	118.3	GWe
		54%	**nuclear**
Electric Power Production	1993	458.1	TWh
		78%	**nuclear**
		15%	hydro/geoth.
		8%	coal
		2%	oil
		1%	gas
	1994	**80%**	**nuclear**
	1995	**75%**	**nuclear**
	2000	**76%**	**nuclear**

NUCLEAR POWER

Policy: Vigorous nuclear power program, scaled down recently to construction of less than one new reactor per year; reprocessing-conditioning-recycling (RCR) fuel cycle policy; export of nuclear plants and services.

Nuclear Power Capacity	1993	59.0	GWe
	1995	58.5	GWe
	2000	64.3	GWe
Reactor Mix	1995	PWR	55 (1972-94)
			4 (1996/98)
		LMFBR	2 (1974)[a]

(a) Initial criticality for SuperPhenix in 1986.

INDUSTRIAL FUEL CYCLE

Policy: Maintain full domestic fuel cycle capability and aggressive export of fuel cycle, products, 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 or clay). Immobilize LLW in bitumen, concrete, or resin and dispose in engineered surface facility.

Cumulative (PWR)	1990	1993	2000
SF Arisings, t U	7,300	10,000	19,000

Industrial-Scale Activities

- Uranium mining and milling (t U/yr): 1100 (1994)

- Uranium enrichment (k SWU/yr)
  - Eurodif, gaseous diffusion: 10,800

- Fuel fabrication (t HM/yr)
  - UO_2: 1,600
  - MOX: 50 (LWR fuels)

- Spent fuel reprocessing (t/yr)
  - Marcoule: 400 (U metal fuels)
  - La Hague: 1,600 (LWR fuels)

Major Milestones

- Melox (MOX fuel fabrication plant-Marcoule) 1995
- TRU disposal facility 2000
- Underground Research Laboratory (completion date uncertain)
- HLW (glass) disposal facility 2000

INTERNATIONAL RELATIONSHIPS

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

Term: 07-26-83 to 07-26-93 (extension in process)

Scope: Preparation/packaging, D&D, waste/spent fuel storage, geologic disposal, transportation requirements; technical workshops in the areas of LLW and TRU waste management; exchange of waste repository site characterization technology and data for granite and salt host rocks.

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

ORGANIZATION

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

  Nuclear Research Centers: Cadarache, Fontenay-aux-Roses, Grenoble, Valrho, Saclay.

- **CEA INDUSTRY:** Industrial holding concerned with all industrial fuel cycle activities in France.

  - **TECHNICATOME** (CEA 90%): design, construction, operation of fuel cycle and/or waste facilities.

  - **STMI** (CEA 60%): waste management, decontamination, dismantling services.

  - **COGEMA** (CEA 89.2%): nuclear fuel cycle.

  - **COMURHEX** (COGEMA 100%): uranium conversion.

  - **EURODIF** (COGEMA 56.5%): commercial enrichment.

  - **SICN** (100%), **FRAGEMA** (50%), **FBFC** (49%), **COMMOX** (60%) - COGEMA subsidiaries: fuel fabrication.

- **SGN** (COGEMA 66%): engineering.
- **TRANSNUCLÉAIRE** (51% COGEMA): transport.

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

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

- **Framatome**

Minister of Industry, Telecommunication and Tourism

- ANDRA - Yves Kaluzny
  - CEA High Commissioner - Robert Dautray
    Chairman R&D -Yannick d'Escatha
    Deputy Chairman - Yannick d'Escatha
    Chairman Industry - Philippe Rouvillois/ Yannick d'Escatha

CEA OPERATIONS UNITS

- DAM - Military applications -Jacques Bouchard
- IPSN - Institut de Protection/de Sûreté Nucléaire - Philippe Vesseron
- DSM - Direction des Sciences de la Matière - Catherine Cesarsky
- DSV - Direction des Sciences du Vivant - André Syrota
- DRN - Direction des Reacteurs Nucléaires - Bertrand Barré
- DCC - Direction du Cycle du Combustible - Noel Camaroat
- DTA - Direction des Techniques Avancées - Alain Bugat
- INSTN - Institut des Sciences et Techniques Nucléaires - T.P. Georges Carola

RESEARCH CENTERS

- CEN

COGEMA

- La Hague Center
  - Reprocessing (LWR)
  - AVH - Vitrification
- Marcoule Center
  - AVM - Vitrification
  - Melox - MOX fuel fabrication

CEA
RESEARCH CENTERS (CEN)

- Cadarache - Michel Suscillon, Director
  - TRU waste and LLW/ILW
  - Environmental
- Fontenay-aux-Roses - Alain Debiar, Director
  - Disposal R&D
  - MOX fuel
  - TRU waste and LLW/ILW
  - Engineered barriers
  - Safety and health protection
- Grenoble - Jean-Pierre Leroux, Director
- Saclay - Eliane Loquet, Director
  - MOX fuel fabrication
  - TRU waste and LLW/ILW treatment
  - Engineered barriers
- Valrho - Claude Vergne, Director
  - APM - Reprocessing (metal)
  - 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
Poore de la Oapix R. Pasichie
1/7 Rue Jean Monet
92298 Chalenay-Malabry Cedex Tel: 33-1-41-17-8000
France Fax: 33-1-41-17-8100

Director Yves Kaluzay
Deputy Director Armand Faussat

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

Facilities

- **Centre de la Manche**
  B.P. 808
  50448 Beaumont-Hague Tel: 33-16-33-52-78-65

  Mission: Disposal of ILW and LLW; capacity: 480,000 m^3 (1988: 350,000 m^3 in place; full and shut down in 1992, closed permanently in 1994).

- **Centre de l'Aube**
  B.P. 7
  10200 Soulaines-Dhuys Tel: 33-16-25-92-33-00

  Mission: Replace La Manche site as disposal facility for ILW/LLW; located 120 miles east of Paris, in Aube; covers about 250 acres and will accommodate 1,000,000 m^3 of ILW/LLW over a period of 30 years.

BRGM (Bureau of Geological and Mineral Research)

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

Director	Jean Pierre Hugon
Managing Director, Geology	H. Astie
Waste Storage	P. F. R. Peaudecerf
Hydrogeology	J. J. Collin
Geotechnology	P. Masure

CEA (Atomic Energy Commission)

Commissariat à l'Energie
Atomique (CEA)
Centre d'Etudes Nucléaires (CEN)
31-33, Rue de la Federation
75752 Paris Cedex 15 Tel: 33-1-40-56-10-00
France Fax: 33-1-42-53-91-22

Chairman	Yannick d'Escatha
High Commissioner	Robert Dautray

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

CEA-IPSN (Institute for Nuclear Safety)

Institute de Protection et de
Sûreté Nucléaire (IPSN)
B.P. 6
92260 Fontenay-aux-Roses
France

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

Director	Philippe Vesseron
Dir., Nuc. Security Research	Michel Livolant
Dir., **Safety**	Daniel Queniart
Safety Analysis	Christian Devillers
Dir., **Safeguards**	Annie Sugier
Health/Dosimetry	Patricia Gourmelon
Environment/Installation	Alain L'homme
Research	A. Chalot
Nuclear Materials	G. Déan

Function: Research and development in environmental safeguards/security.

CEA/CEN-CA (Cadarache Nuclear Research Center)

Centre d'Etudes Nucléaires
de Cadarache
13108 Saint Paul Lez Durance Cedex
France

Tel: 33-42-25-70-00
Fax: 33-42-25-45-45

Director — Michel Suscillon

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

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

(contd next page)

CEA/CEN-CA (contd)

Facilities

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

- **Bituminization Plant**
  Design Basis: Immobilize reactor wastes; twin-screw extruder; capacity, 260 m^3/yr.
  History: Startup, 1977.

- **LLW Incinerator**

- **Resin Embedding Pilot Facility**

- **Solvent Incinerator**

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

Centre d'Etudes Nucléaires
de Fontenay-aux-Roses
B.P. 6
92265 Fontenay-aux-Roses Cedex Tel: 33-1-46-54-70-80
France Fax: 33-1-46-54-75-22

Director Alain Debiar

CEA/CEN-G (Grenoble Nuclear Research Center)

Centre d'Etudes Nucléaires
de Grenoble
17, rue des Martyrs
38054 Grenoble Cedex 09 Tel: 33-76-88-44-00
France Fax: 33-76-88-34-32

Director Jean-Pierre Leroux

Facilities

- **Waste Resin Embedding Facility**

CEA/CEN-S (Saclay Nuclear Research Center)

Centre d'Etudes Nucléaires
de Saclay
91191 Gif-sur-Yvette Cedex Tel: 33-1-69-08-60-00
France Fax: 33-1-69-08-79-90

Director Eliane Loquet
Dir., Fuel Cycle (DCC) Noél Camaroat

Facilities

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

CEA/CEN-VRH (Valrho Nuclear Research Center)

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

Tel: 33-66-79-60-00
Fax: 33-66-79-66-17

Director — Claude Vergne
Mgr., Reprocessing/HLW — Michele Viala, 33-66-79-63-62
Manager, HLW — Jean-Pierre Moncouyoux, 33-66-79-63-78

Facilities

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

- **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 m^3 HLW/yr; product, borosilicate glass blocks, 25-cm diameter by 2.5 m high.
  History: Decommissioned, then dismantled in 1991.

- **PIVER II** - Vitrification of HLW from APM (delayed)

- **Hull Fusion Non-Radioactive Prototype** - Startup, 1984

- **Hull Fusion Radioactive Facility in APM** - Startup, 1993

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

COGEMA (Fuel Cycle Company)

Cogema Direction Generale
2, Rue Paul-Dautier
B.P. 4
78141 Velizy-Villacoublay Cedex — Tel: 33-1-39-26-80-00
France — Fax: 33-1-39-26-27-00

President, CEO, COB	Jean Syrota
Executive Vice President	Christian Gobert
V.P., Reprocessing Division	Jean-Louis Ricaud
V.P., Uranium Division	Yues Coulier
V.P., International Affairs	Jean Pierre Roclother

Cogema, Inc.
7401 Wisconsin Ave. — Tel: 301-986-608585
Bethesda, Maryland 20814-3416 — Fax: 301-652-5690

President, CEO	Michael McMurphy
V.P. Market Development	Frank A. Shallo

NUMATEC, Inc.
Subsidiary of Cogema, Inc.
7401 Wisconsin Ave. — Tel: 301-986-8585
Bethesda, Maryland 20814-3416 — Fax: 301-652-8479

President — Robert Ihde

COGEMA-LA HAGUE

Cogema, Centre de La Hague
B.P. 508
50105 Cherbourg Cedex — Tel: 33-33-03-60-00
France — Fax: 33-33-02-60-13

Director — M. Lederman
33-33-03-60-01

(contd next page)

COGEMA-LA HAGUE (contd)

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

Facilities

- **UP2** (fuel reprocessing plant)
  Mission: Reprocess oxide fuels from LWRs and Phenix FBR (Phenix fuel was reprocessed from 1979 to 1984, diluted with natural uranium fuel for criticality control).
  Design Basis: PUREX flowsheet; oxide fuels: shear-leach head-end oxide (HAO); remote maintenance.
  Capacity: 400 t/yr of LWR fuels.
  History: UP2 startup, 1967; HAO startup, 1976. From June 1976 through December 1993, total HAO throughput was 4,091 t HM fuel from LWRs and 10 t HM from Phenix.

- **UP2-800** (fuel reprocessing plant)
  Mission: Reprocess UO_2 and MOX fuels from French LWRs.
  Design Basis: Progressive expansion of UP2 plant from 400 to 800 t HM/yr of LWR fuel started in 1984, to be completed in 1994. Chop-leach head-end, PUREX flowsheet, AVM vitrification process [R7 vitrification plant: rotary calciner, metallic melter; capacity, 600 m^3/yr HLW feed three lines - 60 L/hr HLW, 25 kg/hr glass; canister dimensions: 42 cm diameter x 1.3 m high (400 kg glass)].
  Capacity: 800 t HM/yr.
  History: Startup, 1994; R7 startup, 1989.

- **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 t HM/yr.
  History: Startup, 1990; throughput of 1,626 t HM as of December 1993.

(contd next page)

COGEMA-LA HAGUE (contd)

- **STE3** (liquid waste treatment facility)
  Mission: Processing/encapsulation in bitumen of LLLW and ILW from reprocessing of spent fuel at the La Hague installations.
  History: Startup, 1989.

COGEMA-MARCOULE

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

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

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

Director	Hughes Delaunay
Reprocessing Plant	Maurice Mellano
AVM Manager	Jean-Claude Batailles-Lannes

Facilities

- **UP1** (reprocessing plant)
  Mission: Reprocess magnesium-clad natural uranium metal fuels from military reactors.
  Design Basis: Mechanical declad; PUREX flowsheet; contact maintenance.
  Capacity: 400 t U/yr of reactor fuel (gas/graphite).
  History: Startup, 1958; 5,085 t U total gas/graphite power reactor fuels processed up to December 1993.

- **AVM** (Ateliers de Vitrification de Marcoule)
  Mission: Demonstrate AVM process: vitrify Marcoule UP1 wastes.
  Design Basis: Rotary calciner feeding an induction-heated metallic melter; nominal capacity 30-L/hr HLW feed and 360 kg/d (one canister) borosilicate glass product; waste form, glass blocks 0.5 m diameter x 1.0 m high.

(contd next page)

COGEMA-MARCOULE

History: Hot startup, June 1978; as of December 1993, 2,145 glass canisters.

- **Incinerator**
- **Bituminization Facility**
- **Melox:** MOX fuel fabrication (120 t HM/yr) - 1995.

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 Tel: 33-1-40-56-10-00
France Fax: 33-1-40-56-14-29

Director, Quality/Security Jean Ohmann

ENSM (PARIS SCHOOL OF MINES)

Ecole Nationale Supérieure
des Mines de Paris
Centre d'Informatique Géologique
35 Rue Saint-Honore Tel: 33-1-64-22-48-21
77305 Fontainebleau France Fax: 33-1-64-22-39-02

Director, Math. Geol. Center Ghislain de Marsily
Deputy Director G. E. Ledoux

Waste Management R&D: Geologic waste isolation (fluid flow, heat transport/mass transport studies; theoretical, lab/field tests).

FBFC (Franco-Belge Company for Fuel Fabrication)

Société Franco-Belge de Fabrication
de Combustibles
Tour Fiat, Cedex 16
92084 Paris la Défense
France

Tel: 33-1-47-96-56-00
Fax: 33-1-47-96-56-03

Director General — Philippe Darmayan

Facilities

- **Fuel Fabrication Plant** (Romans, France)
  Mission: Fabricate UO_2 fuels for power reactors.
  Design Capacity: 750 t HM/yr.

- **Fuel Fabrication Plant** (Pierrelatte, France)
  Mission: Fabricate UO_2 fuels.
  Design Capacity: 400 t HM/yr.

- **Fuel Fabrication Plant** (Dessel Belgium)
  Mission: Fabricate UO_2 fuels.
  Design Capacity: 450 t HM/yr.

SGN

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

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

Chairman/Board, CEO — Colette Lewiner
CEO, Eng. Branch Leader — Serge Lefranc

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

TN

Transnucléaire
11 Rue Christophe-Colomb
75008 Paris
France

Tel: 33-1-40-69-77-00
Fax: 33-1-40-69-77-01

Chairman — Jean Louis Ricaud
Technical Manager — B. Kirchner

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

GERMANY


0
160 km
0
100 mi
N
DENMARK
Kiel
Stralsund
Rostock
NORTH SEA
Lübeck
Schwerin
Wilhelmshaven
Hamburg
Bremerhaven
Emden
Neubrandenburg
NETHERLANDS
Bremen
Gorleben
Peine
Berlin
Amsterdam
Hannover
Braunschweig
Ahaus
Osnabrück
(Asse / Konrad)
Rotterdam
Münster
Morsleben
Wolfenbüttel
Kalkar
Essen
Duisburg
Dortmund
GERMANY (FRG)
Mol
Düsseldorf
Kassel
Leipzig
Jülich
Cologne
Erfurt
Aachen
Bonn (BMFT)
BELGIUM
Plauen
Koblenz
Hanau
(ALKEM / NUKEM)
Wiesbaden
Frankfurt
Mainz
Darmstadt
CZECHOSLOVAKIA
Würzburg
Mannheim
Heidelberg
Saarbrücken
Nürnberg
Heilbronn
Wackersdorf
Metz
Karlsruhe
Regensburg
Stuttgart
FRANCE
Augsburg
Linz
Munich
(TUM)
Freiburg
Salzburg
Basel
Bregenz
Dijon
SWITZERLAND
AUSTRIA

GERMANY

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year	Jun	23	Pentecost Monday
Apr	14	Good Friday	Oct	3	Day of Unity
Apr	17	Easter Monday	Dec	25	Christmas
May	1	May Day	Dec	26	Boxing Day
May	25	Ascension			

TIME

Standard Time Washington, D.C.	**+ 6 hours**
Daylight Saving Time Period:	**03/27 - 09/24/95**

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S. $ = 1.75 Mark (DM)
per Wall Street Journal, 11/08/95. Because 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
Deichmanns Aue 29
53170 Bonn, Germany

Tel: 49-228-339-1
Fax: 49-228-339-2663

Science Counselor — Richard R. Ries

Population	1994	81	million

ENERGY

Electric Power Capacity	1993	115.8	GWe
		20%	**nuclear**
	1994	121.6	Gwe
		20%	**nuclear**
	1995	117.0	GWe
		20%	**nuclear**
	2000	118.0	GWe
		20%	**nuclear**
Electric Power Production	1993	533.3	TWh
		57%	coal
		30%	**nuclear**
		6%	gas
		3%	oil
		3%	hydro
		1%	solids
	1994	526.6%	Twh
		55%	coal
		29%	**nuclear**
		9%	gas
		2%	oil
		4%	hydro
		7%	solids
	1995	**27%**	**nuclear**
	2000	**25%**	**nuclear**

NUCLEAR POWER

Nuclear Power Capacity	1993	22.6	GWe
	1994	23.9	GWe
	1996	23.1	GWe
	2000	23.1	GWe
Reactor Mix	1994	PWR	14
		BWR	7

INDUSTRIAL FUEL CYCLE

Policy: Full commercial capability, enrichment, fuel fabrication, plutonium recycle to LWRs; reprocessing is to be handled by foreign plants. The amendment of the German Nuclear Act of 1994 permits to handle S. F. In both ways via reprocessing or via direct final disposal.

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

Cumulative SF Arisings (LWR)	1990	3,800 t U
	2000	10,150 t U
Cumulative LLW/ILW Arisings	2000	175,000 m^3 conditioned, radioactive waste with negligible heat production
Cumulative Heat-Producing Waste Arisings	2000	3,250 m^3 conditioned, radioactive waste with heat production

Industrial-Scale Activities

- Fuel fabrication capacity
  - UO_2 fuel: 1500 t U/yr
  - MOX fuel: 130 t HM/yr-LWR/10 t HM/yr-FBR fuel elem. (no operating license shut down decision passed)

- AFR spent fuel storage capacity
  - 1,500 t dry storage (Gorleben)
  - 1,500 t dry storage (Ahaus)

Major Milestones

• Acceptance of HLW from Cogema/La Hague and BNFL/Sellafield	1995
• Konrad (iron mine) repository (date pending)	1997/98
• Gorleben repository, HLW	2010

INTERNATIONAL RELATIONSHIPS

DOE/BMFT Agreement for Cooperative Radioactive Waste Management Technology Exchange

Term: 12-20-74 to 06-30-__ (has been extended in November 95)

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 with in situ tests at Asse salt mine; U.S. observation of shaft drilling at the Gorleben repository site; cooperation in tests of transport/storage casks; and waste transportation studies.

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

ORGANIZATION

- **Federal Government**
  - Coordinate nuclear program
  - Sponsor R&D
  - Construct/operate radioactive waste disposal facilities
  - Establish licensing requirements

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

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

GOVERNMENT RESPONSIBILITIES
NUCLEAR FUEL CYCLE/WASTE MGMT.

BMFT (Federal Ministry for Education and Research)

- Government fuel cycle/waste management R&D program administration

GSF/IfT
- Geologic waste disposal R&D
- Supporting lab work - salt properties
- Asse studies

FZK
- LWR fuel cycle waste treatment/packaging R&D
- LWR SF management alternatives - R&D
- HLW vitrification R&D
- Support work - geological/direct disposal of waste

KFA
- Waste treatment
- Support work - LLL/ILW disposal, including HTGR fuel elements

BMW (Federal Ministry for Economics)

BGR
- Geologic survey
- Salt dome repository R&D (salt properties, rock mechanics)

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

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

- Storage/transp./disposal of rad. Wastes
- Supervision of state licensing procedures
- Nuclear safety/radiation protection

-RSK (Reactor Safety Commission)

-SSK (Radiation Protection Commission)

-BfS

- Transportation/storage/licensing
- Responsibility for repository Construction/operation

LÄNDER (State Governments)

- Licensing of nuclear installations
- NMU (Lower Saxony Ministry of Environment)
- Licensing of final repositories (Konrad and Gorleben)

INDUSTRIAL/UNIVERSITY RESPONSIBILITIES

-DBE - Owned by 4 shareholders (one of them is GNS

- Construction/operation (repositories)
- Gorleben and Konrad projects
- Morsleben LLW disposal facility (ERAM)

DWK - Owned by Nuclear Utilities

-WAK (DWK Subsidiary)

NUKEM - Owned by RWE

- LLW/TRU waste treatment R&D facility design
- R&D SF packaging for disposal

GNS - Owned by Nuclear Utilities

- **Waste treatment/conditioning**
- **Transportation of radioactive materials**
- **Shipping cask development**
- **Engineering/D&D services**

BLG (GNS Subsidiary)

- **Operation of Gorleben SF/LLW storage facilities**
- **Construction of PKA**

BZA (GNS Subsidiary)

- **Operation of Ahaus SF interim storage facility**

NCS - Nuclear Cargo Service

- **Transportation of radioactive materials (owned by Deutsche Bahn AG)**

SBH - Owned by Siemens AG

- **Fabrication of uranium/MOX fuels, including R&D/waste management**

TUM - Technical University Munich

- **Actinide chemistry R&D**

BAM (Federal Materials Research/Testing Institute)

Bundesanstalt für Materialforschung
und - prüfung (BAM)
Unter den Eichen 87 Tel: 49-30-8104-0
12205 Berlin, Germany Fax: 49-30-811-5066

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

BfS (Federal Institute for Radiation Protection)

Bundesamt für Strahlenschutz
Postfach 10 01 49 Tel: 49-5341-188-0
38201 Salzgitter, Germany Fax: 49-5341-188-188

Chief Executive Alexander Kaul
Vice-President H. Rösel

BfS, Department of Nuclear
Waste Disposal/Transport
Bundesallee 100 Tel: 49-531-592-7601
38116 Braunschweig, Germany Fax: 49-531-592-7614

Director Helmut Röthemeyer
Dir., Project Mgmt. Bruno Thomauske
Dir., Waste Disposal/Safety Heinrich Illi
Radioactive Waste Peter W. Brennecke
49-531-592-7641
Geoscience Gerhard Stier-Friedland
Radiology/Radiation Protection Dietrich Ehrlich
System Analysis TBD
Dir., Transport/Storage of Wilhelm Collin
Rad. Mtl./Fuel Cycle

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

(contd next page)

BfS (Federal Institute for Radiation Protection)

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, 2010.

- **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, 1997/98.

- **Marsleben Site** (ERAM), 40 km west of magdeburg, former salt mine
  Mission: LAW disposal facility
  Milestone: Startup of disposal 1981

BGR (Federal Institute for Geosciences and Natural Resources)

Bundesanstalt für Geowissenschaften
und Rohstoffe
Stilleweg 2
Postfach 510153 Tel: 49-511-643-0
30655 Hannover, Germany Fax: 49-511-643-2304

Director, Engineering, Geology/Geotechniques	Michael Langer
Rock Mechanics	A. Pahl
Engineering Seismology	R. Lüdeling
Salt Mechanics	H. Albrecht
Mining Rock Mechanics	D. Meister
Salt Geology	W. Jaritz
Numerical Modeling	Manfred Wallner
Hydrogeology	H. Vierhuff
Groundwater Geophysics	W. Giesel

(contd next page)

BGR (contd)

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

BMFT (Federal Ministry for Research and Technology)

Bundesministerium für Bildung
und Forschung

Heinemannstrasse 2
Postfach 200240
53175 Bonn, Germany

Tel: 49-228-570
Fax: 49-228-57-3605

Minister, Science/Technology	Jüngen Rüthgers
Director General, Energy	Eckhard Lübbert
Fuel Cycle/D&D	Klaus Komorowski 49-228-59-3759
Waste Mgmt./D&D/Fuel	B. Abendnoth 49-228-59-3757
U Enrichment/Safeguards	A. H. Remagen 49-228-59-3755
Waste Disposal	Diethard Lummerzheim 49-228-59-3762
Direct Disposal	Hans G. Riotte 49-228-59-3761
Geological Disposal	W. Busch 49-228-59-3764

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

BMU (Federal Ministry for Environmental Protection/Reactor Safety)

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit	
Kennedyallee 5	Tel: 49-228-305-0
53175 Bonn, Germany	Fax: 49-228-305-3225
Minister	Angelika Merkel
Dir. Gen., Nuc. Installation Safety/Radiation Protection/ Nuclear Fuel Cycle	Hennen Lüden
Dir., Nuc. Installation Safety	M. Stein Kempen 49-228-305-2805
Director, Radiation Protection	Dr. Goust 49-228-305-2905
Director, Fuel Cycle	Arnolf Matting 49-228-305-2950
Policy	Dr. Bröcking 49-228-305-2930
Reprocessing/Conditioning	K. H. Berg 49-228-305-2821
Treatment/Storage/Transp.	Herbert Dreisvogt 49-228-305-2721
Final Repository	Manfred Bloser 49-228-305-2951
Chairman, Reactor Safety Commission (RSK)	Adolf Birkhofer
Chairman, Radiation Protection Commission (SSK)	Christian Steffen

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

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

Deutsche Gesellschaft zum Bau
und Betrieb von Endlagern
für Abfallstoffe mbH
Woltorfer Strasse 74 Tel: 49-5171-43-1
31224 Peine, Germany Fax: 49-5171-43-218

Managing Directors	Jürgen P. Lempert Manfred Florl Hans-Jürgen Krug
Project Gorleben, Mgr.	Wolfgang Schulz 49-5171-43-250
Project Konrad, Mgr.	Rüdiger Putzer 49-5171-43-310
Project-Related R&D, Mgr.	Hans-Jürgen Engelmann 49-5171-50-3370

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

DWK (German Fuel Reprocessing Company)

Deutsche Gesellschaft für
Wiederaufarbeitung
von Kernbrennstoffen mbH
Baringstrasse 6 Tel: 49-511-3668-0
30022 Hannover, Germany Fax: 49-511-3668-207

Manager Bernd Zur Nedden

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

ERAM (LLW Repository)

Endlager für Radioaktive
Abfälle Morsleben
Am Schacht 105
39343 Morsleben, Germany

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

Manager Klaus Ebel
49-39050-8-200

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

FZR (Forschungszentrum Rossendorf)

Research Center Rossendorf, Inc.

The Research Center Rossendorf, Inc. ("FZR"), is located on the eastern outskirts of Dresden. It was founded in January 1992 on a research site exisiting since 1956.

The Research Center Russendorf, Inc. Is engaged in pure and application oriented basic research. Research topics are Biomedicine/Chemistry, Radioecology, Materials Science, Nuclear Physics, and Safety Research

The FZR is funded in equal parts by the Federal Republic of Germany and Free State of Saxprey. Permanent staff are approximately 450 people. Additionally, there is a scientific staff of about 150 people mainly based on project sources. The FZR operates several different linear accelerators and cyclotrons and other special experimental facilities.

Scientific Director: W. Hafele
Tel: 49-351-260-3350

Administrative Director: G. Panuewski
Tel: 49-351-260-3350

- Research Divisions
- Technical Divisions
- Publications
- WWW

(contd next page)

FZR (contd)

FORSCHUNGSZENTRUM ROSSENDORF c.V.
P.O. Box 51 01 19 Tel: 49-351-260-0
D-01314 Dresden Fax: 49-351-269-0461

Research Divisions

Institutes:

- Ion Beam Physics and Materials Research
- Bioinorganic and Radiopharmaceutical Chemistry
- Radiochemistry
- Nuclear and Hadronic Physics
- Safety Research

Director: H. Mitsche
Tel: 49-351-260-3210
Director: F. P. Weif
Tel: 49-351-260-3480

Function: Specification and migration of radionuclides. Interaction of Radionuclides with organic matter. Chemistry of heaviest elements.

Scientific Departments:

- Experimental facilities and information technology
- Analytical Chemistry
- New Accelerators

Technical Divisions

- Communication and data processing
- Library
- Technical Services
- Safety and Security

GNS (Company for Nuclear Service)

Gesellschaft für
Nuklear-Service mbH
Hollestrasse 7A
45130 Essen, Germany

Tel: 49-201-409-0
Fax: 49-201-409-1100

Managing Directors

Wolfgang Hawickhorst
49-201-109-1200
Klaus Janberg
49-201-409-1400
Norbert Semann
49-201-109-1600

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

Ownership: Nuclear utilities.

Facilities

- **AFR Spent Fuel Storage Facilities** (Gorleben and Ahaus sites, operated by GNS subsidiaries, BLG, and BZA, respectively)
  Design Basis: Dry storage in CASTOR casks - 400 casks (in 183 x 138 x 19-m-high building).
  Capacity: 1500 t each facility.
  History: Startup of AFR at Gorleben has been delayed due to litigation. Ahaus went into operation in 1992.

- **PKA Pilot Fuel Conditioning Plant** (Gorleben)
  Mission: Demonstration of SF conditioning and encapsulation to meet the requirements for interim storage and final disposal.

  Design Basis: Hot cell with installations for rod consolidation, compaction of fuel assembly hardware, loading of canisters; maximum throughput 35 t HM/yr.
  Milestone: Startup, 1996.

GRS (Company for Reactor Safety)

Gesellschaft für
Reaktorsicherheit mbH
Schwertnergasse 1
50667 Köln, Germany

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

General Manager — Adolf Birkhofer

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

GSF/FBA (Research Center for Environmental Sciences/Asse Research Mine)

GSF-Forschungsbergwerk Asse
Postfach 1461
38284 Wolfenbuttel, Germany

Tel: 49-5536-880
Fax: 49-5336-89379

Director:	Manfred W. Schmidt Tel: 49-5336-89-219
Scientific Advisor	Volker Schauermann Tel: 49-5336-89-232
Mine Surveying:	Gerd Hensel Tel: 49-5336-89-213
Radiation Protection:	Herbert Meyer Tel: 49-5336-89-234
Finance/Controlling	Rolf Stippler Tel: 49-5336-89-360
Construction:	Helmut Kolditz 49-5336-89-350

Facilities

- Asse Research Mine (12 km southeast of Wolfenbuttel) 38319 Remlingen, Germany — Tel: 49-5336-890

Mission:

- In-situ-testing for a salt dome repository
- Backfilling of old mine workings
- From 1967 through 1978, disposal of LLW and HLW.

KFA (Jülich Research Center)

Forschungszentrum Jülich GmbH
Postfach 1913
52245 Jülich, Germany

Tel: 49-2461-61-0
Fax: 49-2461-61-5327

Director, Institute of Chemical Technology (ICT)	TBD
Director, Institute of Reactor Materials (IRW)	Hubertus Nickel 49-2461-61-3058
ILW/SF/HTGR Fuel Disposal	Heiner Brücher 49-2461-61-6409
Waste Treatment (ZFK-DE)	Stephan R. Halaszovich 49-2461-61-5288
Quality Assurance (PKS)	Reinhard Odoj 49-2461-61-6190
Hot Cell Facility (GHZ)	Günter Pott 49-2461-61-3196

Function: Develop advanced waste management technologies.

Activities: Hot cell experiments dealing with the development of advanced ILW/HLW conditioning processes; characterization of waste products/packages; conditioning of radioactive wastes generated from research center; development/demonstration of quality assurance measures for waste packages; retrievable in situ testing of ILW disposal techniques in Asse salt mine, including direct disposal of HTR fuel elements; LLW incineration using Jülich furnace design.

FZK (Research Center Karlsruhe)

Kernforschungszentrum
Karlsruhe GmbH
Postfach 3640
76021 Karlsruhe, Germany

Tel: 49-7247-820
Fax: 49-7247-82-5070

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

(contd next page)

FZK (contd)

Director, Inst. for Technology and Institute for trade Chemistry (ITC)	Klaus Ebert 49-7247-82-2400
Director, Institute for Nuc. Waste Technology (INE)	Jä-ii Kim 49-7247-82-2230
Process Engineering	S. Weisenburger 49-7247-82-4288
Director, Institute for Radiochemistry (IRCh)	Prof. Ache 49-7247-82-3200
Director, Ctrl. Eng. Dept. (HIT)	Hermann Rininsland 49-7247-82-3000
Decommissioning of WAK and research reactors, operated by FZK	Walter Müller-Dietsche 49-7247-82-5930
Program Management "Entsorgung" (PTE)	Klaus-Detlef Closs 49-7247-82-5790

Facilities

- **Ceramic Melter**
  Mission: HLW vitrification process development with ceramic melter for the PAMELA pilot plant.

  Design Basis: Liquid-fed, joule-heated melter; PAMELA capacity: 30 L/hr HLLW or 30 kg/hr glass.
  History: Startup PAMELA melter, 1976; Mark 1, 1985, hot; Mark 2, 1990, cold, Mark 3 1993, cold.

- **Waste Concreting Plant** (radioactive)
  Mission: Immobilize KfK ILW.
  Design Capacity: 1.2 m^3/d waste.
  History: Startup, 1986.

NMU (Lower Saxony Ministry of Environment)

Niedersächsisches Umweltministerium
Archivstrasse 2
Postfach 41 07 Tel: 49-511-104-0
30041 Hannover, Germany Fax: 49-511-104-3399

Minister	Monika Griefahn
Dir., Nucl.Energy/Rad.Protection	Klaus-Dieter Becherer
Final Repositories	Klaus-Arno Beckers 49-511-104-3550
NFC (WM/Reprocessing/SF)	Dietmar A. Kopp 49-511-104-3503

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

NUKEM

NUKEM GmbH
Industriestrasse 13
P.O. Box 1313 Tel: 49-6023-91-01
63754 Alzenau, Germany Fax: 49-6023-91-1222

Managing Directors	L. Aumüller, H. A. Pirk H. W. Binzel, P. Schmidt
Process Engineering	O. Pfahls
Fuel Cycle Services	H. Keese
Non-Destructive Testing	H. Hüschelrath
Environmental Technology	P.G. Maurer
Solar Energy Technology	W. Hoffmann
Nuclear Engineering	E. Wehner

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.

DETEC

Decommissioning Technologies, GmbH
Industriestrasse 13
63755 Alzenau, Germany

Tel: 49-6023-91-04
Fax: 49-6023-91-1222

Managing Directors: Gerwin Rasche, Peter Mildwein

Function: Provide services for D&D, engineering, remote handling systems.

SBH

Siemens AG Brennelementewerk Hanau
Postfach 110060
63434 Hanau, Germany

Tel: 49-6181-58-0
Fax: 49-6181-58-3502

Production Manager: Jürgen Krellmann, 49-6181-58-4599

Chemistry/Waste Management: F. W. Ledebrink, 49-6181-58-4169

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

Facilities

- **Fuel Fabrication Plants**

  Capacity UO_2 - 1500 t HM/yr LWR fuel (will be decommissioned in 1995).
  MOX - 130 t HM/yr LWR fuel or 10 t HM/yr FBR fuel (plant constructed, no operating license will be decommissioned)

TUM (Technical University Munich)

Technische Universität München
Institut für Radiochemie
Walther-Meissner-Strasse 3
85748 Garching b. München
Germany

Tel: 49-89-3209-220
Fax: 49-89-3209-2204

Director Franz Baumgärtner

VKTA (Nuclear Engineering/Analytics Company)

Verein für Kernverfahrenstechnik
und Analytik Rossendorf e.V.
Postfach 510 mg
01314 Dresden, Germany

Tel: 49-351-260-0
Fax: 49-351-269-0461

General Manager Wolf Häfele
49-351-260-3350

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

Facilities

- **ABÜS** (Waste treatment plant)
  Laboratory- and pilot-scale R&D of LLW/HLW treatment processes: volume reduction (evaporation, press compaction, solidification); conditioning, using novel (remote) handling techniques (two hot cells). Completed in 1991; hot operation in 1996.

- **SWA** (Waste water processing/treatment plant)
  Treatment consisting of mechanical filtration, ion exchange for low-salt wastes, and evaporation for high-salt wastes and wastes containing boric acid.

- **Radioisotope Production Facilities**

WAK (Fuel Reprocessing Company)

Wiederaufarbeitungsanlage Karlsruhe
Betriebsgesellschaft mbH
Postfach 1263
76339 Eggenstein-Leopoldshafen
Germany

Tel: 49-7247-88-0
Fax: 49-7247-4755

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

Chief Executive	R. Heere 49-7247-88-2201
Technical Oversight and dismantling work	Horst P. Wiese 49-7247-88-2118
Plant Manager	Martin Weishaupt 49-7247-88-2298
Decommissioning	Klaus Eiben 49-7247-88-2117
Waste Conditioning/Transport	Joachim Fleisch 49-7247-88-2230

Facilities

- **WAK Reprocessing Plant** (owned by FZK)
  Mission: Reprocess UO_2 and MOX fuels; recover plutonium for recycle; test advanced technology.
  Design Basis: Chop-leach head-end; PUREX process; capacity, 0.175 t HM/d.
  History: On-line from September 1971 to early 1980, when it was shut down for dissolver replacement; operation resumed October 1982; total throughput to December 1990, approx. 210 t HM (130 t HM from LWR fuel); shut down December 31, 1990; decommissioning/dismantling plans in progress.

- **PAMELA Pilot Plant** (Mol, Belgium - ownership transferred to Belgoprocess in 1986; operated by WAK/Belgoprocess team)
  Mission: Demonstrate ceramic melter and VITROMET production with stored Eurochemic HLLW.

(contd next page)

WAK (contd)

Design Basis: Liquid-fed ceramic melter, 0.72 m^2 surface area; capacity, 36 L/hr feed, 25 kg/hr glass (three canisters/d of 150-kg glass/canister); product, borosilicate glass blocks, 0.3 m diameter by 1.2 m high.

History: Hot operation, startup 1985 (KfK development); as of August 1991: 910 m^3 waste vitrified, 2,180 canisters filled; tanks now empty, plant in standby condition, to vitrify WAK-WAWC.

INDIA


Peshawar
Islamabad
AFGHANISTAN
CHINA
Amritsar
Lahore
PAKISTAN
Lhasa
Delhi
New Delhi
NEPAL
BHUTAN
Hyderabad
Jaipur
Agra
Lucknow
Jodhpur
Kanpur
Karachi
Patna
Allahabad
Varanasi
BANGLADESH
Ahmadabad
Jamshedpur
Indore
Jabalpur
Calcutta
BURMA
Surat
Nagpur
Cuttack
Tarapur
Trombay
INDIA
Bombay
Poona
Bay of Bengal
Arabian Sea
Hyderabad
Vishakhapatnam
Bangalore
Mangalore
Madras
Mysore
Kalpakkam
Cochin
INDIAN OCEAN
SRI LANKA
0
800 km
N
0
500 mi

INDIA

MAJOR PUBLIC HOLIDAYS (1995)

Jan	26	Republic Day	Jun	9	Muharram
Feb	27	Mahashiuvatri	Aug	10	Milad-un-Nabi
Mar	3	Idu'l Rotr	Aug	15	Independence Day
Mar	17	Holi	Aug	18	Janamasktami
Apr	13	Mahavir Jaganti	Oct	2	Mahatma Gandhi's Birthday
Apr	14	Good Friday	Oct	3	Dussehra
May	11	Idulzuha	Oct	23	Festival of Lights
May	14	Buddha Purnima	Nov	7	Guru Nanak's B'day
			Dec	25	Christmas

TIME

Standard Time Washington, D.C. **+ 9.5 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. $ = 34.6 Rupee

per Wall Street Journal, 11/08/95. Because rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct dial to India are complete as listed, after dialing international access code: **011**. Country code is **91**; listed local numbers include city code.

U.S. EMBASSY - NEW DELHI

American Embassy
Shanti Path
Chanakyapuri
New Delhi 110021, India

Tel: 91-11-600-651
Fax: 91-11-687-2391 (Embassy)
Fax: 91-11-687-6033 (Science office)

Science Counselor — Paul C. Maxwell

Population	1994	919.9	million

ENERGY

Electric Power Capacity	1993	70.7	GWe
		<3%	**nuclear**
	1997	100	GWe
		<3%	**nuclear**
Electric Power Production	1993	323.5	TWh
		20%	coal
		77%	hydro
		<3%	**nuclear**
	1997	**10%**	**nuclear**

NUCLEAR POWER

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

Due to resource and technical problems, it is doubtful that 1997 nuclear power forecasts (end of eighth five-year plan) can be met; commissioning of the 500 MW FBR by the year 2000 is highly unlikely.

Nuclear Power Capacity	1993	1.7	GWe
	1995	2.2	GWe
	2000	3.5	GWe
Reactor Mix	1994	BWR	2 (1969)
		HWR	8 (1973-94)
			6 (1996-01)
Reactor Development	1985	FBR	12-15 MWe test unit
	2000	FBR	500 MWe commercial

INDUSTRIAL FUEL CYCLE

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

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

Cumulative Spent Fuel	1990	1,580 t U
Arisings (LWR/HWR)	2000	5,000 t U

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

Industrial-Scale Activities

• Heavy-water design capacity (t/yr):	1993	719
• Uranium mining and milling (t/yr):	1985	130
	1988	170
• UO_2 fuel fabrication (t/yr):	1984	210
	2000	1,500
• Fuel reprocessing (t/yr):		
Trombay pilot plant	1962	30
Tarapur plant	1982	100
Kalpakkam plant	1992/93	100

• HLW vitrification: Tarapur (1985)

Major Milestones

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

INTERNATIONAL RELATIONSHIPS

Member of Board and Governors of IAEA since its inception. Agreement with U.S. on peaceful nuclear cooperation. Elected Chairman of the Board of Governors of IAEA (September 94 - September 95).

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

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

India signed International Convention on Nuclear Safety at Vienna in 1994.

ORGANIZATION

Prime Minister

- **Atomic Energy Commission**
  - **Department of Atomic Energy**
    - **Atomic minerals**
    - **Nuclear fuels**
    - **Power project engineering**
    - **Research and development**
      - **Bhabha Atomic Research Centre, Trombay, Bombay**
        - **Fuel cycle R&D**
        - **Waste management R&D**
        - **Research reactors**
      - **Indira Gandhi Centre for Atomic Research, Kalpakkam**
        - **Fuel cycle R&D**
        - **Waste management R&D**
        - **Fast reactor technology**

BARC

Bhabha Atomic Research Centre, Trombay
Bombay 400 085, India

Tel: 91-22-551-4910
91-22-556-4716
Fax: 91-22-556-0750

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

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

Facilities

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

- **WIP (Waste Immobilization Plant) - Trombay**
  Startup: construction, 1981; commissioned 1985; hot operation, 1990.

- **Experimental Uranium Enrichment Facility**

DAE

Atomic Energy Commission (AEC) Tel: 91-22-202-2543
91-22-202-6823
Fax: 91-22-204-8476

Chairman R. Chidambaram
Secretary K. V. Mahadeva Rao

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

Minister, Science/Technology Bhuunesh Chaturvedi

Atomic Energy Regulatory Board (AERB)
Chairman A. Gopalakrishnan

Function: Regulation and licensing of nuclear facilities.

Nuclear Power Corporation (formerly Nuclear Power Board)
Managing Director Y.S.R. Prasad

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 Tel: 91-4117-40240
Tamil Nadu, India Tlx: 041-6244
Fax: 91-4117-40360

Fast Breeder Reactor Centre, Director Placid Rodriguez

Located near Madras power station.

(contd next page)

IGCAR (contd)

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

Facilities

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

KAPS

Kakrapar Atomic Power Station (2 x 220 MWe PHWRs)
Gujaral

KOLAR WASTE DISPOSAL RESEARCH STATION

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

Function: Assess the suitability of peninsular gneisses for location of a deep geologic 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.

(contd next page)

MAPS (contd)

Facilities

- **Fuel Reprocessing Plant Kalpakkam**
  Mission: Reprocess spent fuel from the Kalpakkam reactors and from the 15-MW FBTR commissioned in 1985.

  Design Basis: PUREX process, with a separate line for FBTR mixed-carbide fuels; capacity, originally 0.5 t HM/d for PHWR fuels, now increased to 200 t HM/yr; cold operation, 1991.

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

- **ISF (Interim Storage Facility)-Kalpakkam**

NAPS

Narova Atomic Power Station (2 x 220 MWe PHWRs)
Uttar Pradesh.

NFC

Nuclear Fuel Complex
Hyderabad, India

Facilities

- **Fuel Fabrication Plant** - Initial throughput of 50 t/yr increased by 1990 to 350 t/yr; expected to go to 600 t/yr; manufactures seamless stainless tubes and produces special materials; NFC has produced a special alloy of niobium, hafnium, and titanium for India's space programs that has been successfully tested.

NSC

Nuclear Science Center
New Delhi, India

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

Facilities

- **Pelletron Accelerator Facility** - Commissioned early in 1991; housed in 30-m-high tower; can accelerate atoms up to 16 MeV.

RAPS

Rajasthan Atomic Power Station (100, 200 MWe PHWRs)
Rjasthan.

Function: Both reactors have been shut down indefinitely since April 1995 due to heavy water leakage in the core.

TAPS

Tarapur Atomic Power Station
Tarapur, Maharashtra, India

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

Facilities

- **PREFRE (Fuel Reprocessing Plant) - Tarapur**
  Mission: Reprocess natural and low-enriched UO_2 fuels.
  Design Basis: Chop-leach head-end; PUREX flowsheet; contact maintenance; capacity, 150 t HM/yr.
  History: Construction completed, 1975; hot operation, 12/1982.

- **WIP (Waste Immobilization Plant)**
  Mission: Vitrify Tarapur HLW.
  Design Basis: Two-step calcination and melting in drainable pot; capacity, 25 L/hr HLLW, 125 kg glass/canister, one canister/d; product, borosilicate glass blocks.
  History: Construction completed, 1981; hot startup, 1990.

- **SSSF** (Solid Storage Surveillance Facility)
  Mission: Provide air-cooled storage for WIP products.
  Design Basis: Stack-induced natural draft air cooling; capacity for 20 years' storage of vitrified HLW from Tarapur and Trombay.
  History: Completion, 1990.

- **ILW Bituminization Plant**

- **Polymerization Facility**

- **Pilot (hot cell-sized) Mox Fuel Fabrication Facility** (1990)

ITALY


SWITZERLAND
Lausanne
Geneva
FRANCE
AUSTRIA
Klagenfurt
HUNGARY
Ispra
Bergamo
Saluggia
Brescia
Milan
Padua
Verona
Trieste
Turin
Venice
Parma
Genoa
Bologna
YUGOSLAVIA
Savona
Ravenna
Pisa
SAN MARINO
LIGURIAN SEA
Florence
Livorno
Ancona
ADRIATIC SEA
ITALY
CORSICA (To France)
Rome
Bari
Naples
Salerno
Taranto
Brindisi
SARDINIA
Rotondella (Trisaia)
Cagliari
TYRRHENIAN SEA
Palermo
Messina
MEDITERRANEAN SEA
SICILY
IONIAN SEA
Catania
TUNISIA
0 160 km
N
0 100 mi

ITALY

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year
Jan	6	Epiphany
Apr	14	Easter
Apr	25	Liberation Day
May	1	Labor Day
Aug	15	Assumption
Nov	1	All Saints Day
Dec	8	Immaculate Conception
Dec	25-26	Christmas

TIME

Standard Time Washington, D.C. **+ 6 hours**
Daylight Savings Time Period: **03/26 - 09/23/95**

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S. A visa is currently not required for a visit to Italy.

CURRENCY EXCHANGE RATE

1 U.S. $ = 1593.25 Lira
per Wall Street Journal, 11/08/95. Because 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: 39-6-4674-2275
Fax: 39-6-4674-2663

Science Counselor — Gregory J. Dunn

Population	1994	58.1	million

ENERGY

Electric Power Capacity	1993	62.4	GWe
	1995	66.5	GWe
	2000	76.6	GWe
Electric Power Production	1992	222.7	TWh
		52%	oil
		19%	hydro
		16%	gas
		11%	coal
		2%	geothermal

NUCLEAR POWER

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

INDUSTRIAL FUEL CYCLE

Waste Management Strategy: Spent fuel from previous nuclear power plant operations has been reprocessed abroad; vitrified HLW will be returned, starting in 1995; canisters will be temporarily stored until a final repository is available (clay formations are being considered); dry storage onsite is presently planned by ENEL; no site for disposal of LLW/ILW has been selected.

Cumulative SF Arisings	1990	342	t U LWR
		1,353	t U GCR

INTERNATIONAL RELATIONSHIPS

Member of EC, IAEA, and OECD/NEA; CEC Joint Research Center establishment is located in northern Italy at Ispra.

ORGANIZATION

- **ENEA** (Agency for New Technologies, Energy and Environment) - applied R&D activities carried out in the three sites of Casaccia, Saluggia, and Trisaia.
- **ANPA** (National Agency for Environmental Protection) - regulatory body; inspection/control and health/environment protection.
- **ENI** - government-owned oil and energy holding company.
- **Nucleco** - company jointly owned by ENEA/ENI; LLW/ILW management (except disposal).
- **FN** (Fabricazioni Nucleari) - former fabrication factory; presently developing new materials.
- **ENEL** - state-owned power utility.

ENEA (Agency for New Technologies, Energy & Environment)

Ente per le Nuove Tecnologie,
l'Energia e l'Ambiente
Viale Regina Margherita 125 Tel: 39-6-8528-1
00198 Rome, Italy Fax: 39-6-8528-2591

President	Nicolo Caribbo
Director General	Fabio Pistella
Director, Energy Dept.	Sergio Garribba
Director, Fusion	Roberto Andreani
Dir., D&D/WM	Franco Pozzi
Asst. Dir., SF/WM	Piero Risoluti

Function: Direct basic and applied research on energy and environment (mostly non-nuclear). Current nuclear-related work includes cooperation in international programs and is carried out in three sectors: Fusion, Innovative Reactors, and Decommisioning and Waste Management.

Nuclear Activities - Dismantling: Decommission facilities, remove stored nuclear material. Tasks: condition liquid/solid radioactive wastes stored at the Eurex (Saluggia) and Itrec (Trisaia) plants and the Casaccia Center; remove spent fuel from reprocessing pilot plants; decontaminate and dismantle plants and laboratories, including plutonium oxide fuel fabrication laboratory.

Owner: Government.

ENEL (National Electric Energy Agency)

Ente Nazionale per
l'Energia Elettrica
Casella Postale 386
Via Giovan Battista Martini 3 — Tel: 39-6-8509-1
00198 Rome, Italy — Fax: 39-6-8509-3370

Chairman — Franco Viezzoli

Government body responsible for all electric power production.

FN

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

Chairman — C. Boffa

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

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

NUCLECO

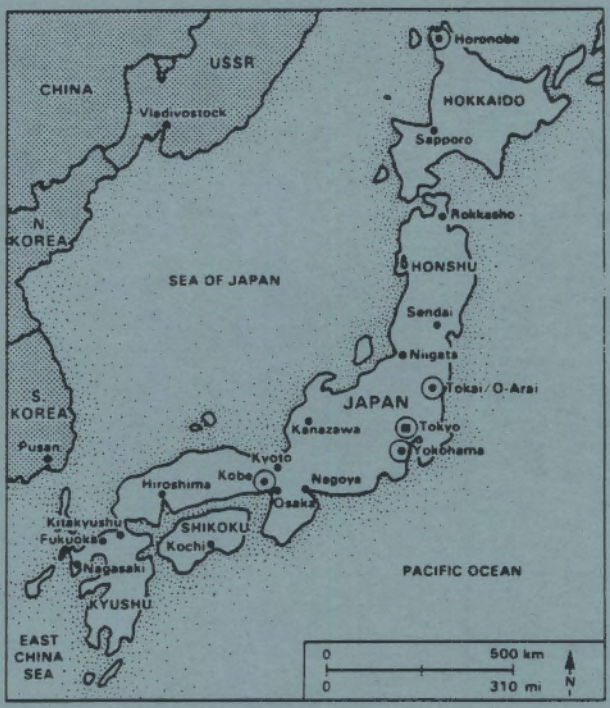
Nucleco
Via Anguillarese 351 Tel: 39-6-3046-302
00060 Rome, Italy Fax: 39-6-3048-3081

Chairman P. Venditti

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

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

JAPAN


USSR
CHINA
Vladivostock
Horonobe
HOKKAIDO
Sapporo
Rokkasho
N. KOREA
HONSHU
SEA OF JAPAN
Sendai
Niigata
Tokai/O-Arai
S. KOREA
JAPAN
Kanazawa
Tokyo
Yokohama
Pusan
Kyoto
Kobe
Nagoya
Hiroshima
Osaka
Kitakyushu
Fukuoka
SHIKOKU
Kochi
Nagasaki
PACIFIC OCEAN
KYUSHU
EAST CHINA SEA
0
500 km
0
310 mi
N

JAPAN

MAJOR PUBLIC HOLIDAYS (1995)

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

TIME

Standard Time Washington, D.C. **+ 14 hours**

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S. $ = 103.18 Yen

per Wall Street Journal, 11/08/95. Because rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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

U.S. EMBASSY - TOKYO

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

Tel: 81-3-3224-5000
Fax: 81-3-3589-4235

Science Minister-Counselor — Michael A. Michaud
Tel: 81-3-4334-5500
Fax: 81-3-3224-5229

DOE Representative — Milton A. Eator
Tel: 81-3-3224-5444/78
Fax: 81-3-3224-5769

Population	1994	125.1	million

ENERGY

Electric Power Capacity	1993	186.2	GWe
		20%	**nuclear**
	1995	195	GWe
		20%	**nuclear**
	1997	212	Gwe
		21%	**nuclear**
	2000	222.7	GWe
		21%	**nuclear**
	2002	262	GWe
		21%	**nuclear**
Electric Power Production	1993	888.3	TWh
		31%	oil
		30%	**nuclear**
		20%	gas
		15%	coal
		9%	hydro
	1995	**31%**	**nuclear**
	1997	**33%**	**nuclear**
	2000	**35%**	**nuclear**
	2002	**34%**	**nuclear**

NUCLEAR POWER

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

Nuclear Power Capacity	1993	36.7	GWe
	1995	39.6	GWe
	1997	45.1	GWe
	2000	47.5	GWe
	2002	54.1	Gwe
Reactor Mix	1994	GCR	1 (1966)
		HWR	1 (1979)
		BWR	25 (1969-93)
			3 (1995-97)
		PWR	21 (1970-94)
			2 (1995-97)
		FBR	1 (1995)

Reactor Development HWR (ATR), LMFBR, HTGR

INDUSTRIAL FUEL CYCLE

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

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

Cumulative SF Arisings (LWR)	1990	7,500	t U
	1991	12,400	t U

Industrial-Scale Activities (Capacity)

• Uranium mining and conversion (t UF_6/yr):		200
• Uranium reconversion (t U/yr):		1,028
• Uranium enrichment (t SWU/yr):	1981	50
	1988	250
	2000	3,000

• Fuel fabrication		
- UO_2 for LWR (t U/yr):	1987	2,495
- MOX for FBR (t/yr):	1988	6
- MOX for ATR (t/yr):	1988	10
	1993	50
• Reprocessing (t/yr):	1981	210
	2000	1,010

Major Milestones

• Storage facility for vitrified HLW from COGEMA/BNFL	1995
• Fuel reprocessing plant (Rokkasho-mura) SF storage	1995
reprocessing operation	1999
• Selection of demonstration site for in situ test with HLW disposal package	>2000
• FBR fuel reprocessing pilot plant operation	>2000
• Startup of HLW disposal site	>2000
• Experimental ocean disposal of LLW	TBD

INTERNATIONAL RELATIONSHIPS

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

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

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

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

ORGANIZATION

Government funds nuclear R&D and is responsible for HLW disposal; industry handles the commercial fuel cycle and LLW disposal and pays for HLW disposal.

NUCLEAR FUEL CYCLE/WASTE MANAGEMENT ORGANIZATION

Prime Minister

- **AEC**
  - * Nuclear program policy
  - * Advistory Committee on Radioactive Waste
  - * HLW Overall Program Committee
- **NSC**
  - * Safety

- **MITI**
  - * Nucl. power development
  - * Nucl. power reactor licensing
  - * Comm. fuel cycle/ waste management
  - * Indus. sponsors (util., manufacturers, etc.)
  - **CRIEPI**
    - * R&D for utilities
    - * SF storage tech.
    - * Properties of LLW packages
  - **JNFL**
    - * HLW storage
    - * LLW storage/disposal
    - * U enrichment
    - * Reprocessing
    - * Waste Treatment
    - * Fuel Cycle Equipment
  - **RMC**
    - * LLW disposal R&D
    - * Environmental monitoring/safety

- **STA**
- **NSB**
  - * Tech. support to NSC
  - * Safety
  - * Regulation
  - * Radiation protection
- **NIRS**
  - * Radiological sciences
- **AEB**
  - * Tech. support to AEC
  - * Policy
  - * Research
  - * Development
- **PNC**
  - * Fuel cycle process development/demonstration (U enrichment, reprocessing, MOX fuel fabrication waste management
  - * Advanced reactor development
- **JAERI**
  - * Reactor safety R&D
  - * Waste management & environmental safety assessments
  - * HLW partitioning

___ Government
- - - Semi-government or industry

PARTIAL PNC ORGANIZATION

President-Board of Directors

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

PARTIAL JAERI ORGANIZATION

President

- Takasaki Radiation Chemistry Research Establishment
- Oarai Research Establishment
- Naka Fusion Research Establishment
- Tokai Research Establishment
  - Department of Reactor Engineering
  - Department of Fuels and Materials Research
  - Department of High Temperature Engineering
  - Department of Research Reactor Operation
  - Department of JPDR
  - Department of Radioisotopes
  - Nuclear Safety Research Center
    - Department of Reactor Safety Research
    - Department of Fuel Safety Research
    - Department of Reactor Fuel Examination
    - Department of Environmental Safety Research
      - Environmental Radioactivity
      - Radioactive Waste Management
      - Airborne Waste-Environmental Safety

AEB

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

Tel: 81-3-3581-1686
81-3-3581-5271
Fax: 81-3-3581-2585

Director General	Isamu Sasayama
Deputy Director General	Toshio Okazaki
Director, Policy Div.	Tetsuhisa Shirakawa
Dir., Power Reactor Dev. Div.	Ryo Kimura
Dir., Nuclear Fuel Div.	Shinichiro Izumi
Dir., Research/Internatl. Div.	Hiroshi Nagano

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

AEC

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

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

Chair (Minister of State for Science/Technology)	Yasuoki Urano
Vice-Chairman Chair	Yoshinori Ihara

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

CRIEPI

Central Research Institute
of Electric Power Industry
1-6-16, Ohtemachi
Chiyoda-ku, Tokyo 100, Japan

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

President	Susumu Yoda

(contd next page)

CRIEPI (contd)

Function: Provide R&D support for utilities.

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

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

Function: Laboratory under CRIEPI.

GIRIO

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

Director, Department
of Optical Materials
Teruo Kodama

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

HITACHI

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

President Tsutomu Kanai
Gen. Mgr., Nuc. Power Systems Div. Tsutomu Hayashi
Sr. Chief Engineer Atou Shimozato
Nuclear Power Development Ryoichi Kondo

Waste Management R&D: Development of volume reduction systems for radioactive waste; application of automation and robotics technology; development of advanced control technology using fiber optics.

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

President Akira Sakai

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

IHI

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

President Kousaku Inaba
Senior Managing Director Ukichi Kishino
Gen. Mgr., Nucl. Power Sales Hiroshi Tomioka

(contd next page)

IHI (contd

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

Tel: 81-45-751-1231
Fax: 81-45-753-9564

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

JAERI

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

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

President	Shozo Shimomura
Vice President	Masaji Yoshikawa
Vice President	Shojiro Matsuura
Exec. Director, International	Hirofumi Satake

Location: JAERI headquarters and radioisotope center are in Tokyo; the Tokai and Oarai research establishments share government reservations with PNC at Tokai-mura and Oarai-machi; Tokai and Oarai are 120 and 100 km, respectively, northeast of Tokyo, near the ocean; these sites can be reached by train from Tokyo to the city of Mito, then by taxi; the Naka Research Establishment (fusion energy) is in Naka-machi near Tokai-mura.

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

JAERI: OARAI

Japan Atomic Energy Research Institute
Oarai Research Establishment
Oarai-machi
Higashi-Ibaraki-gun
Ibaraki-ken Pref. 311-13, Japan

Tel: 81-292-67-4111
Fax: 81-292-66-2235

Director General — Yoshihiko Kaneko

JAERI: TOKAI

Japan Atomic Energy Research Institute
Tokai Research Establishment
Tokai-mura, Naka-gun
Ibaraki-ken Pref. 319-11
Japan

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

Director General — Michio Ichikawa
Deputy Director General — Takeshi Tamagawa
Deputy Director General — Takeshi Tsujino
Deputy Director General — Shinzo Saito

Facilities

- **WASTEF** (glove box and hot cell facilities)
  Mission: HLW safety evaluations.
  History: Cold startup, 1981; hot, 1982.

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

- **NUCEF**
  Facility to conduct research on safety of SF reprocessing and treatment of radioactive wastes to support licensing review by STA on reprocessing plant being constructed by JNFL.

  STACY (Static Experimental Critical Facility)

(contd next page)

JAERI: TOKAI (contd)

TRACY (Transient Experimental Critical Facility)

Experimental Facility for TRU (research on separation/recovery of TRU)

JGC

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

President	Eiji Watanabe
Director Advisor	Takao Nakajima
General Manager, Director	Hiroshi Kuribayashi
Deputy General Manager	Keisuke Okazaki

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
Japan Fax: 81-292-66-8810

Nuc. & Adv. Tech. Projects Tomiaki Yamada

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

(contd next page)

JGC (contd)

Facilities

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

- **Contaminated Liquid Waste Recycle Plant**
  Mission: Recovery of clean water from LLLW for re-use.
  Design Basis: 75 L/min.; filtration; reverse osmosis; active carbon bed adsorption; chelate resin adsorption; ion-exchange adsorption; evaporation.

JNFL

Japan Nuclear Fuel Limited
1-12-15 Honcho, Aomori-shi
Aomori 030, Japan

Tel: 81-177-73-7171
Fax: 81-177-31-1551

President — Kiyoshi Nozawa
Vice Presidents — Tetsuo Hirasawa
Kiyoshi Fuseya
Hiroshi Takashina
Hideto Kamekawa

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

Owner: Japanese utilities (10).

JNFL Tokyo Branch Office
Daiichi Seimei Bldg.
2-10 Hirakawa-cho 1-chome
Chiyoda-ku, Tokyo, Japan

Tel: 81-3-3239-6521
Fax: 81-3-3239-6479

(contd next page)

JNFL (contd)

Rokkasho Works Construction Office
504-22 Aza Notsuke, Oaza Obuchi
Rokkasho-mura, Kamikita-gun Tel: 81-175-72-3311
Aomori-ken, Japan Fax: 81-175-72-3228

Managing Director/Gen. Manager Yuuta Suzuki

Facilities

- **Uranium Enrichment Plant** (at Oishitai, Rokkasho-mura).
  Mission: Enrich uranium for Japanese utilities to establish indigenous nuclear fuel cycle (cost: U.S. $1.38 billion).
  Capacity: 150 t SWU/yr initially; 1500 t SWU/yr final capacity.
  History: Initial startup, 1992; 1500 t SWU/yr ~2000.

- **LLW Disposal Facility** (at Oishitai, Rokkasho-mura).
  Mission: Dispose of Japanese utilities-generated LLW (cost: U.S. $1.23 billion).

  Capacity: Approximately 1 million drums initially; final capacity, 3 million drums.
  History: Startup, December 1992.

- **Fuel Reprocessing Plant** (at Iyasakatai, Kamikita-gun, Rokkasho-mura).
  Mission: Reprocess Japanese fuels.
  Design Basis: 800 t HM/yr; 3000 t U storage pool; HLW vitrification/storage; partial design by SGN, France; construction start, 1992; operations, 1995.
  Milestones: SF storage, 1995; FRP startup, 1999.

KOBE STEEL

Kobe Steel, Ltd.
No. 3-18, Wakinohamacho
1-chome
Chuoh-ku, Kobe 651, Japan

Tel: 81-78-251-1551
Fax: 81-78-232-3459

General Manager	Toru Abe
Mech. Eng. Research Lab. (MERL)	Takao Mizguchi
Nuclear Engineering	Fumiaki Komatsu

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

MITI

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

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

Minister	Hiroshi Kumagai
V. Minister	Hideaki Kumano
International Affairs	Sozaburo Okamatsu

MITI/ANRE

Agency of Natural Resources
and Energy
Ministry of International
Trade and Industry
3-1 , Kasumigaseki 1-chome
Chiyoda-ku, Tokyo 100, Japan

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

Director-General	Tomio Tsutsumi
Dep. Director-General	Yasuo Hayashi
Dep. Dir.-Gen., Nucl. Energy	Tohru Namiki
Dir., Nuclear Industry	Hideo Matsui
Dir., Internatl. Nuc. Affairs	Reiji Nagase

MMC

Mitsubishi Materials Corporation
5-2 Ohtemachi 1-chome Tel: 81-3-3213-2111
Chiyoda-ku, Tokyo 100, Japan Fax: 81-3-3215-2435

Vice President	Yuumi Akimoto
Gen. Mgr., Nuc. Energy	Eiji Yagi
Gen. Mgr, Tech. Planning Dept.	Tamotsu Ishii
Gen. Mgr., Nuc. Resources Development/Waste Mgmt.	Takaaki Kashiwagi

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

MOFA

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

Minister	Tsutomu Hata
Director General, Disarmament/ Scientific Affairs	Akira Hayashi
Director, Nuclear Energy	Yukiya Amano
Deputy Director	Yoshifumi Okamura

NIRS

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

Director General	Hiromichi Matsudaira

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

NSB

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

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

Director-General	Isamu Sasaya
Deputy Director-General	Hisaharu Dosho
Dir., Nuc. Mtl. Reg. Div.	Itsuro Misumi
Dir., Nuc. Safety Policy Div.	Kimihiko Oda
Dir., Reactor Reg. Div.	Mitsuo Hayashi
Dir., Safeguards Division	Kiyoshi Honma
Dir., Radiation Protec. Div.	Kaoru Naito
Dir., Nuc. Safety Policy Res.	Haruo Suzuki

Function: Provide support to the Nuclear Safety Commission.

NSC

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

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

Chairman — Yasumasa Togo

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

PNC

Power Reactor and Nuclear Fuel
Development Corporation
Sankaido Building
1-9-13 Akasaka
Minato-ku, Tokyo 107, Japan

Tel: 81-3-3586-3311
Fax: 81-3-3583-6386

President	Takao Ishiwatari
Exec. Vice Presidents	Mitsuo Taguchi, Hiroshi Ohishi
Exec. Dir., Nuc. Fuel/Reprocess.	Hiroyoshi Kurihara
Exec. Dir., WM	Masao Yamamoto
Exec. Deputy Directors, WM	Yoshiro Asakura, Aiji Yamato
Deputy Director, WM	Kouichi Tasurumaki
Coordination	Tomohiro Asami
Conditioning Research	Yasumasa Ando
Isolat'n Syst. Research	Noriaki Sasaki
International Project	Hideki Sakuma
Geoscience Research	Minoru Yamakawa
Dir., Fuel Cycle Develop.	Hidechiyo Kashihara
Dir., Fuel Cycle Engineering	Naomi Tsunoda
Dir., International	Tadatomo Yamaguchi
Deputy Dir., International	Takao Yagi
International Cooperation	Takashi Kano
U.S. DOE Tech. Representative	Jim Scott 81-3-3586-3311

PNC Washington Office:

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

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

Manager	Masayori Tsutsumi

PNC: OARAI

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

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

Director	Kiminori Shiba
Gen. Mgr., Waste Management	Yuji Enokido
Director, Fuels/Materials	Masami Katsuragawa

Facilities

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

- **WDF (Waste Dismantling Facility)**
  Mission: Condition large contaminated equipment; develop D&D technology.
  Design Basis: Capacity to condition 5.5 t/yr.
  History: Hot startup, 1984.

PNC: TOKAI

PNC Tokai Works
4-33 Muramatsu
Tokai-mura, Naka-gun
Ibaraki-ken 319-11, Japan

Tel: 81-292-82-1111
Fax: 81-292-82-1469
or 81-292-82-9398

Director	Kenji Miyahara
Deputy Directors	Nobuyuki Sasao
	Kei Nakata, Yasumasa Oki
Dir., Reprocessing Plant	Osamu Yamamura
Dir., Technology Dev. Coord.	Hisataka Ando
Dir., Health/Safety	Naoyuki Sakurai
Dir., Waste Technology Dev.	Sumio Masuda
HLW Technology	Jin Ouchi
LLW Technology	Yoshio Nakanishi
Geological Isolation Tech.	Tadashi Mano

(contd next page)

PNC: TOKAI (contd)

Dir., Waste Plants Operation	Takao Akiyama
Dir., Reprocess. Tech. Dev.	Koichi Onichi
Dir., Nuc. Fuel Tech. Dev.	Yoichiro Kishimoto

Facilities

- **Fuel Reprocessing Plant**
  Mission: Reprocess low-enriched UO_2.
  Design Basis: Oxide fuels: chop-leach head-end; PUREX flowsheet; capacity, 0.7 t HM/d; remote maintenance of chop-leach equipment; contact maintenance of other components.
  History: Startup, 1977; 509 t U spent fuel processed through 1990.

- **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: Hot startup, 1983.

- **Tokai Plutonium Fuel Fabrication Facility**
  Mission: Fabricate FBR and ATR fuels.
  Design Basis: FBR fuels-1 t/yr (30% PuO_2 in enriched UO_2);
  ATR fuels-10 t/yr (2% PuO_2 in UO_2).
  Throughput: 100 t MOX produced from 1979 - 1989.

- **Tokai Plutonium Fuel Production Facility**
  Mission: Fabricate large quantities of MOX fuel for FBR and ATR.
  Design Basis: FBR fuels, 5 t/yr; ATR fuels 40 t/yr.
  History: Hot startup, 1988.

- **EDF (Engineering Demonstration Facility)**
  Mission: Nonradioactive, full-scale and/or engineering mockup tests of processes and equipment for FBR spent fuel reprocessing.
  History: Startup, 1982.

(contd next page)

PNC: TOKAI (contd)

- **ETF (Engineering Test Facility)**
  Mission: Develop engineering test of HLW vitrification and ceramic melter technologies.
  Design Basis: Joule-heated melter.
  History: Startup, 1980.

- **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 L/batch HLW.
  History: Hot tests, 1982.

- **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.
  History: Hot test, 1988; operation, 1988.

- **Bitumization Demonstration Facility**
  Mission: Immobilize LLLW concentrate.
  Design Basis: 200 L/hr.

- **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: Incineration of combustibles/chloride-containing wastes; mechanical volume reduction.
  History: Operation startup, 1987.

(contd next page)

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 m^3 HLLW/d.
  History: Construction start, 1988; cold test, 1992.
  Milestone: Hot test, 1994.

- **Recycle Equipment Test Facility**
  Mission: Demonstrate FBR fuel reprocessing equipment and process technology.
  Design Basis: 10 kg/hr
  Milestone: Startup, 1994.

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

RWMC

Radioactive Waste Management Center
Mori Building #15
8-10, Toranomon 2-chome Tel: 81-3-3504-1081
Minato-ku, Tokyo 105, Japan Fax 81-3-3504-1297

President Toshio Fukuda
Executive Director Takashi Tsusuki

Function: R&D on safe and effective treatment and disposal techniques for radioactives wastes.

Owners: Japanese industry, MITI, and STA.

STA

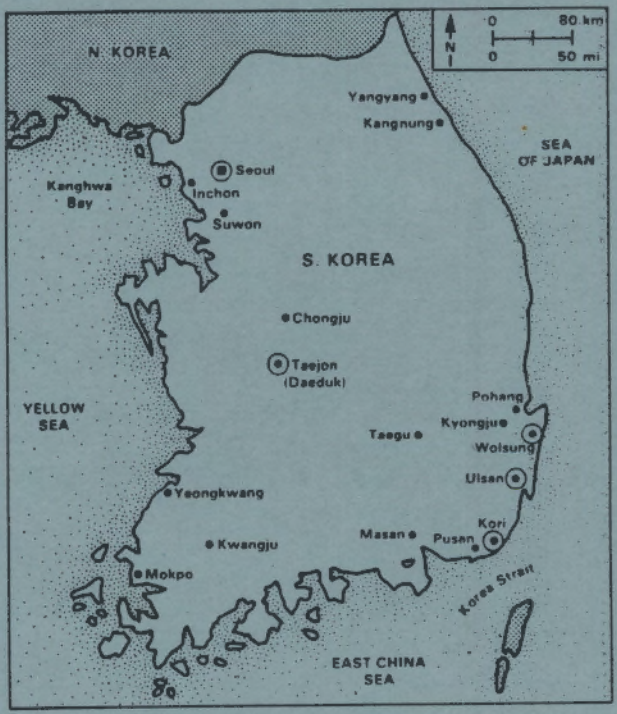
Science and Technology Agency
2-1 Kasumigaseki, 2-chome
Chiyoda-ku, Tokyo 100
Japan

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

Minister, Science/Technology	Satsuki Eda
Vice Minister	Takuya Hirano
Deputy Minister	Kenichi Murakami
Director-General, AEB	Hiroto Ishida
Dep. Director-General, AEB	Toshio Okazaki
Dir., Policy Division, AEB	Haruo Suzuki
Director-General, NSB	Isamu Sasaya
Dep. Director-General, NSB	Shobu Kudo

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

KOREA (SOUTH)


N. KOREA
N
0
80 km
0
50 mi
Yangyang
Kangnung
SEA
OF JAPAN
Seoul
Kanghwa
Bay
Inchon
Suwon
S. KOREA
Chongju
Taejon
(Daeduk)
YELLOW
SEA
Pohang
Kyongju
Taegu
Wolsung
Ulsan
Yeongkwang
Kori
Masan
Pusan
Kwangju
Mokpo
Korea Strait
EAST CHINA
SEA

REPUBLIC OF KOREA

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1-2	New Year
Feb	18-20	Lunar New Year
Mar	1	Independence
Apr	5	Arbor Day
May	5	Children's Day
May	14	Buddha's Birthday
Jun	6	Memorial Day
Jul	17	Constitution Day
Aug	15	National Day
Sep	26-28	Chusok (Thanksgiving)
Oct	3	National Foundation Day
Dec	25	Christmas

TIME

Standard Time Washington, D.C. **+ 14 hours**

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S. $ = 768.35 Won (W)

per Wall Street Journal, 10/01/95. Because rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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

U.S. EMBASSY - SEOUL

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

Tel: 82-2-397-4114
Fax: 82-2-738-8845

Science Counselor

F. Ken Crosher

Population	1994	45	million

ENERGY

Electric Power Capacity	1993	27.1	GWe
		28%	**nuclear**
	1995	31.1	GWe
		28%	**nuclear**
	2000	42.3	GWe
		32%	**nuclear**
Electric Power Production	1993	144	TWh
		40%	**nuclear**
		~30%	coal
		~25%	oil
		5%	hydro
	1995	**35%**	**nuclear**
	2000	**41%**	**nuclear**

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	1993	7.6	GWe
	1995	8.6	GWe
	2000	13.7	GWe
Reactor Mix	1994	PWR	8 (1978-89)
			4 (1995-99)
		HWR	1 (1983)
			3 (1997/99)
Reactor Development (feasibility studies)			Advanced PWR

INDUSTRIAL FUEL CYCLE

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

Waste Management Strategy: LLW/ILW repository to be constructed by mid-1990s with emphasis on engineered barriers; candidate sites have been identified in Koolup Island; utility surcharge of 2 mil/kWh to fund waste management; extended storage (~60 years) of SF planned in AR and AFR facilities; no decision has been made on reprocessing or disposal of SF/HLW.

Cumulative SF Arisings	1990	1,500	t U
	1995	2,600	t U
	2000	4,400	t U

Industrial-Scale Activities

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

Major Milestones

- LLW disposal site (500,000 drums) 1996

INTERNATIONAL RELATIONSHIPS

Member of IAEA; agreement with U.S. for peaceful nuclear cooperation.

ORGANIZATION

- Deputy Prime Minister ---- Atomic Energy Commission (AEC)
  - Ministry of Trade, Industry and Energy (MOTIE)
    - Electric Power Bureau (EPB)
      - Korea Electric Power Corporation (KEPCO)
      - Korea Power Engineering Company (KOPEC)
      - Korea Electric Power Operating Service Company, Ltd. (KEPOS)
      - Korea Heavy Industries/Construction Co. (KHIC)
      - Korea Nuclear Fuel Company, Ltd. (KNFC)
  - Ministry of Science and Technology (MOST)
    - Atomic Energy Office (AEO)
      - Nuclear Policy Office (NPO)
        - Nuclear Policy Division
        - Nuclear R&D Division
        - Atomic Energy International Cooperation Division
      - Nuclear Safety Office (NSO)
        - Nuclear Licensing Division
        - Nuclear Inspection/Enforcement Division
        - Radiation Safety Division
        - Nuclear Control Division
      - Korea Advanced Institute of Science/Technology (KAIST)
      - Korea Atomic Energy Research Institute (KAERI)
      - Korea Institute of Nuclear Safety (KINS)
      - Korea Institute of Geology, Mining and Materials (KIGAM)
      - Korea Institute of Energy Research (KIER)

AEO

Atomic Energy Office
Ministry of Science and Tech.
1 Chungang-dong, Kyonggi-do
Kwacheon 171-11 Tel: 82-2-503-7654
Republic of Korea Fax: 82-2-503-7673

Asst.Minister, AEO	Se Jong Kim
Director General, NPO	Chung-Won Cho
Dir., Nuclear Policy	Yong Hwan Kim
Dir., Nuclear R&D	Jin Kyung Kim
Dir., Internatl. Cooperation	Young Sik Kim
Director General, NSO	Nam Huh
Dir., Nuclear Licensing	Jong Hyuk Chung
Dir., Nuc. Inspection/Enforcement	Young Chud Kang
Dir., Radiation Safety	Jae Ok Jang
Dir., Nuclear Control	Dong Dae Sul

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

AEC

Atomic Energy Commission
1, Chungang-dong
Kwacheon 171-11 Tel: 82-2-503-7646
Republic of Korea Fax: 82-2-507-0558

Chairman: Deputy Prime Minister Jae Hyung Hong

Function: Decision-making body for policies on nuclear energy; R&D plan for nuclear fuel and nuclear energy applications; chaired by Deputy Prime Minister; ministers of MOST and MOTIE are required members.

EPB

Electric Power Bureau
Ministry of Trade, Industry
and Energy
Kwacheon 171-11 Tel: 82-2-503-9638
Republic of Korea Fax: 82-2-503-9649

Dir. General for Energy Policy Joo Suck Suh

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

KAERI

Korea Atomic Energy Research
Institute
150 Tukjin-dong
Daeduk-gu, Taejon Tel: 82-42-868-2000
Republic of Korea Fax: 82-42-868-2702

President Jae In Shin
82-42-868-2121
Sr. VP, Nuclear Sung Ki Chae
VP, MRR Project Sung Nyun Kim
Dir., Nuclear Safety/Research Chang Guy Park
Dir., Spent Fuel Management Hyun Soo Park

Function: Develop reactor engineering and nuclear fuel cycle technology; assist government (MOST) with regulatory/licensing issues and in establishing national nuclear policy.

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

KAIST

Korea Advanced Institute of
Science and Technology
373-1 Kusong-dong, Yusong-gu
Taejon 305-701, ROK

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

President — Duk Yong Yoon
Nuclear Engineering — Kun Jai Lee

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

KEPCO

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

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

President — Chong Hun Lee
Vice President — Ke Hwee Kim

Function: Develop power resources; generate/transmit electricity (operates all nuclear and conventional power plants in Korea); responsible to the government (MER).

KIER

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

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

President — Young Mok Sohn

Function: Development of energy technologies and exploitation of energy.

KINS

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

Tel: 82-42-868-2601
Fax: 82-42-868-1700

President	Yong Kyu Lim
Vice President	Suk Hyung Moon
Dir., Safety Review	Seung Hyuk Lee
Director, Safety Inspection	Won Ki Shin
Director, Standards Development	Won Hyo Yoon

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

KIGAM

Korean Institute of Geology,
Mining and Materials
30 Gajung-dong
Yusong-gu, Taejon
Republic of Korea

Tel: 82-42-868-3114
Fax: 82-42-861-9720

President — Pil Jong Kang

Function: Development and utilization of resources.

KNFC

Korea Nuclear Fuel Company, Ltd.
150 Tukjin-dong, Daeduk-gu
Taejon, Republic of Korea

Tel: 82-42-868-1000
Fax: 82-42-868-2380

President — Chang Suk Lee

Function: Develop domestic nuclear fuel fabrication.

(contd next page)

KNFC (contd)

Owners: KEPCO (95%); KAERI (5%).

Facilities

- Fuel Fabrication Plant, Daeduk site, 200 t U/yr.

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 — Ki Oak Chang

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

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	Kun Mo Chung
Vice Minister	Bon Young Ku
Asst.Minister, AEO	Se Jong Kim
Director General, NPO	Chung-won Cho
Dir., Nuclear Policy	Young Hwan Kim
Dir., Nuclear R&D	Jim Kyung Kim
Dir., Internatl. Cooperation	Young Suk Kim
Director General, NSO	Nam Hun
Dir., Nuclear Licensing	Jong Hyuk Chung
Dir., Nuc. Inspection/Enforcement	Yong Chul Kang
Dir., Radiation Safety	Jae Ok Kang
Dir., Nuclear Control	Dong Dae Sul

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

MTIE

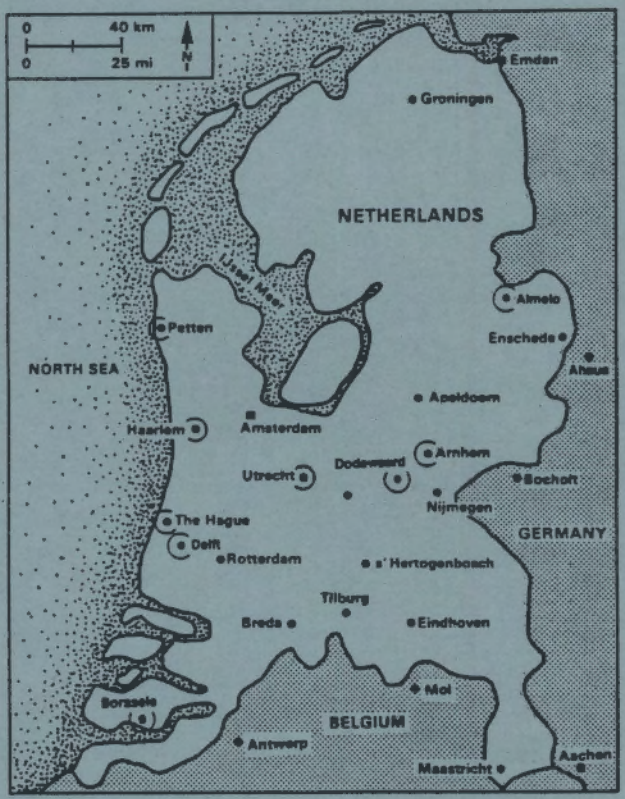
Ministry of Trade, Industry
and Energy
1, Chungang-dong
Kwacheon, Kyonggi-do
Republic of Korea

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

Minister	Joe Yoon Park
Vice Minister	Un Suh Park
Director General, EPB	Joo Suck Suh

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

NETHERLANDS



NETHERLANDS

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year	May	5	Liberation Day
Apr	14	Good Friday	May	12	Ascension
Apr	16-17	Easter	May	22-23	Pentecost
Apr	30	Queen's Birthday	Dec	25-26	Christmas

TIME

Standard Time Washington, D.C. **+ 6 hours**
Daylight Savings Time Period: **03/26 - 09/23/95**

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S. $ = 1.60 Guilder (Fl.)
per Wall Street Journal, 10/01/95. Because rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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

U.S. EMBASSY - THE HAGUE

American Embassy
Lange Voorhout 102
2514 E The Hague
Netherlands

Tel: 31-70-310-9209
Fax: 31-70-361-4688

Economic Section

Daniel T. Fantozzi

Population	1994	15.3	million

ENERGY

Electric Power Capacity	1993	17.6	GWe
		2.8%	**nuclear**
	1995	19.2	GWe
		2.6%	**nuclear**
	2000	18.7	GWe
		2.7%	**nuclear**
Electric Power Production	1992	69.2	TWh
		61.4%	gas
		31%	coal
		5.3%	**nuclear**
		0.1%	oil
		2.2%	others
	1995	**5%**	**nuclear**
	2000	**4%**	**nuclear**

NUCLEAR POWER

Policy: Lifetime of both nuclear power plants ends in 2004; during this Cabinet period no decisions on new nuclear capacity will be made; in general, there is no need for additional capacity in the coming years.

INDUSTRIAL FUEL CYCLE

Nuclear Power Capacity	1993	0.5	GWe
	1995	0.5	GWe
	2000	0.5	GWe
Reactor Mix	1994	BWR	1 (1969)
		PWR	1 (1973)

INDUSTRIAL FUEL CYCLE

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

Waste Management Strategy: Use single centralized waste collection service; extend interim storage of all wastes (50-100 years) until decisions are made on disposal; studies on final disposal of all radioactive wastes in geologic 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 of subseabed disposal; feasibility of disposal within international or bilateral framework is also being explored.

Cumulative SF Arisings (LWR)	1990	228	t U
	2000	369	t U

INTERNATIONAL RELATIONSHIPS

Member of EC, IAEA, and OECD/NEA.

ORGANIZATION

- **Government** - Ministries of Economic Affairs; Housing; Physical Planning/Environment; and Social Affairs/Employment exercise overall control of nuclear matters with Parliamentary approval of their decisions.

- **COVRA** (Centrale Organisatie Voor Radioactief Afval) - stores and collects all radioactive wastes.
  - Interim storage center, 1994.

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

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

Major Milestone

- Interim Storage Center 1994

COVRA (Central Organization for Radioactive Waste)

Centrale Organisatie Voor
Radioactief Afval
Spanjeweg 1, P.O. Box 34
4453 ZG s'-Heerenbroek Tel: 31-1196-13900
Netherlands Fax: 31-1196-13950

Director	Jan Vrijen
Deputy Director	H.D.K. Codee
Waste Storage/Transportation	U. Bakema

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

Facilities

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

ECN (Netherlands Energy Research Center)

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

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

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

Research Center

Managing Director	H. H. van den Kroonenberg
Nuclear Energy Research	A. M. Versteegh

(contd next page)

ECN (contd)

Nuc. Waste/Geologic Disposal	L. H. Vons
Safety Assessment	J. Prij
Radionuclide Migration	R.J.M. Koning
Actinide Burning	A. Abrahams

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

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

GEOLOGICAL SURVEY OF THE NETHERLANDS

Geological Survey of the Netherlands
Richard Hokade 10
Postbus 157 Tel: 31-23-300300
2000 AD Haarlem, Netherlands Fax: 31-23-351614

Director	C. Staudt
Deep Subsurface Dept.	H. M. van Montfrans

KEMA (Research/Testing Electrochemical Materials Company)

N.V. Tot Keuring van Elektro-
technische Materialen Arnhem
Utrechtseweg 310
Postbus 9035 Tel: 31-85-569111
6800 ET Arnhem, Netherlands Fax: 31-85-515606

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

(contd next page)

KEMA (contd)

Function: Research and consulting development; services for utilities; waste management R&D; characterization, quality assurance, volume reduction, and storage of radioactive wastes.

MINISTRY OF ECONOMIC AFFAIRS

Ministerie van Economische Zaken
Postbus 20101
NL-2500 EC The Hague, Netherlands

Tel: 31-70-3798911
Fax: 31-70-3796358

Dir. Electricity/Nuclear Energy — H.F.G. Geyzers, 31-70-3796471

Radioactive Waste — J. N. A. Enst, 31-70-3797849

MINISTRY OF HOUSING, PHYSICAL PLANNING AND ENVIRONMENT

Ministerie van Volkshuisvestling
Ruimtelijke Ordening en
Milieubeheer
Postbus 20G51
Rijnstraat 0
2500 EZ Dan Hag
Netherlands

Tel: 31-70-3393939
Fax: 31-70-3391355

Directors, Rad. Protection — C. M. Plug, R. Dortland

Radioactive Waste — M.A. Selling

MINISTRY OF SOCIAL AFFAIRS AND EMPLOYMENT

Ministry of Social Affairs
and Employment
Postbus 90801
2509 LV The Hague, Netherlands

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

Nuclear Safety — J. Versteeg

RIVM (National Institute of Public Health and Environment Protection)

Rijksinstituut voor Volksgezondheid
en Milieuhygiene
Antonie van Leeuwenhoeklaan 9
Postbus 1
3720 BA Bilthoven, Netherlands

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

Safety Assessment of
Underground Disposal Studies

A. van den Berg
31-30-743397

PAKISTAN


CHINA
Pamir Range
Kabul
AFGHANISTAN
Peshawar
Islamabad
Rawalpindi
Farah
Kandahar
Sargodha
Sialkot
Gujranwala
Zabol
Lyallpur
Lahore
Jhang Maghiana
Delhi
Quetta
Multan
Zahedan
PAKISTAN
Bahawalpur
Agra
IRAN
Sukkur
INDIA
Jodhpur
Hyderabad
Karachi
ARABIAN SEA
0 km 500
N
0 mi 310

PAKISTAN

MAJOR PUBLIC HOLIDAYS (1995)

Feb	1	Start of Ramadan	Aug	10	Prophet's Birthday
Mar	2-4	Ramadan	Aug	14	Independence
Mar	23	Pakistan Day	Sep	6	Defense of Pakistan
May	1	May Day	Sep	11	Death of Quaid-I-Az
May	10-12	Sacrifice Feast	Nov	9	Iqbal Day
Jun	8-10	Muharram	Dec	25	Quaid-I-Azam Birthday
Jul	3	Bank Holiday			

TIME

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

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S. $ = 31.58 Rupee
per Wall Street Journal, 10/01/95. Because 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
Diplomatic Enclave, Ramna 5
P.O. Box 1048
Islamabad, Pakistan

Tel: 92-51-82-6161
Fax: 92-51-21-4222

Economics/Science Officer — Craig Curti

Population	1995	130	million

ENERGY

Electric Power Capacity	1992	13.7	GWe
		1.5%	**nuclear**
	1995	12,530	MW
	2000	13.8	GWe
		<1%	**nuclear**
Electric Power Production	1992	54.3	TWh
		64%	gas/oil
		39%	hydro
		>1%	**nuclear**
		<1%	coal
	1995	39%	hydro
		1%	**nuclear**

NUCLEAR POWER

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

Nuclear Power Capacity	1992	0.1	GWe
	2000	0.1	GWe
Reactor Mix	1994	HWR	1 (1972)
		PWR	1 (1999)

INDUSTRIAL FUEL CYCLE

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

Cumulative SF Arisings	1993	170 t U
	2000	440 t U

INTERNATIONAL RELATIONSHIPS

Member of IAEA; agreement with U.S. and other nations on peaceful nuclear cooperation; has not signed NPT.

ORGANIZATION

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

PAEC

Pakistan Atomic Energy Commission
P.O. Box 1114 Tel: 92-51-82-4276
Islamabad, Pakistan Fax: 92-51-82-4908

Chairman Ashfaq Ahmad
Secretary Muhammad Azfal
Waste Management Raze ur-Rehrnan

Function: Advocate increased nuclear energy generation to overcome serious energy shortages in a country substantially lacking in natural energy resources. In an effort to accelerate Pakistan's overall economic development, the Commission also promotes the use of nuclear technologies in other areas, such as enhancing agricultural production and medical diagnosis/therapy.

(contd next page)

PAEC (contd)

Facilities[a]

- **Fuel Fabrication Plant** at Kundian - manufacturing fuel for KANUPP since 1978; located near the Chashma site, where SGN was to build a 50-100 t U/yr spent fuel reprocessing plant (project started in 1974, halted in 1977).

- **A. Q. Khan Research Laboratory** at Kahuta - provides nuclear training and R&D on centrifuge enrichment.

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

- **Chasnupp Plant** - new nuclear power plant, 300 MW, to be fully operational in early 1999.
  - light water, low-enriched uranium
  - China turnkey construction of the Chasnupp plant
  - now under construction

PINSTECH

Pakistan Institute of
Science & Technology
P.O. Nilore
Islamabad, Pakistan Tel: 92-51-84-7601-9

Director I. H. Qureshi

(contd next page)

(a) Based on publicly available information, organizational responsibility and specific location of some facilities cannot be identified with certainty; e.g., some reports appear to discuss the same facility, but their location is referred to variously as Kahuta, Rawalpindi, or Islamabad, which are relatively close to one another.

PINSTECH (contd)

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

Facilities[a]

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

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

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

  Reprocessing Plant, laboratory scale; nonradioactive startup, 1982.

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

(a) Based on publicly available information, organizational responsibility and specific location of some facilities cannot be identified with certainty; e.g., some reports appear to discuss the same facility, but their location is referred to variously as Kahuta, Rawalpindi, or Islamabad, which are relatively close to one another.


800 km
0
800 Mi
NORWEGIAN SEA
NORWAY
Oslo
SWEDEN
Stockholm
FINLAND
Helsinki
Riga
St Petersburg
Minsk
BELARUS
Smolensk
Tver'
MOSCOW
Kiev
Orel
Kursk
UKRAINE
Rostov
Volgograd
Saratov
Kazan'
Orenburg
Stavropol
Astrakhan
Tbilisi
Arkhangelsk
Salekhard
Dudinka
Kirov
Gorky
Perm
Sverdlovsk
Ekaterinburg
Khanty-Mansi
Chelyabinsk
Kurgan
Omsk
Novosibirsk
Tomsk
Krasnoyarsk
Barnaul
Abakan
Kyzyl
Irkutsk
Ulan Ude
Chita
Yakutsk
RUSSIA
KAZAKHSTAN
MONGOLIA
Anadyr
Magadan
Palana
Khabarovsk
Blagoveshchensk
Vladivostok
CHINA

RUSSIA

RUSSIA

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year	May	9	Victory Day
Jan	7	Christmas (Orthodox)	June	12	Independence
Mar	8	Women's Day	Dec	12	Constitution Day
May	1-2	Solidarity Day	Nov	7-8	Revolutionary Days

TIME

Standard Time Washington, D.C. (Moscow) **+ 8 hours**
Daylight Savings Time Period: **03/26 - 09/23/95**

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S. $ = 4578 Rubles
as of 12/01/95; rates continue to fluctuate. The Russian ruble is available only in Russia. Payment in U.S. currency and credit cards is rarely accepted. Consult the U.S. embassy for up-to-date information.

DIRECT DIALING

Individual numbers for direct dial to Russia are complete as listed, after dialing international access code: **011**. Country code is 7; listed local numbers include city code.

U.S. EMBASSY - MOSCOW

American Embassy
Novinskiy Bul'var 19/23
121099 Moscow, Russia

Tel: 7-095-252-2451
through -2459
Fax: 7-095-956-4261
E-mail: usembest@glas.apc.org

Minister, Environ., Science, and Tech. John Zimmerman

Population	1994	149.6	million

ENERGY

Electric Power Capacity	1992	212	GWe
		12%	**nuclear**
	2000	245	GWe
		10%	**nuclear**
	2005	270	GWe
		11%	**nuclear**
Electric Power Production	1992	1066	TWh
		43%	gas
		21%	coal
		15%	hydro/geoth.
		12%	**nuclear**
		9%	oil

NUCLEAR POWER

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

Nuclear Power Capacity	1994	20.2	GWe
	2000	25.0	GWe
	2005	36.5	GWe

Reactor Mix	1994	GR	1 (Indef.)
		PWR	1 (Indef.)
		FBR	1 (1981)
			2 (Indef.)

Reactor Development advanced PWRs (VVER-500, VVER-1000, VPBER-600), LGRs (MKER-800), LMFBRs

INDUSTRIAL FUEL CYCLE

Policy: Complete domestic fuel cycle capability, including enrichment, fuel fabrication (UO_2 and MOX), and reprocessing; complete fuel cycle services, including SF storage and LLW/ILW disposal; shift to PWRs (since Chernobyl accident in 1986).

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

Liquid LLW from nuclear reactor operations is currently evaporated, incorporated into bitumen or cement, and stored and/or disposed of at disposal facilities at each reactor station. Thirty-six other, regional facilities exist for medical, industrial, and radioactive waste disposal. Efforts are under way to decrease liquid LLW volumes and to recycle them in water and reactant circuits.

Solid LLW, compacted at each nuclear power station, is stored/disposed of at reactor sites; regional burial facilities are being considered to minimize transportation-related risks.

INTERNATIONAL RELATIONSHIPS

DOE/MAPI

Agreement on Scientific and Technical Cooperation in the Field of Peaceful Uses of Atomic Energy

Term: 05-25-90 to 05-24-95 (initiated 1973)

Scope: Technology information exchange.

Memorandum of Cooperation in the Fields of Environmental Restoration and Waste Management

Term: 09-18-90 to 09-17-95

Scope: Technology information exchange on policy and practices; evaluation of problems in environmental remediation, D&D of facilities and materials; R&D; analysis/investigations of waste partitioning; vitrification and geologic disposal of radioactive waste.

Member of IAEA and WANO; cooperation with CERN and JINR.

ORGANIZATION

Nuclear Program Control

- **MINATOM** (Ministry for Atomic Energy, Russian Federation) - nuclear safety; territory rehabilitation; defense conversion programs; regulation and policy; weapons/disarmament;civilian and defense nuclear fuel cycle; waste management; successor to MAPI (Ministry of Atomic Power and Industry).

- **Ministry of Environmental and Natural Resource Protection of the Russian Federation.**

- **GOSATOMNADZOR** (Russian Federal Authority for Nuclear and Radiation Safety).

Research and Development

- **All-Russian Research Institute for Inorganic Materials**, Moscow, reprocessing, solidification, and disposal of HLW; properties of solid waste forms.

- **All-Russian Research Institute for Nuclear Power Plant Operation**, Moscow, reprocessing/disposal of NPP radioactive wastes.

- **Institute of Physical Chemistry**, Moscow (branch of the Russian Academy of Sciences), radionuclide migration; waste form properties.

- **Kurchatov Institute** (Russian Scientific Centre), Moscow, major independent scientific center; nuclear power R&D, physics, superconductivity, fusion.

  V. G. Khlopin Radium Institute, St. Petersburg, reprocessing, HLW partitioning/solidification, solid waste form properties, off-gasses, waste storage/disposal, environmental remediation.

- **Scientific Research Institute of Chemical Engineering**, Ekaterinburg, vitrification/bitumenization pilot plants.

- **Institute of Theoretical and Experimental Physics (ITEP)**, Moscow, wide-scale fundamental theoretical and experimental nuclear and particle physics.

- **Institute of High-Energy Physics (IHEP)**, Protvino, Moscow Region, basic particle research; building 3000 GeV proton accelerating storage ring.

- **Institute of Innovation and Thermonuclear Research**, Troitsk, Moscow Region, thermonuclear fusion, plasma physics, laser physics and technology, development and application of MHD generators.

- **All Russian Research Institute of Chemical Technology (VNIIKT)**, Moscow, conducts research into leaching of radioactive, rare, noble, and other metals, and reprocessing of liquid and solid wastes.

- **Institute of Physics and Power Engineering (IPPE)**, Obninsk, develops nuclear power plants, monitoring systems, instrumentation; full-scale testing of nuclear power plant prototypes; supplies radioactive isotopes to world market, produces medical isotopes.

- **Institute of Electrophysical Equipment (NIEFA)**, St. Petersburg, designs and manufactures linear electron accelerators for radiation technology; supplies thermonuclear and electrophysical devices to Kurchatov, Khlopin, IHEP.

- **Research Institute of Atomic Reactors (NIIAR)**, Dimitrovgrad, large nuclear center researches complex problems in nuclear power, reactor materials science, and transuranic elements and atomic physics; operates eight research and experimental reactors.

- **Scientific Engineering Center (SNIIP)**, Moscow, develops/manufactures instrumentation and systems for nuclear power plants and characterization and monitoring of radioactive contamination.

- **Research and Design Institute of Installation Technology (Research and Production Asso., NIKIMT)**, Moscow, develops nuclear facility installation and repair technologies, maintenance and backfitting for nuclear reactors and thermonuclear devices.

- **Russian Federal Nuclear Center - All-Russian Research Institute of Experimental Physics (VNIIEF)**, Nizhni Novgorod Region, conducts theoretical and analytical research in nuclear physics, gas dynamics, radiation, nuclear kinetics, thermonuclear reaction.

- **Russian Federal Nuclear Center - All Russian Research Institute of Technical Physics (VNIITF)**, Urals Region near Chelyabinsk, basic/applied research in nuclear physics, nuclear charges, nuclear explosion recorders. Science and design support for weapons dismantlement is high priority.

- **VNIPIET** (All-Russian Design and Research Association for Energy Technology), St. Petersburg, design of SF reprocessing facilities, SF transportation/storage.

ALL-RUSSIAN RESEARCH INSTITUTE FOR INORGANIC MATERIALS

All-Russian Research Institute
for Inorganic Materials
Rogov Str. 5a
123060 Moscow, Russia

Tel: 7-095-190-8262
Fax: 7-095-196-4168

Director — Mikhail I. Solonin
Deputy Director — Anatoliy C. Mamayev

Function: R&D on SF reprocessing, radioactive waste processing/solidification (bitumenization/vitrification, etc.), off-gases.

ALL-RUSSIAN RESEARCH INSTITUTE FOR NUCLEAR POWER PLANTS

All-Russian Research Institute
for Nuclear Power Plants
Ferganskaya Str. 25
109507 Moscow, Russia

Tel: 7-095-376-1550
Fax: 7-095-274-0073

Director General — A. Armen Abagyan
Deputy Director — Valentin N. Shpyakin

Function: Processing and disposal of NPP radioactive wastes; decontamination of equipment/facilities; emergency situation studies.

GOSATOMNADZOR
(Russian Federal Authority for Nuclear/Radiation Safety)

GOSATOMNADZOR
Taganskaya Str. 34
109147 Moscow, Russia

Tel: 7-95-272-4710
Fax: 7-95-278-8090

Chairman	Yuri G. Vishnevsky
Deputy Chairman	Alexander Gutsalov
Administration	Valentin A. Rekunov

Function: Supervision of all safety aspects of Russian nuclear industry.

KHLOPIN

Research Production Association
V. G. Khlopin Radium Institute
Shvernik pr. 28
194021 St. Petersburg, Russia

Tel: 7-812-247-5641
Fax: 7-812-534-7752

Director-General	Alexander I. Karelin
Deputy Directors	Evgeny B. Anderson
	A. A. Rimskij-Korsakov
Laboratory Manager	Valeriy N. Romanovskiy
	7-812-247-6522
Chief Scientist	Leonard N. Lasarev

Activities: Development of SF treatment (reprocessing, thermal decladding, meltdown of hulls); improved HLW partitioning; waste immobilization; off-gas treatment; ^{85}Kr storage; waste disposal; geochemistry; studies on solidified waste properties; environmental remediation, protection, and monitoring.

(contd next page)

KHLOPIN (contd)

Facilities

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

KURCHATOV

Russian Scientific Centre
Kurchatov Institute
Kurchatov Square 1 — Tel: 7-095-196-9241
123182 Moscow, Russia — Fax: 7-095-943-0074

President	Evgeniy P. Velikhov
Vice-President	Nicolai N. Ponomarev-Stepnoy
Nuclear Safety	Ilya V. Elkin
	Yuri P. Buzulukov

Function: Nuclear power research; R&D on LLW/ILW.

MAYAK

Production Association `MAYAK'
Lenin Str. 31 — Tel: 7-351-713-1659
454065 Chelyabinsk-65, Russia — Fax: 7-351-713-3826

Director	Victor Fetisov
Chief Engineer	Alexander P. Suslov
Dir., Radiochemical Plant	Vladimir K. Sazhnov
Chief Engineer, Radiochem. Plant	Evgeniy G. Dzekun

(contd next page)

MAYAK (contd)

Location: Near city of Kyshtym.

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

Facilities

- **Power Reactor Fuel Reprocessing Plant**
  Design Basis: Started reprocessing VVER-440 reactor fuel in 1976, with about 2000 t U reprocessed to 1989.

- **Fully Radioactive HLW Vitrification Plant**
  Design Basis: Single-stage joule-heated ceramic melter with feed rate of 500 L/hr; ~160 t of HLW phosphate glass produced 1987-1988; melter was shut down due to electrode problems; similar melter was modified and started operation in June 1991. As of April 1992, 50 MCi of HLW have been incorporated into phosphate glass.

MINATOM

Ministry for Atomic Energy
of the Russian Federation
Bol'shay Ordynka Str. 24/26
101000 Moscow, Russia

Tel: 7-095-239-4545
Fax: 7-095-230-2420

Minister	Viktor N. Mikhailov
First Deputy Minister	Vitaly F. Konovalov
Deputy Ministers	Nikolai N. Egorov
	Yuri I. Tychkov
	Lev D. Riabev
	Yevgeny Reshetnikov
	Victor A. Sidorenkov
	Alexandr G. Makarov
General Manager	Valery V. Bogdan
International Relations	Mikhail N. Ryzhov

(contd next page)

MINATOM (contd)

Function: Manage all aspects of nuclear power industry. Established in January 1992; successor to MAPI.

MINING/CHEMICAL COMBINE

Mining and Chemical Combine
53 Lenin ul
660033 Krasnoyarsk, Russia

Tel: 7-391-232-1251
Fax: 7-391-232-0374

Director	Valeriy A. Lebedev
Chief Engineer	Urij S. Volzhanin
Dep. Chief Engineer	Yuri A. Revenko
Dir., Radiochemical Plant	Gennadi A. Demidov
Chief Eng., Radiochemistry	Yuri P. Sorokin

Function: SF reprocessing, waste management, underground disposal.

MINISTRY FOR ECOLOGY/NATURAL RESOURCES

Ministry for Ecology and
Natural Resources
B. Gruzinskaya Str. 4/6
123812 GSP Moscow, Russia

Tel: 7-095-252-2305
Fax: 7-095-254-8283

Minister	Victor I. Danilov-Danilyan
Deputy Minister	Nikolai G. Rybalskiy

Function: Responsible for control and standardization of releases containing radionuclides.

RADON

Research Production
Association RADON
7th Rostovski per. 2/14
119121 Moscow, Russia

Tel: 7-095-248-1911
Fax: 7-095-248-1941

Director-General — Igor A. Sobolev
Vice Director-General — Sergey A. Dimitriev
Specialist — A. P. Kobelyev

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

Facilities

- **Sergiev Posad Disposal Site** (formerly Zagorsk, located 75 km NE of Moscow)
  Largest facility (about 170 acres) with capacity for 3500 m^3 (including 500 m^3 liquids) waste per year (capacity at 15 other facilities <1000 m^3/yr each); waste from scientific, industrial, medical, and other producers; waste characteristics similar to reactor waste, including spent radiation sources, liquid concentrates, combustible liquids, highly active research reactor core components (with short-lived nuclides and limited alpha emitters); treatment/conditioning of wastes is by compaction, combustion, cementation, bitumenization, vitrification, and special immobilization in metal matrix; disposal is in engineered concrete in-ground structures.

RESEARCH AND PRODUCTION ASSOCIATION OF INSTALLATION TECHNOLOGY

Research and Production Association
of Installation Technology
Altufjevskow sh. 43
Moscow, Russia

Tel: 7-095-489-9095
Tlx: 9031000

Director — Yurij F. Yurchenko
Deputy Director — Alexey A. Kurkumeli

Function: assemble and repair multipurpose nuclear facilities; R&D; reconstruction.

SCIENTIFIC RESEARCH INSTITUTE OF CHEMICAL ENGINEERING

Scientific Research Institute
of Chemical Engineering
Griboyedov Str. 32
620010 Ekaterinburg, Russia

Tel: 7-347-227-4303
Fax: 7-343-227-5505

Director — Boris R. Borisov
Deputy Director — Vasili I. Leverash

Facilities

- **KS-KT-100** (cold pilot plant - HLW vitrification)
  Mission: Develop waste vitrification technology.
  Design Basis: Fluid bed calciner; in-crucible melter (two-stage process); capacity, 100 L/hr HLLW, 20 kg/hr glass; 160-180 kg glass/batch; product, phosphate glass in crucibles.
  History: Startup, approximately 1975.

VNIPIET
(Planning, Design, Research and Technological Association)

VNIPIET
Savushkin Str. 82
197228 St. Petersburg, Russia

Tel: 7-812-239-1170
Tlx: 7-812-239-1898

Director-General Vladimir A. Kurnosov
Deputy Director N. V. Stakhov

Function: Design plants/facilities for SF reprocessing, waste processing, storage/disposal; SF transport/storage; decontamination.

SOUTH AFRICA

SOUTH AFRICA

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year	June	16	Youth Day
Mar	21	Human Rights Day	Aug	9	Women's Day
Apr	17	Family Day	Sept	24	Heritage Day
Apr	14	Good Friday	Dec	16	Reconciliation Day
Apr	27	Freedom Day	Dec	25	Christmas
May	1	Worker's Day	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 U.S.; in addition, a visa is currently required for a visit to South Africa. Most travel agencies can provide up-to-date information about requirements.

CURRENCY EXCHANGE RATE

1 U.S. $ = 3.66 Rand

per Wall Street Journal, 10/01/95. Because 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. EMBASSY - HOHANNESBURG

American Embassy
11th FL. Kine Ctr
Commissioner and Kruls Sts
PO Box 2155
Johannesburg, South Africa

Tel: 27-11-331-3937
Fax: 27-11-331-6178

Economic Affairs Counselor J. Michael Cleverley

Population	1994	43.9	million

ENERGY

Electric Power Capacity	1993	33.2	GWe
		6%	**nuclear**
	1995	34.1	GWe
		5%	**nuclear**
	2000	37.9	GWe
		5%	**nuclear**
Electric Power Production	1993	154	TWh
		94%	coal
		<5%	**nuclear**
		1%	other
		<1%	hydro
	1995	**6%**	**nuclear**
	2000	**6%**	**nuclear**

NUCLEAR POWER

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

Nuclear Power Capacity	1993	1.8	GWe
	2000	1.8	GWe
Reactor Mix	1994	PWR	2 (1984/85)

INDUSTRIAL FUEL CYCLE

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

Cumulative SF Arisings (LWR)	1990	180 t U
	2000	520 t U

Major Milestones

- Dry SF storage facility (Vaalputs) 2000

INTERNATIONAL RELATIONSHIPS

Member of IAEA.

ORGANIZATION

Ministry of Mineral and Energy Affairs

- **Atomic Energy Corporation (AEC)**
  - **Pelindaba Site**
    - **R&D**
    - **Research reactor**
    - **Isotope production**
    - **Fuel fabrication**
    - **LLW disposal**
  - **Vaalputs National LLW Disposal Facility**
    - **LLW/ILW disposal**
    - **Site characterization**
  - **Valindaha Site**
    - **Uranium conversion**
- **National Energy Council (NEC)**
- **Council for Nuclear Safety (CNS)**
  - **Independent regulatory licensing authority**

Eskom

- **Electricity production**

AEC

Atomic Energy Corporation
of South Africa Ltd.
P.O. Box 582 Tel: 27-12-316-4911
Pretoria, South Africa Fax: 27-12-316-3111

Chief Executive Officer	Waldo E. Stumpf
Senior General Managers	
Nucl. Fuel Production	P. J. Venter
Technology Development	K. F. Fouche
Engineering	L. S. Snyders
Business Development	A. G. M. Jackson
Sr. Mgr., Nuc. Waste Management	B. B. Hambleton-Jones

Function: Overall responsibility for government nuclear activities including uranium conversion, R&D, radioisotope production, radwaste disposal, and repository; fuel fabrication.

Facilities

- **Pelindaba Site**

  Mission: Perform nuclear R&D; operate research reactor, isotope production line, food irradiation facility; manufacture fuel; operate LLW treatment/shallow-land disposal facilities. Enrichment facilities at Pelindaba are now closed and are being decommissioned.

- **Vaalputs National LLW Disposal Facility**
  Private Bag X7 Tel: 27-251-22832
  Springbok 8240, South Africa Fax: 27-251-81220

  Mission: Operate LLW/ILW shallow-land disposal facilities; perform site characterization and environmental studies.
  Design Basis: 1,470 m^3/yr LLW/ILW disposal.

- **Valindaba Uranium Conversion Plant**
  Mission: Perform enrichment R&D; operate semi-commercial conversion plant. Pilot-scale operations shut down in 1990.
  Design Basis: 700 t U/yr conversion.

CNS

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

Tel: 010-27-12-663-5500
Fax: 010-27-12-663-5513

Chairman	J. B. Martin
Vice-Chairman	D. Reitmann
Exec. Officer	B. C. Winkler
General Manager	J. Leaver

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

ESKOM

ESKOM
P.O. Box 1091
Johannesburg 2000
South Africa

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

Chief Executive/COB	A. J. Morgan
Chairman, Electricity Council	John B. Maree
Exec. Dir., Technology	J. A. de Beer

Function: Provide electricity for public use.

SPAIN


Toulouse
Sete
Biarritz
FRANCE
La Coruña
Gijón
Oviedo
Santander
Bilbao
San Sebastian
Santiago
Vitoria
Pamplona
ANDORRA
ATLANTIC OCEAN
Vigo
Burgos
Logronos
Gerona
Zaragoza
Barcelona
Valladolid
Soria
Porto
Salamanca
Segovia
Madrid
SPAIN
Toledo
Valencia
Albacete
PORTUGAL
Lisbon
Ciudad Real
Badajoz
Alicante
Córdoba
Murcia
Cartagena
MEDITERRANEAN SEA
Huelva
Seville
Granada
Faro
Málaga
Almeria
Cádiz
Gulf of Cadiz
GIBRALTAR
Ceuta
MOROCCO
Melilla
0 100 mi
N 0 160 km

SPAIN

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year	Oct	12	National Day
Jan	6	Epiphany	Dec	6	Constitution Day
Apr	13	Holy Thursday	Dec	8	Immaculate Conception
Apr	14	Good Friday	Dec	25	Christmas
May	1	Labor Day			

TIME

Standard Time Washington, D.C. **+ 6 hours**
Daylight Savings Time Period: **03/27 - 09/24/95**

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S. $ = 124.18 Peseta
per Wall Street Journal, 10/01/95. Because 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
75, Serrano
28006 Madrid, Spain

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

Science Attaché — Helen B. Lane

Population	1994	39.3	million

ENERGY

Electric Power Capacity	1993	42.4	GWe
		17.5%	**nuclear**
	1995	46.2	GWe
		15.9%	**nuclear**
	2000	51.4	GWe
		14.3%	**nuclear**
Electric Power Production	1993	153.2	TWh
		39.3%	coal
		34.8%	**nuclear**
		16.2%	hydro
		6.3%	oil
		0.7%	other
	1995	165.5	TWh
		27.4%	**nuclear**
	2000	195.3	TWh
		23.2%	**nuclear**

NUCLEAR POWER

Policy: Continue to operate existing nuclear power plants. Moratorium on new nuclear power plant construction has been in place for several years (confirmed 1991).

Nuclear Power Capacity	1993	7.4	GWe
	2000	7.4	GWe
Reactor Mix	1994	PWR	7 (1969-88)
			4 (Indef.)
		BWR	2 (1971-85)
			2 (Indef.)

INDUSTRIAL FUEL CYCLE

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

Waste Management Strategy: Store spent fuels at the reactor sites for at least 10 years; reracking in some reactor pools and dry storage in dual-purpose casks planned to provide additional capacity until geologic repository is ready to receive HLW (spent fuel); granite, salt, and clay are being considered as host rock for repository; shallow-land burial of LLW in fully engineered facility at El Cabril, province of Córdoba, in operation since October 1992.

Cumulative SF Arisings (LWR)	1990	950	t U
	1995	1,800	t U
	2000	2,000	t U

Industrial-Scale Activities (Capacity)

- U mining/milling: 270 t U/yr
- U enrichment: 11.1% interest in Eurodif
- Fuel fabrication: 200 t U/yr
- Intermediate SF storage: 3,000 t U

INTERNATIONAL RELATIONSHIPS

DOE/Empresa Agreement in the Field of Radioactive Waste Management

Term: 12/16/92 - 12/16/97

Scope: Exchange of technology for management of radioactive wastes, i.e., characterization of geologic formations; preparation/packaging; disposal; surface/subsurface storage; performance and transportation assessments; mutually agreed-upon topics associated with management of radioactive waste.

Member of EU, IAEA, and OECD/NEA.

CIEMAT (Energy Research Center)

Centro de Investigaciones
Energéticas, MedioAmbientales
y Tecnologicas
22, Avenida Complutense
Ciudad Universitaria
28040 Madrid, Spain

Tel: 34-1-346-6000/01
Fax: 34-1-346-6005

President	A. Lafuente Félez
General Director	José Angel Azuara Solís
Dir., Nuclear Tech. Institute	Manuel Montes Ponce de León
Dir., Environment Institute	J. G. Maganto Fernández
Waste Management Unit	Armando Uriarte Hueda

Function: Organized into five research institutes: Nuclear Technology (R&D on nuclear fuel cycle, decommissioning, material sciences, and safety analyses); Technology Institute; Environment Institute (radiation protection included); Basic Research Institute (fusion research included); and Renewable Energy Institute.

CSN (Council of Nuclear Safety)

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

Tel: 34-1-346-0100
Fax: 34-1-346-0471

President	J. M. Kindelán
Commissioners[a]	A. Alonso Santos
	R. Caro Manso
	A. Martin

Function: Independent body, responsible to Parliament, with regulatory powers on nuclear safety and radiation protection matters.

(a) Nominations pending.

ENRESA (National Waste Management Company)

Empresa Nacional de Residuos
Radiactivos S.A.
7, Emilio Vargas
28043 Madrid, Spain

Tel: 34-1-519-5255
Fax: 34-1-519-5268

President — J. A. Pina Barrio, 34-1-279-2667

General Director — Alberto López Garcia, 34-1-279-2858

Engineering Director — Aurelio M. Ulibarri

International Relations — Valentín González, 34-1-519-5314

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

ENUSA (National Fuel Cycle Company)

Empresa Nacional
del Uranio S.A.
12, Santiago Rusinol
28040 Madrid, Spain

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

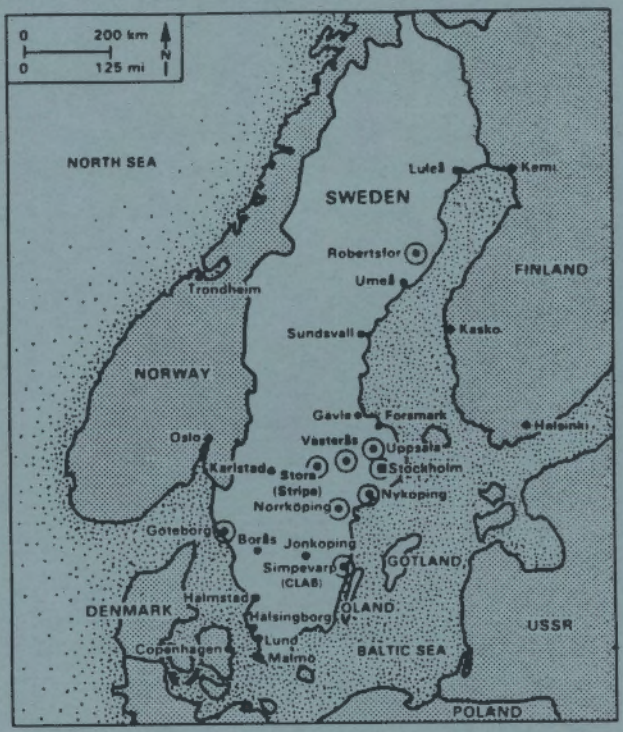
President — Alfredo Llorente Legaz

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

MINISTRY OF INDUSTRY AND ENERGY

Minister	J. M. Eguiegaray Ucelay
Secretary General, Energy/Mineral Resources	A. Lafuente Félez
General Director of Energy	María Luisa Huidobro Arreba

SWEDEN


0 200 km
0 125 mi
N
NORTH SEA
SWEDEN
Luleå
Kemi
Robertsfor
Umeå
FINLAND
Trondheim
Sundsvall
Kasko
NORWAY
Gävle
Forsmark
Helsinki
Oslo
Västerås
Uppsala
Karlstad
Stora
(Stripa)
Stockholm
Nykoping
Norrköping
Göteborg
Borås
Jonkoping
GOTLAND
Simpevarp
(CLAB)
Halmstad
DENMARK
Halsingborg
OLAND
USSR
Lund
Copenhagen
Malmo
BALTIC SEA
POLAND

SWEDEN

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year
Apr	14	Good Friday
Apr	17	Easter Monday
May	25	Ascension
June	5	Pentecost Monday
June	24-25	Midsummer
Nov	1	All Saints
Dec	24-25	Christmas
Dec	26	Boxing Day

TIME

Standard Time Washington, D.C. **+ 6 hours**
Daylight Savings Time Period: **03/26 - 09/23/95**

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S. A visa is currently not required for a visit to Sweden; however, it is recommended to consult a travel agency for up-to-date information on requirements.

CURRENCY EXCHANGE RATE

1 U.S. $ = 6.6855 Krona (SEK)
per Wall Street Journal, 11/08/95. Because 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
100 00 Stockholm, Sweden

Tel: 46-8-783-5300
Fax: 46-8-661-1964

Economic Section

Kenneth H. Kolb

Population	1994	8.7	million

ENERGY

Electric Power Capacity	1993	34.2	GWe
		29%	**nuclear**
	1995	34.8	GWe
		29%	**nuclear**
	2000	35.0	GWe
		29%	**nuclear**
Electric Power Production	1993	140.8	TWh
		52%	hydro
		42%	**nuclear**
		6%	coal, oil, solids, gas
	1995	**43%**	**nuclear**
	2000	**44%**	**nuclear**
	2005	**46%**	**nuclear**

NUCLEAR POWER

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

Nuclear Power Capacity	1993	10.0	GWe
	2000	10.0	GWe
Reactor Mix	1995	BWR	9 (1972-85)
		PWR	3 (1975-83)

INDUSTRIAL FUEL CYCLE

Policy: Direct disposal of spent fuel; no Pu recycle is planned; costs of waste management and future decommissioning of nuclear power plants are paid by fees collected from the nuclear utilities.

Waste Management Strategy: Store spent fuel for 30-40 years in an underground pool storage facility; encapsulate spent fuel in a highly corrosion-resistant canister; emplace in a deep geologic (crystalline rock) repository.

Cumulative SF Arisings (LWR)	1993	2,560	t U
	2010	7,800	t U
Cumulative Waste Arisings (conditioned and encapsulated, ready for disposal)	2020		
	SF	5,600	canisters
	TRU	6,000	m^3
	Reactor waste	95,000	m^3
	Reactor core comp.	19,000	m^3
	D&D	113,000	m^3

Industrial-Scale Activities

- LWR fuel fabrication: 400 t U/yr.

Major Milestones
(Deep Repository Project)

• Collect information for general and feasibility studies	1993-95
• Site investigations	1995-98
• Regulatory review, stage 1	1999
• Detailed characterization	1999-2004
• Regulatory review, stage 2	2004-05
• Construction of deep repository	2005-08
• Regulatory review of construction	2007-08
• Operation start, initial stage disposal activities	2008

INTERNATIONAL RELATIONSHIPS

DOE/SKB Agreement for Cooperation in Waste Management
Term: 07-01-77 to 09-09-95
Scope: Preparation and packaging of waste forms; storage, field, and laboratory testing; geologic disposal; safety, environment, institutional, and public relations issues. Collaboration in Stripa Mine

test program (NEA coordination), U.S. participation in performance assessment computer model and code intercomparison sponsored by SKB.

Member of IAEA and OECD/NEA; waste management cooperative agreements with Canada, EC, Finland, France, Spain, Switzerland. Host country for NEA Stripa Project.

ORGANIZATION

- **Waste Management**
  - **SKB** (Swedish Nuclear Fuel and Waste Management Company) - executes spent fuel and waste management program for the utilities; manages waste disposal R&D programs.

- **Licensing Responsibilities**
  - **SKI** (Swedish Nuclear Power Inspectorate) - licensing for construction/operations of nuclear facilities; administers waste management fund collected from nuclear utilities; oversees back-end fuel cycle activities.
  - **SSI** (Swedish National Institute of Radiation Protection)
  - National Swedish Franchise Board for Environment Protection
  - Municipality where the facility is to be located (right of veto)

CHALMERS (TECHNICAL UNIVERSITY)

Chalmers Tekniska Hoegskola Tel: 46-31-72-10-00
412 96 Goeteborg, Sweden 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
Pipersgatan 27
112 28 Stockholm, Sweden

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

Manager — Bertil Grundfelt

Function: Computer calculations on hydrology/nuclide migration.

KTH (Royal Institute of Technology)

KTH
100 44 Stockholm, Sweden

Tel: 46-8-790-60-00
Fax: 46-8-109-199

Chemical Engineering — Ivars Neretnieks
Inorganic Chemistry — I. Grenthe

Waste Management R&D: Near- and far-field migration modeling, rock-matrix diffusion experiments; actinide chemistry, solubility calculations, groundwater sampling and characterization.

NUCLEAR SAFETY AND TRAINING CENTER

Kärnkraftssäkerhet och
Utbildning AB
PO Box 1039
S-61129 Nykoping, Sweden

Tel: 46-155-263-500
Fax: 46-155-263-074

President — Svante Nyman
Manager — Lars R. Erikson

Function: Promote coordination/cooperation among the Swedish utilities in their nuclear power plant safety work; nuclear simulator training in Sweden.

SGAB (Swedish Geological Company)

Geosigma AB
P.O. Box 894
75108 Uppsala, Sweden

Tel: 46-18-65-08-00
Fax: 46-18-12-32-02

Director — Nils-Ake Larsson

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
P.O. Box 5864
102 40 Stockholm, Sweden

Tel: 46-8-665-28-00
Fax: 46-8-661-57-19

President	Sten Bjurström 46-8-665-2834
Vice President	Per-Eric Ahlström 46-8-665-2838
Systems/Facilities, Director	Hans Forsström 46-8-665-2832
Director, R&D/Safety Anal.	Tönis Papp 46-8-665-2801
Geoscience	Lars Olof Ericsson 46-8-665-2830
Chemistry	Fred Karlsson 46-8-665-2811
Design & Engineered Barriers	Christer Svemar 46-8-665-2825
Material Sciences	Lars Werme 46-8-665-2883
International Relations	Monica Hammarström 46-8-665-2883
Nuc. WM Int'l Consult. Services	Bo Gustafsson 46-8-665-2816

(contd next page)

SKB (Nuclear Fuel and Waste Management Company) (contd)

Function: Coordinate and arrange for nuclear fuel supply and reprocessing services for all Swedish nuclear power reactors; manage and fund R&D for the back end of the fuel cycle; responsible for design, construction, and operation of all necessary storage and disposal facilities; demonstrate that SF and other long-lived wastes can be disposed of safely and permanently; provide transportation of SF outside reactor sites.

Owners: Utilities.

Facilities

- **CLAB** (Central Storage for Spent Fuel, located at Simpevarp, adjacent to Oskarshamn Power Station)
  Mission: AFR storage facility.
  Design Capacity: Initially 3000 t; being upgraded to 5000 t.
  History: Startup construction, May 1980; startup operation, 1985.

- **SFR** (Swedish final repository for LLW and ILW, located in rock 50 m below seabed, 1 km outside Forsmark harbor on Gulf of Bothnia).
  Design: Concrete silos inside cylindrical rock caverns isolated by layer of bentonite clay backfill between silo and rock for high-activity ILW; conventional tunnel rooms for LLW; low-activity ILW is in concrete-walled "hot-cells" in tunnels; 1-km-long tunnels leading to repository will be plugged with concrete.
  Capacity: 90,000 m^3.
  History: Phase-1 construction startup, 1983; operation startup, 1988; Phase-2 operations startup, late 1990s.

- **Äspö Hard Rock Laboratory**

SKB Development/Äspö Hard Rock Laboratory
Project Office
Box 5864 Tel: 46-8-665-2831
102 48 Stockholm, Sweden Fax: 46-8-665-5719

Project Manager Olle Olsson

(contd next page)

SKB (Nuclear Fuel and Waste Management Company) (contd)

SKB Äspö Hard Rock Laboratory
Site Office, Pl 300
570 93 Figeholm, Sweden

Tel: 46-491-82000
Fax: 46-491-82005

Site Manager — Olle Olsson

Underground research laboratory (located on Äspö Island at Simpevarp) under construction; startup/operation 1994.

SKI (Nuclear Power Inspectorate)

Statens Kärnkraftinspektion
Box 27 106
102 52 Stockholm, Sweden

Tel: 46-8-665-44-00
Fax: 46-8-661-90-86

Director — Lars-Olof Högberg
Waste Management — Soeren Norrby

Function: Responsible for licensing nuclear facilities; administers waste management fund collected from nuclear utilities; oversees back-end fuel cycle activities.

SSI (National Institute of Radiation Protection)

Statens Straalskyddsinstitut
Box 60204
104 01 Stockholm, Sweden

Tel: 46-8-729-71-00
Fax: 46-8-729-71-08

Director — Gunnar Bengtsson
Radwaste Group — Gunnar Johansson (A)

Function: Responsible for establishing and enforcing radiation protection regulations.

STUDSVIK RADWASTE AB

Studsvik Radwaste AB
611 82 Nyköping, Sweden

Tel: 46-155-210-00
Fax: 46-155-630-44

Director Olle Andersson

Function: Nuclear waste R&D and services to support Swedish power programs (contract research) on LLW and ILW treatment, D&D techniques, SF leaching, biosphere migration, dose calculations.

Owner: Vattenfall (via Studsvik AB).

VATTENFALL

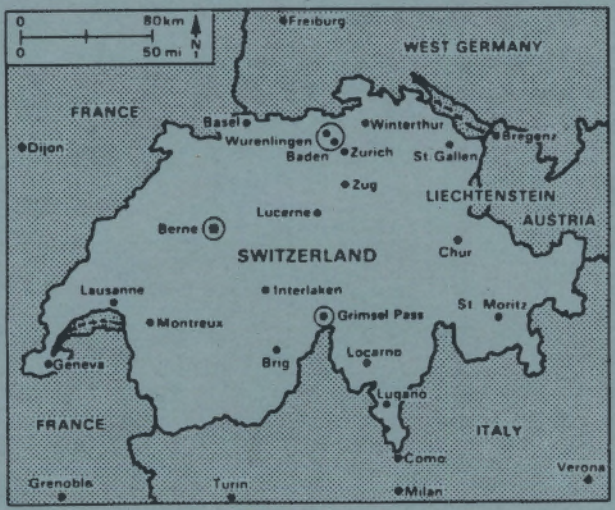
Vattensfall
162 87 Vaellingby
Sweden

Tel: 46-8-739-50-00
Fax: 46-8-737-01-70

President Carl-Eric Nyquist
Nuclear Power Stig Sandklef

Function: Operate the power distribution grid in Sweden; produce power (owner of Ringhals Nuclear Power Plants).

SWITZERLAND



SWITZERLAND

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year
Apr	14	Good Friday
Apr	16-17	Easter
May	1	Labor Day
May	12	Ascension
Jun	4	Whitsuntide
Jun	5	White Monday
Jun	5	Corpus Christi
Jun	22-23	Pentecost
Aug	1	National Day
Sept	13	Fed Day of Prayers
Dec	25-26	Christmas

TIME

Standard Time Washington, D.C.	**+ 6 hours**
Daylight Savings Time Period:	**03/27 - 09/24/95**

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S. $ = 1.1513 Franc

per Wall Street Journal, 10/01/95. Because rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct dial to Switzerland are complete as listed, after dialing international access code: **011**. Country code is **41**; listed local numbers include city code.

U.S. EMBASSY - BERN

American Embassy
Jubiläumstrasse 93
3005 Bern, Switzerland

Tel: 41-31-357-7011
Fax: 41-31-357-7336

Population	1994	7	million

ENERGY

Electric Power Capacity	1993	15.5	GWe
		19%	**nuclear**
	1995	15.9	GWe
		20%	**nuclear**
	2000	17.0	GWe
		19%	**nuclear**
Electric Power Production	1993	57.8	TWh
		57%	hydro/geoth.
		38%	**nuclear**
		1%	oil
		1%	other
	1995	**38%**	**nuclear**
	2000	**36%**	**nuclear**

NUCLEAR POWER

Policy: Federal government is in favor of nuclear power, but local opposition has delayed its expansion.

Nuclear Power Capacity	1993	3.0	GWe
	2000	3.2	GWe
Reactor Mix	1994	BWR	2 (1972/84)
		PWR	3 (1969-79)

INDUSTRIAL FUEL CYCLE

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

Waste Management Strategy: Develop two waste repositories: a horizontally accessed rock cavern in a host rock with considerable overburden for LLW/ILW, and a deep repository in crystalline rock or sedimentary

formations for HLW glass, unreprocessed SF elements, and alpha wastes; interim storage of all waste at common center until repositories available.

Cumulative SF Arisings (LWR)	1990	1,090 t U	
	2000	2,000 t U	
Cumulative Waste Arisings[a]	LLW/D&D		
(Planning basis: after	waste	100,000 or	100,000 m³
40-yr operation at 3 GWe)	LLW/ILW	15,000 or	10,000 m³
	HLW glass	500 or	160 m³

Major Milestones

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

INTERNATIONAL RELATIONSHIPS

DOE/NAGRA Agreement for Cooperation in Radioactive Waste Management

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

Scope: Preparation and packaging of wastes; field and laboratory testing; storage; geologic disposal; environment and safety; design and operational issues; transportation requirements; public acceptance issues; information exchange and direct cooperation, particularly concerning Grimsel Pass URL activities.

Member of IAEA and OECD/NEA; cooperative agreements with SKB/Sweden, CEA/France, ANDRA/France, Euratom/EC, ONDRAF/Belgium, PNC/Japan, NIREX/U.K., BfS, BMFT, GSF, and BGR/Germany, TVO/Finland.

(a) Two scenarios considered: complete reprocessing (left column) or no reprocessing (right column) after the year 2000.

ORGANIZATION

- **NAGRA** - National Cooperative for the Disposal of Radioactive Waste - formed by utilities/government to handle fuel cycle/waste management activities.

- **GNN** - Scnossenschaft für die Nukleare Entosorgung, Wellenberg - new company formed in 1994 for construction and operation of a LLW/ILW repository at Wellenberg in central Switzerland.

- **PSI** - Paul Scherrer Institut - formed (1987) through merger of EIR (Federal Institute for Reactor Research) and SIN (Swiss Institute for Nuclear Research).

- **Federal Energy Office** - sets criteria for waste management practices, including geologic disposal.

BEW (Federal Office for Energy)

Bundesamt für Energiewirtschaft
Nuclear Safety Inspectorate (HSK) Tel: 41-31-61-56-11
CH-3003 Bern, Switzerland Fax: 41-31-26-43-07

Waste Management Section Auguste Zurkinden
Director E. Kiener
Vice Director A. J. Baer

Function: Licensing and inspection of nuclear installations.

NAGRA/CEDRA/CISRA (National Cooperative for the Disposal of Radioactive Waste)

Nationale Genossenschaft für die Lagerung
Radioaktiver Abfälle (Nagra)
or
Société Coopérative Nationale pour
l'Entreposage de Déchets Radioactifs (CÉDRA)
or
Società Cooperativa Nazionale per
l'Immagazzinamento di Scorie Radioattive (CISRA)
Hardstrasse 73 Tel: 41-56-37-11-11
CH-5430 Wettingen, Switzerland Fax: 41-56-37-12-07

President	Hans Issler
Director, Science/Technology	Charles McCombie
Chief Geologist	Marc F. Thury
Site Characterization	Ch. Sprecher
Nuclear Technology and Safety	Piet Zuidema

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

Facilities

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

- **Gesselschaft für die nuckleare Entsorgung Wellenberg** - c/o Nagra, Hardstresse 73, 5430 Wettingen Switzerland

President	P.U. Fischer
Directors	H. Beeler
	J. Peter
	E. Kowalski
	C. McCombie

PSI

Paul Scherrer Institut
5232 Villigen, Switzerland

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

Director — Meinrad Eberle
Manager, Waste Mgmt. Proj. — J. Hadermann

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

Waste Management R&D: Incineration of TRU wastes; modeling of radionuclide migration through heterogeneous geologic media; chemical behavior of radionuclides during migration; transport of radionuclides through the biosphere; natural analogue studies; hydrological studies; sorption constants on different rocks; immobilization of LLW/ILW in cement; leaching rates on LLW/ILW forms; and long-term corrosion tests on waste package materials.

Facilities

- **Hot cells, radioactive laboratories, incinerator**.
- **ADA** (Acid Digestion Plant) for TRU wastes.
  Design Basis: carbonization/digestion in H_2SO_4/HNO_3 at 150°C; capacity, 1 kg/hr solid wastes.
  History: Non-Pu runs, late 1981; Pu runs, 1982.

ZWILAG (Interim Waste Storage Facility)

Zwischenlager Würenlingen AG
Parkstrasse 23
5401 Baden, Switzerland

Tel: 41-56-20-31-11
Fax: 41-56-20-37-58

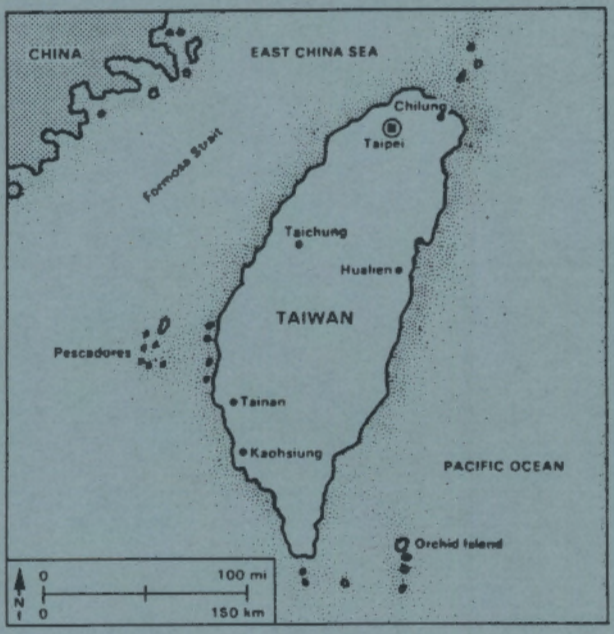
Director — Hans R. Lutz
41-56-20-38-55
Tech. Project Manager — C. Vuilleumier

(contd next page)

ZWILAG (contd)

Function: Provide interim storage for spent fuel, HLW, LLW, and ILW; the facility was voter-approved in 1989 and will be managed by the local council and the nuclear utilities; construction is expected to take at least two years (startup in 1998) and cost about (U.S.) $350 million; organization is a consortium of Swiss nuclear utilities.

TAIWAN


CHINA
EAST CHINA SEA
Formosa Strait
Chilung
Taipei
Taichung
Hualien
TAIWAN
Pescadores
Tainan
Kaohsiung
PACIFIC OCEAN
Orchid Island
0
100 mi
N
0
150 km

TAIWAN

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1-3	Commemoration Day	Sep	9	Mid-Autumn Day
Jan	29 - Feb. 2	Lunar New Year	Sep	28	Confucius Birth
Mar	29	Youth Day	Oct	10	National Day
Apr	4	Women/Children's Day	Oct	25	Taiwan Restoration
Apr	5	Tomb Sweeping Day	Oct	31	Ch. Kai-Shek's Birth
Jun	2	Dragon Boat Fest	Nov	12	Sun Yat-Sen's Birth
			Dec	25	Constitution Day

TIME

Standard Time Washington, D.C. **+ 13 hours**

PASSPORT/VISA

A passport is needed to depart and re-enter the U.S. In addition, a visa is recommended for a visit to Taiwan; short-term visas are available under certain conditions. Most travel agencies can provide up-to-date information about requirements.

CURRENCY EXCHANGE RATE

1 U.S. $ = 26.89 Taiwan Dollar
per Wall Street Journal, 10/01/95. Because rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct dial to Taiwan are complete as listed, after dialing international access code: **011**. Country code is **886**; listed local numbers include city code.

AIT - TAIPEI

American Institute in Taiwan
7 Lane 134
Hsin Yi Road, Sec. 3
Taipei, Taiwan

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

Science Officer — Della Knox-Bennett

Population	1994	21.2	million

ENERGY

Electric Power Capacity	1994	21.0	GWe
		27%	**nuclear**
	1994	21.0	GWe
		27%	**nuclear**
Electric Power Production	1994	21.0	TWh
		35%	coal
		32%	**nuclear**
		16%	oil
		10%	other
		7%	hydro
	1994	110.3	TWh
		35%	coal
		30%	**nuclear**
		21%	oil
		6%	other
		8%	hydro

NUCLEAR POWER

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

Nuclear Power Plant Capacity	1994	4.9	GWe
	1995	4.9	GWe
	2003	6.7	GWe
Reactor Mix	1994	BWR	4 (1978-83)
		PWR	2 (1984/85)

INDUSTRIAL FUEL CYCLE

Policy: Purchase fuel materials and enrichment; develop indigenous fuel production capability: UF_6 conversion; UO_2 pellet preparation; fuel hardware fabrication; fuel assembly.

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

Cumulative SF Arisings (LWR)	1995	1,600	t U
	2000	2,600	t U

Major Milestones

LLW disposal facility	
• Selection of site/method	1995
• Site characterization, engineering, design and licensing	1998
• Completion, start of operation HLW disposal facilities	2002
SF interim storage facility	
• Commission MRS at Chinshan reactor site	2000
• Commissioning of Kuosheng reactor site	2005
SF disposal facility	
• Geologic repository site selection	2016
• Commission final repository	2032

ORGANIZATION

- **TAIPOWER** (Taiwan Power Company) - operation of nuclear power plants (owned by the government); country's only electric utility; radwaste disposal.

- **AEC** (Atomic Energy Council) and RWA (Radwaste Administration) - regulatory functions.

- **INER** (Institute of Nuclear Energy Research) - nuclear R&D.

AEC

Atomic Energy Council
67, Lane 144
Keelung Road, Section 4
Taipei Taiwan, 106

Tel: 886-2-363-4180
Fax: 886-2-363-5377

Chairman	Yih Yun Hsu
Sr. Vice Chairman	Ching-Shen Su
Vice Chairman	Mam-Chao Wang
Secretary General	Chao-Ming Tsai
Dir., Planning	Bao-Dian Lee 886-2-362-8567
Dir., Rad. Protection	Wei-li Chen 886-2-362-6189
Dir., Nuc. Regulations	Tsing-Tung Huang 886-2-362-8571
Dir., Technology	Yi-Bin Chen 886-2-366-0886

INER

Institute of Nuclear Energy Research
P.O. Box 3
Lung-Tan 32500, Taiwan

Tel: 886-2-365-1717
Fax: 886-2-471-1064

Director	Der-Yu Hsia
Dep. Directors	Li-Fu Lin Ging-Shung Yu Gang Ting
Nuclear Engineering	Shih-Kuei Cheng
Nuclear Instrumentation	Der-Sun Lee
Nuclear Fuel/Matls. Research	Ching-Tien Yang
Health Physics	Ming-Fong Su

Fuel Cycle R&D: Solvent extraction technology; yellowcake conversion to UO_2; cement and thermoplastic waste forms for reactor wastes; HLW conditioning processes; burial of LLW.

RA-AEC

Radwaste Administration
of AEC
5f, 37, San Min Rd., Sec. 2
Panchiao, Taiwan 220

Tel: 886-2-964-7401
Fax: 886-2-964-7464

Director — Syh-Tsong Chiou

TAIPOWER

Taiwan Power Company
17F, 242 Roosevelt Rd., Sec. 3
Taipei 107, Taiwan

Tel: 886-2-365-1234
Fax: 886-2-396-8593

Chairman — C. C. Chang, 886-2-368-8000

President — S. C. Chi, 886-2-365-8001

Vice President — M. C. Tsai, 886-2-367-8012

Dir., Nuclear Engineering — Victor Y.C. Liao, 886-2-367-7126

Dir., Nuclear Operation — A. H. Jeng, 886-2-367-7969

Dir., Nuclear Safety — S. J. Tsuei, 886-2-367-7341

Dir., Nuclear Backend Management — F. H. Chen, 886-2-368-3419

TRMC-AEC

Taiwan Radiation
Monitoring Center of AEC
823 Cherng-Ching Rd.
Kaohsiung, Taiwan 83

Tel: 886-7-380-2326
Fax: 886-7-381-1660

Director — Yu-Ming Lin

UNITED KINGDOM

UNITED KINGDOM

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year	May	27	Spring Holiday
Apr	5	Good Friday	Jun	10	Queen's Birthday
Apr	8	Easter Monday	Aug	26	Summer Holiday
May	6	Bank Holiday	Dec	25	Christmas
			Dec	26	Boxing Day

TIME

Standard Time Washington, D.C.	**+ 5 hours**
Daylight Savings Time Period:	**03/27 - 10/22/95**

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 U.S. $ = 1.55 Pound

per Wall Street Journal, 11/16/95. Because 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: **001**. Country code is **44**; listed local numbers include city code.

U.S. EMBASSY - LONDON

American Embassy
24/31 Grosvenor Square
London W1A 1AE, United Kingdom

Tel: 44-71-499-9000
Fax: 44-71-409-1637

Science Counselor — Jeffrey T. Lutz

Population	1995	58.4	million

ENERGY

Electric Power Capacity	1993	65.3	GWe
		18%	**nuclear**
	1995	76.9	GWe
		17%	**nuclear**
	2000	82.4	GWe
		16%	**nuclear**
Electric Power Production	1993	325.2	TWh
		62%	coal
		27%	**nuclear**
		9%	oil
		3%	gas
		2%	hydro
	1995	**29%**	**nuclear**
	2000	**27%**	**nuclear**

NUCLEAR POWER

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

Nuclear Power Capacity	1995	13.1	GWe
	2000	12.9	GWe
Reactor Mix	1995	GCR	20 (1956-72)
		AGR	14 (1976-89)
		PWR	1 (1995)
Reactor Development	PWRs; future LMFBR development.		

INDUSTRIAL FUEL CYCLE

Policy: Reprocess and recycle U to AGR and LWR systems; develop and maintain complete fuel cycle capability (UF_6 conversion, enrichment, UO_2 and MOX fuel fabrication, spent fuel reprocessing); sell fuel cycle services abroad.

Waste Management Strategy: Reprocess spent Magnox/AGR fuels as rapidly as plant capacity permits; reprocess other thermal reactor fuel after several years' cooling; vitrify HLW (French process); long-term interim storage of HLW glass for at least 50 years before disposal; shallow-land burial of LLW currently; future deep-land disposal of LLW and ILW.

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

Industrial-Scale Activities (Capacity)

- Uranium conversion (Springfields)
  - UF_6 production: 9,000 t/yr
  - UO_2 conversion: 10,000 t/yr

- Uranium enrichment (Capenhurst)
  - Centrifuge plant: 800 t SWU/yr

- Fuel fabrication
  - Springfields
    U metal (Magnox): 1,300 t U/yr
    AGR/LWR fuels: 300 t/yr
  - Sellafield
  - MOX fuels capacity, 1992: 6 t/yr (LWR)

- Fuel reprocessing
  - Magnox fuels (Sellafield): up to 1500 t/yr
  - UO_2 fuels (THORP, Sellafield): 1200 t/yr (1992)
  - FBR fuels (PFR, Dounreay): 50 kg HM/d

- HLW vitrification
  - Sellafield Vitrification Plant, radioactive operation, 1990

INTERNATIONAL RELATIONSHIPS

DOE/UKAEA Agreement in the Field of Decommissioning Nuclear Facilities

Term: 03-01-85 to 03-01-93

Scope: Techniques used, schedules, costs, manpower, radiation exposures, and waste arisings relevant to decommissioning projects (U.S./ Shippingport Station - U.K./Windscale AGR); treatment, packaging, storage, transportation, disposal methods, and costs for wastes arising from the decommissioning operations; emphasis on exchange of technical information, specialists, samples, materials, instruments, and testing equipment.

DOE/UKAEA Agreement in the Field of Radioactive Waste Management Technology

Term: 10-30-86 to 10-29-91

Scope: LLW/ILW, TRU waste and D&D technology; treatment; geologic disposal; transportation; storage; environment/safety and public acceptance issues; performance assessment; packaging; emphasis on technical information exchange, primarily TRU waste treatment.

Member of EC, IAEA, and OECD/NEA; agreements/partnerships with various nations.

ORGANIZATION

- **AEA Technology**: nuclear research; laboratories at Harwell, Risley, Sellafield, Springfields, Dounreay.
- **DoE** (Department of Environment): develops waste management strategy, funds and coordinates generic waste management R&D.
- **HMIP** (Her Majesty's Inspectorate of Pollution): regulates effluent discharges to the environment.
- **BNFL** (British Nuclear Fuels plc): commercial fuel cycle and engineering services for domestic and foreign customers.
- **NIREX** ("private limited"/government-owned company): LLW and ILW disposal in deep repository.
- **BGS** and **IOS** (British Geological Survey and Institute of Oceanographic Sciences): supporting R&D for the waste management program.
- **NRPB** (National Radiological Protection Board): environmental R&D.
- **NII** (Nuclear Installations Inspectorate): licensing.
- **MAFF** (Ministry of Agriculture, Fisheries, and Food) regulation of waste management.

NUCLEAR FUEL CYCLE/WASTE MANAGEMENT ORGANIZATION

- National Government
  - Department of Environment (DoE)
    - H.M. Inspectorate of Pollution (HMIP)
    - Radioactive WM Advisory Committee (RWMAC)
    - Building Research Establishment (BRE)
  - Department of Health/Social Services
    - National Radiological Protection Board (NRPB)
  - Department of Trade and Industry (DTI)
    - Nat. Environment Research Council (NERC)
      - British Geological Survey (BGS)
      - Inst. of Oceanographic Sciences (IOS)
      - Nuclear Electricity Authorities
      - NIREX
      - British Nuclear Fuels plc (BNFL)
      - AEA Technology
  - Health and Safety Executive (HSE)
    - Nuclear Installations Inspectorate (NII)
  - Ministry of Defense (MOD)
    - Atomic Weapons Res. Establishment (AWE)
  - Ministry of Agriculture, Fisheries and Food (MAFF)
    - Fisheries Laboratories

FUEL CYCLE/WASTE MANAGEMENT RESPONSIBILITIES

Department of Energy (DEN)

- Nuclear Electricity Authorities (Nuclear Electric, Scottish Nuclear)
  - Nuclear Electricity Production
  - Reactor Waste Management
- British Nuclear Fuels plc (BNFL)
  - Risley (HQ)
    - Engineering
  - Sellafield
    - Reprocessing
    - Waste Conditioning
    - MOX Fuel Production
    - LLW Disposal (Drigg)
  - Springfields
    - Fuel Fabrication
    - UO_2 Production
    - Uranium Conversion
  - Capenhurst
    - Uranium Enrichment
- AEA Technology
  - Decommissioning and Radwaste
  - Environment & Energy
  - Fuel Services
  - Fusion
  - Industrial Technology
  - Safety & Reliability
  - Reactor Services
- NIREX

AEA

AEA Technology
Corporate Headquarters
B329 Harwell Laboratory
Didcot, Oxon, 0X11 ORA
United Kingdom

Tel: 44-1235-821111
Fax: 44-1235-432916

Chairman	Anthony Cleaver
Dep. Chairman	Brian L. Eyre
Chief Executive	Peter Watson
Marketing Director	Michael Watson

Government-owned nuclear research and applications agency, since 1986 operating on a fully commercial basis; supply a range of products and services for the nuclear industry in the U.K. and worldwide.

UKAEA Government Division
Nuclear Site Operations
Dounreay
Caithness KW14 7TZ
United Kingdom

Tel: 44-1847-804000
Fax: 44-1847-802697

Director	John Baxter
Mgr., Customer Mgmt., Finance	David Thom

Fuel reprocessing of special nuclear fuels.

UKAEA Government Division
Fusion
Culham, Abingdon
Oxon, OX14 3DB
United Kingdom

Tel: 44-1235-521840
Fax: 44-1235-463682

Director	D. R. Sweetman
Research Director	D. C. Robinson

Responsibility for the U.K. contribution to the international fusion program.

AWE

Atomic Weapons Establishment
Aldermaston, Reading RG7 4PR
United Kingdom
Tel: 44-73-56-4111

Waste Management — S. Hunter

BGS

British Geological Survey
Nicker Hill, Keyworth
Nottingham, NG12 5GG
United Kingdom
Tel: 44-60-77-6111
Fax: 44-60-77-6602

Director — P. J. Cook

BNFL

British Nuclear Fuels plc
Risley, Warrington
Cheshire WA3 6AS
United Kingdom
Tel: 44-925-83-2502
Fax: 44-925-82-2711
Ver: 44-925-83-2369

Location: About 20 miles by car from Manchester International Airport, or by train from London to Warrington (approximately three hours), then six miles by car to Risley.

Chairman	John Guiness 44-925-83-5000
Chief Exec. Officer	N. L. Chamberlain 44-925-83-5006
Dep. Chief Exec. Officer	Greg G. Butler
Dir., International Group	Graham Watts
Dir., Engineering Group	Ken G. Jackson
Dir., U.K. Group	Graham Smith

(contd next page)

BNFL (contd)

BNFL, Inc.
1776 I Street NW
Washington, DC 20006
Tel: 202-785-2635
Fax: 202-785-4037

President — R. "Landy" Langley

BNFL Inc. is a nuclear technology applications company specializing in radioactive waste management, decontamination and decommissioning of outmoded facilities, technology development and application, special nuclear materials handling, and safety and health protection in the North American market.

BNFL, Japan KK
Toranamon Wing Building
Third Floor
12-10 Nishi Shinbashi 1-Chome
Minato-Ku
Tokyo 105, Japan
Tel: 00-813-3593-7151
Fax: 00-813-3593-7160

President — David Woolf

BNFL Liaison Office
Fourth Floor Doo-Kyoung Building
64-1 Hannam-Dong
Yongsan Ku, Seoul
Tel: 00-8227-49-1611/1612/1613
Fax: 00-8227-49-1614

General Manager — John Ireland

URENCO
Capenhurst Works
Chester
Cheshire CH1 6ER
United Kingdom
Tel: 44-51-339-4101
Fax: 44-51-339-5541

Dir., Enrichment Division — Pat C. Upson

Function: Enrichment of U by centrifuge process (URENCO).

BNFL: SELLAFIELD

British Nuclear Fuels plc
Sellafield, Seascale
Cumbria CA20 1PG
United Kingdom

Tel: 44-9402-8333
Fax: 44-9467-28987

Location: From London Euston Station to Carlisle Station by train, about four hours; transport can be arranged by BNFL from Carlisle (approximately one and a half hours; from Manchester International Airport by car takes about three hours.

Dir., Magnox Reprocessing	Grahame K. Smith 44-9402-74245
Dir., THORP Division	Chris Loughlin
Dir., Waste Mgmt.	Peter Manning
Dir., Decom. Div.	Sam Kelly
Dir., Reactor Division	Bill McLaughlan

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

Facilities

- **B205** (Magnox Fuel Reprocessing Plant)
  Mission: Reprocess Magnox (magnesium-clad, U metal) fuels from U.K. GCRs.
  Design Basis: Magnox fuels - mechanical declad; PUREX flowsheet; "no maintenance" concept; nominal capacity, 1500 t/yr; HLLW storage - SS tanks, 70 m^3 and 150 m^3, in SS-lined concrete cells.
  History: Magnox fuels - startup, 1964; annual throughput of Magnox fuels, 1000-1200 t HM; oxide head-end (installed in B204), operated 1969-1973 and processed 90 t oxide fuel; shut down after a contamination release incident.

- **Magnox Fuel Handling Plant**
  - Storage/decanning of Magnox fuel.
  - Storage/dismantling of AGR fuel.

(contd next page)

BNFL: Sellafield (contd)

- **THORP** (Thermal Oxide Reprocessing Plant)
  Mission: Reprocess AGR, domestic and foreign LWR fuels.
  Design Basis: PUREX flowsheet, pulsed columns and mixer-settlers; "no maintenance" concept; nominal capacity, 1200 t U/yr.
  History: Startup, February 1994.

- **Drigg Waste Disposal Facility** (300-acre site, four miles from Sellafield)
  Mission: LLW disposal.
  Design Basis: Shallow-land disposal in clay-based trenches and recently, in concrete vaults.
  Capacity: 650,000 m^3 LLW disposed of through 1989.

- **MOX Fuel Fabrication Facilities**
  - Pilot plant, capacity - 7 t/yr
  - Production plants, capacity - 120 t/yr; startup, 1997.

- **Vitrification Plant**
  Mission: Solidify Sellafield HLW.
  Design Basis: AVM process; product, borosilicate glass blocks.
  Capacity: 250-300 t/yr glass.
  History: Startup, 1990.

- **WTC** (Waste Treatment Complex)
  Mission: Prepare TRU waste for disposal; underground refurbishment to include supercompaction.
  Milestone: Startup, 1995

- EP-1 and EP-2
  Mission: Encapsulate ILW in cement matrix in 500-L drums.
  Capacity: 13 500-L drums/d (EP-1); 20 500-L drums/d (EP-2).
  History: Startup EP-1, 1990.
  Milestone: Startup EP-2, 1994.

(contd next page)

BNFL: Sellafield (contd)

- **EARP** (Enhanced Actinide Removal Plant)
  Mission: Remove actinides from liquid effluents by ultra-filtration and flocculation.
  Capacity: 1000 m^3/d.
  Milestone: Startup, 1994.

BNFL: SPRINGFIELDS

British Nuclear Fuels plc
Springfields Works
Salwick, Preston
Lancashire PR4 OXJ Tel: 44-772-72-8262
United Kingdom Fax: 44-772-72-5607

Director, Fuel Division Ted Williams

Function: Supply fuel for U.K. reactors; UF_6 conversion to UO_2 powder/pellets production; fabricate PWR fuel; provide recycle services (enrichment in conjunction with URENCO).

BRE

Building Research Establishment
Department of the Environment
Building Research Station
Garston, Watford WD2 7JR Tel: 44-927-894040
United Kingdom

Asst. Dir., Geotech./Struc. Eng. J. B. Menzies
Seabed Disposal T. Freeman
Continental Disposal C. M. Cooling
Geotech. Division R. M. C. Driscoll

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

HMIP

H.M. Inspectorate of Pollution
Department of the Environment
Romney House, 43 Marsham Street
London SWIP 3PY Tel: 44-71-276-3000
United Kingdom Fax: 44-71-276-8100

Chief Executive David Slater
44-71-276-8080
Director, Regulatory Systems Div. Alan Duncan
44-71-276-8129
Research Steven Brown

Waste Management Responsibility: Administer U.K. waste management programs; fund and coordinate waste treatment and waste isolation R&D at Harwell, BGS, and NRPB; regulate discharge of radioactive materials to the environment.

IOS

Institute of Oceanographic Sciences
Brook Road, Wormley, Godalming
Surrey GU8 5UB Tel: 44-142-868-4141
United Kingdom

Director C. Summershayes

Function: Model radionuclide transport in the ocean.

MAFF

Ministry of Agriculture,
Fisheries and Food
Ergon House, Room 231
c/o Nobel House
17 Smith Square Tel: 44-71-238-6170
London SW1P 3JR, U.K. Fax: 44-71-238-6215

Chief Inspector M. A. Segal

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

MAFF Fisheries Laboratory
Pakefield Road
Lowestoft, Suffolk NR33 OHT Tel: 44-502-562244
United Kingdom

Director, Research P. Greig-Smith

NII

Nuclear Installations Inspectorate
Baynards House
1 Chepstow Place
Westbourne Grove Tel: 44-71-717-6000
London W2 4TF, U.K. Fax: 44-71-727-4116

Chief Inspector/Nuc.Installations Sam Harbison

Function: Licensing of nuclear facilities.

NIREX

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

Tel: 44-235-82-5500
Fax: 44-235-83-1239

Managing Director	M. Folger
Technical/Projects	C. Bayliss

Function: Commission/manage research and development to propose a site suitable for a deep repository for LLW/ILW; construct and operate the repository; continue necessary R&D on long-term waste emplacement.

Owners: BNFL (42.5%), Nuclear Electric plc (42.5%), Scottish Nuclear Ltd. (7.5), and UKAEA (7.5%) are partners in the "private limited" company. One special share, having absolute power of veto, is held by the Secretary of State for Energy.

NRPB

National Radiological
Protection Board
Chilton Didcot
Oxfordshire OX11 ORQ
United Kingdom

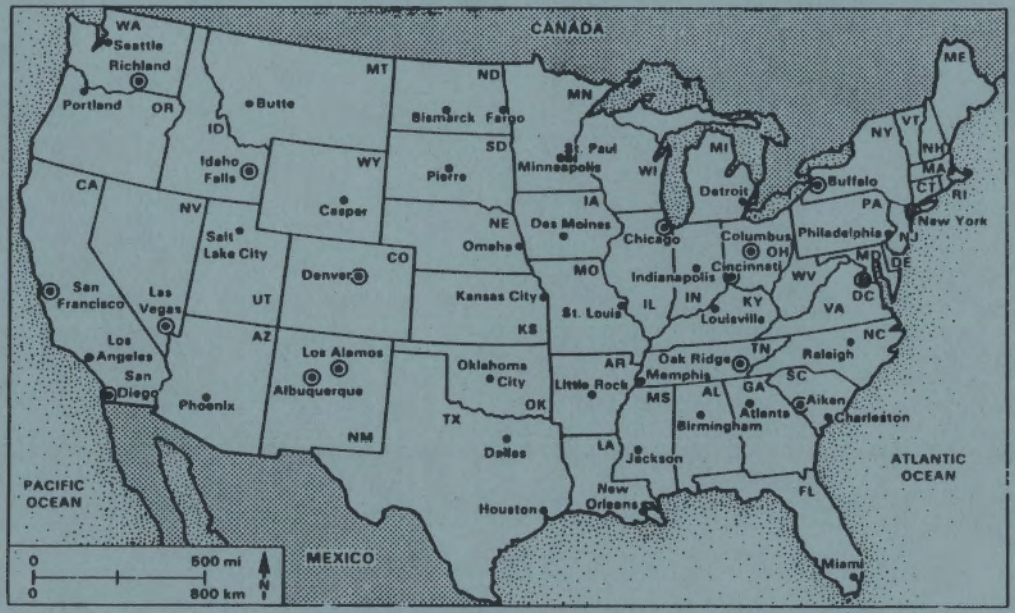
Tel: 44-235-83-1600
Fax: 44-235-83-3891

Director	Roger H. Clarke
Secretary	M. O. Riordan
Asst. Dir., Environ. Sci.	J. W. Stather
Asst. Dir., Physical Sci.	A. D. Wrixon
Asst. Dir., Medical Sci.	J. R. Harrison

(contd next page)

NRPB (contd)

Function: Independent board, established in 1970 as a result of the Radiological Protection Act; members appointed by the Health Ministry; advise governmental/industrial organizations on radiological protection matters and standards; contract research to improve radiological protection; provide some technical services.



UNITED STATES

UNITED STATES

MAJOR PUBLIC HOLIDAYS (1995)

Jan	1	New Year	Sep	4	Labor Day
Jan	16	M. L. King Day	Oct	9	Columbus Day
Feb	20	Presidents Day	Nov	11	Veterans Day
May	29	Memorial Day	Nov	23	Thanksgiving
July	4	Independence	Dec	25	Christmas

Daylight Savings **4/02-10/28/95**

STATE ABBREVIATIONS

AL - Alabama	LA - Louisiana	OH - Ohi
AK - Alaska	ME - Maine	OK - Oklahoma
AZ - Arizona	MD - Maryland	OR - Oregon
AR - Arkansas	MA - Massachusetts	PA - Pennsylvania
CA - California	MI - Michigan	RI - RhodIsland
CO - Colorado	MN - Minnesota	SC - South Carolina
CT - Connecticut	MS - Mississippi	SD - South Dakota
DE - Delaware	MO - Missouri	TN - Tennessee
FL - Florida	MT - Montana	TX - Texas
GA - Georgia	NB - Nebraska	UT - Utah
HI - Hawaii	NV - Nevada	VT - Vermont
ID - Idaho	NH - New Hampshire	VA - Virginia
IL - Illinois	NJ - New Jersey	WA - Washington
IN - Indiana	NM - New Mexico	WV - West Virginia
IA - Iowa	NY - New York	WI - Wisconsin
KS - Kansas	NC - North Carolina	WY - Wyoming
KY - Kentucky	ND - North Dakota	

FOREIGN NATIONAL VISITS TO U.S. DOE FACILITIES

Foreign visitors to U.S. DOE facilities must complete and submit an IA-473 form (OMB 1910-2100) "Request for Foreign National Unclassified Visit or Assignment" to the laboratory, contractor, or site to be visited at least 30 days before the proposed visit. In certain cases, in lieu of form IA-473, a DOE Operations Office (site specific) form may be used but must be submitted within the same time frame. The request to visit must be based on prior arrangements with appropriate DOE or DOE contractor staff.

Population	1994	260.7	million

ENERGY

Electric Power Capacity	1993	752	GWe
		13%	**nuclear**
	1995	766	GWe
		13%	**nuclear**
	2000	793	GWe
		13%	**nuclear**
Electric Power Production	1993	3271	TWh
		53%	coal
		20%	**nuclear**
		13%	gas
		9%	hydro./geotherm
		3%	oil
	1995	**19%**	**nuclear**
	2000	**18%**	**nuclear**

NUCLEAR POWER

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

Nuclear Power Capacity	1993	99	GWe
	1995	100	GWe
	2000	101	GWe
Reactor Mix	1993	PWR	73 (1968-95)
			5 (Indef.)
		BWR	37 (1965-90)
			1 (Indef.)

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. Disposal of spent fuel and HLW will be implemented in the future. Mining, milling, fabrication of UO_2 fuel, and LLW disposal are done predominantly by private firms; enrichment and HLW/spent fuel disposal are the responsibilities of the federal government; a private enrichment enterprise is being started.

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

Cumulative Spent Fuel Arisings	1993	27,800	t IHM
	1995	31,400	t IHM
	2000	40,400	t IHM

Major Milestones

• Demonstration start of disposal of defense TRU waste at Waste Isolation Pilot Plant (WIPP)	TBD
• Candidate site identified for MRS facility	TBD
• States/compacts must have civilian LLW disposal capability or manage their own LLW	1994
• States not having LLW disposal capability must take title to all LLW produced within their state	1996

- Startup of MRS facility with limited SF acceptance 1998
- Start construction of geologic repository for commercial SF/HLW 2004
- Startup of repository for spent fuel and HLW 2010
- Start of study on need for second repository for SF/HLW 2007-2010
- Environmental cleanup of DOE sites complete 2019

INTERNATIONAL RELATIONSHIPS

Member of OECD/NEA and IAEA. Bilateral agreements for cooperation (extension of several agreements in process) Canada, CEC, China, Germany, France, Japan, Spain, Sweden, Switzerland, Russia and the U.K; a brief outline of DOE agreements, primarily related to waste management, is provided in the appropriate section of other countries in this report. International cooperation and exchange of waste management technology is encouraged.

ORGANIZATION

- **DOE** (Department of Energy) - Responsible for planning and implementing programs for the safe handling of radioactive wastes generated by its federal activities and for disposal of all HLW, SF, TRU waste, and greater-than-class-C LLW; responsible for ensuring availability of adequate technology for safe and efficient management of nuclear wastes from both civilian and federal activities.

  - **HQ** (Headquarters) - Provides policy, guidance, and funding for nuclear waste management, including environmental restoration and fuel cycle programs. Specific responsibilities are divided among the following offices:

  - **EM** (Office of Environmental Management) - Environmental cleanup, compliance, technology development, transportation, and waste management activities for DOE sites identified in the Environmental Restoration and Waste Management Five-Year Plan.

- **RW** (Office of Civilian Radioactive Waste Management) - After-reactor interim storage, transportation, and disposal of spent nuclear fuel and HLW; development of an MRS facility.

- **PO** (Office of International Research and Development Policy, Assistant Secretary for Policy, Planning and Program Evaluation) - Coordinates DOE's international activities.

- **OP** (Operations Office) - Implements HQ policy and directives at DOE sites: issues orders to specific sites, directs efforts of DOE contractors.

- **Contractors** - Manage and operate DOE facilities in accordance with HQ and OP guidance and orders; national R&D laboratories.

• **DOI** (Department of the Interior)

  - **USGS** (U.S. Geological Survey) - Laboratory and field geologic investigations.

• **DOT** (Department of Transportation) - Develop, issue, and enforce safety standards governing aspects of hazardous materials transport, including radioactive materials.

• **EPA** (Environmental Protection Agency) - Establish and enforce general standards for protection of the environment.

• **NRC** (Nuclear Regulatory Commission) - Issue and enforce regulations and licenses of commercial nuclear activities and disposal of spent fuel and HLW, in compliance with general environmental standards issued by the EPA; through agreements with states that so desire, delegate the licensing of selected types of nuclear facilities.

DOE (DEPARTMENT OF ENERGY) PARTIAL ORGANIZATION

Secretary

Deputy Secretary
Under Secretary

- EM - Office of Environmental Management
- RW - Office of Civilian Radioactive Waste Management
  - YMPO
- PO - Office of International Research and Development Policy, Assistant Secretary for Policy, Planning and Program Evaluation
- Other Offices
- Operations Offices
  - AL - Albuquerque
    - LANL - MOUND - RFP - SNL - WIPP
  - COO - Chicago
    - ANL - BNL - BCO
  - ID - Idaho
    - INEL - WINCO - WVNS
  - NV - Nevada
  - OR - Oak Ridge
    - ORNL
  - OAK - Oakland Operations Office
    - ETEC - LLNL
  - RL - Richland
    - PNNL - WHC
  - SR - Savannah River
    - WSRC

NRC (NUCLEAR REGULATORY COMMISSION) PARTIAL ORGANIZATION

Chairman
Commissioners

- **Executive Director for Operations**
  - **OIP - Office of Internatl. Programs**
  - **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)**

DOE-Headquarters

U.S. Department of Energy	Tel: 202-586-5000
1001 Indep. Avenue	Fax: 202-586-5049
Washington, DC 20585	Verif: 202-586-5100
U.S. Department of Energy	Tel: 301-903-4511
Germantown	Fax: 301-903-3888
Washington, DC 20545	Verif: 301-903-5465

Secretary	Hazel R. O'Leary	202-586-6210

Office of Environmental Management (EM)
[Proposed Organization]

Assistant Secretary for EM	Thomas P. Grumbly	202-586-7710
Principal Deputy	Richard J. Guimond	-7745
Strategic Planning & Analysis	James P. Werner	-9280
Health and Safety	John C. Tseng	301-903-7170
DAS/Management & Finance	Gail M. Pesyna	202-586-1665
DAS/Waste Management	Stephen P. Cowan	202-586-0370
Eastern Operations	Ralph E. Erickson	301-903-7188
Central Operations	Joseph A. Coleman	-7410
Western Operations	James A. Turi	-7147
Hanford Operations	Maureen A. Hunemuller	-1446
Technical Services	James V. Antizzo	-7180
DAS/Environmental Restoration	James Owendoff	202-586-6331
Eastern Area	James J. Fiore	301-903-2328
Northwestern Area	Sally A. Robison	-3626
Southwestern Area	Ralph G. Lightner	-3850
Program Integration	William E. Wisenbaker	-3124
DAS/Science & Technology	Clyde W. Frank	202-586-6382
Science & Risk Policy	Mark A. Gilbertson	-5042
Technology Development	Stephen Lien	301-903-7911

(contd next page)

DOE-HQ (contd)

Technology Integration	John M. Lankford	-7294
International Programs	Ray G. De La Torre	202-586-6121
DAS/Nuclear Material & Facility Stabilization	Jill E. Lytle	202-586-5151
Nuclear Material Stabilization	Henry F. Dalton	-7503
Spent Fuel Management	George F. Cole	301-903-1450
DAS/Site Operations	Willis W. Bixby	202-586-8754
Transportation, Emergency Management & Analytical Services	Richard W. Brancato	301-903-7278

Office of Civilian Radioactive Waste Management (OCRWM)

Director	Daniel H. Dreyfus	202-586-6842
Dep. Director	Lake Barrett	-6850
Quality Assurance	Donald G. Horton	702-794-7675
Human Resources & Administration	James C. Bresee (A)	202-586-9173
Program Mgmt & Integration	Ronald A. Miner	-9694
Waste Acceptance & Transportation	Samuel Rousso	-9116

Yucca Mountain Site Characterization Office (YMSCO)
Phase 2, Suite P200
101 Convention Ctr. Dr.
Las Vegas, NV 89109

702-794-7900
Fax: -7907
Verif: -7919

Project Manager	Wesley E. Barnes	-5170
Dep. Proj. Mgr.	J. Russell Dyer	-7586
Scientific Programs	Susan B. Jones	-7613
Eng./Field Operations	Richard L. Craun	-7787
Env., Health/Safety	Wendy R. Dixon	-7946
Suitability/Licensing	Steve J. Brocoum	-7971

(contd next page)

DOE-HQ (contd)

Public Affairs	Gregory N. Cook	-7964
Administration	Jerri J. Adams	-7792
Quality Assurance	Donald G. Horton	-7675
International Programs	Robert A. Levich	-7946

Office of Policy

PO-1	Assistant Secretary	Susan F. Tierney	202-586-5800
PO-7	D.A.S. Intl. Affairs	David J. Jhirad	-5493
PO-70	Intnl. Tech. Coop.	John Brockman	-5915
PO-9	DAS Nat. Sec. and ER Mgmt. Policy	Robert Alveraz	-4640

DOE OPERATIONS OFFICES

ALBUQUERQUE OPERATIONS OFFICE (AL)

U.S. Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, NM 87115

Tel: 505-845-4154
Fax: -6058
Verif: -6319

Manager	Bruce G. Twining	-6049
Environment/Spec. Proj.	John Arthur (A)	-6210
Uranium Mill Tailings	UMTRA Team	-5640

DOE Rocky Flats Office (Denver Site)
Rocky Flats Plant
P.O. Box 464
Golden, CO 80402-0464

Tel: 303-966-7000
Fax: -4092
Verif: -2719

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

WIPP

Waste Isolation Pilot Plant P.O. Box 2078 Carlsbad, NM 88221-3090		Tel: 505-887-8100 Fax: -0707 Verif: -8110
Manager (DOE)	George E. Dials	505-234-7300
Carlsbad Operations Center	Paul E. Brewer	-0025
WIPP Sci. PM (SNL)	Wendell D. Weart	505-848-0788
Operating Contractor Mgr (WEC)	Carl M. Cox	505-234-8202

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

Function: Demonstrate defense transuranic waste disposal in a deep salt formation; if successfully demonstrated, WIPP will become a repository for this type of defense waste.

CHICAGO OPERATIONS OFFICE (COO)

U.S. Department of Energy Chicago Operations Office 9800 South Cass Avenue Argonne, IL 60439		Tel: 708-252-2001 Fax: -2343 Verif: -2209
Manager	Cherri J. Langenfeld	-2110 Fax: -2206
Environmental Programs	A.L. Taboas	-2236 Fax: -2654
WM/Tech. Devel.	Joel C. Haugen	-2093
Envir. Restoration	Jeffrey Roberts	-2228
Technical Support	Antanas Bindokas	-2692

IDAHO OPERATIONS OFFICE (ID)

U.S. Department of Energy
Idaho Operations Office
850 Energy Drive
Idaho Falls, ID 83401-1562

Tel: 208-526-0111
Fax: -5406

Manager	John M. Wilcynski	-5665
Deputy Manager	Delores J. Ferri (A)	-1478
Executive Assistant	Donald W. MacDonald	-6520
Program Execution	Thomas F. Burns, Jr.	-7653
SF Program	Brian Edgerton	-1081
R&D	Neil S. Burrell	-1984
Environmental Restoration	Lisa A. Green	-0417
Waste Management	Joel T. Case	-6795

NEVADA OPERATIONS OFFICE (NV)

U.S. Department of Energy
Nevada Operations Office
P.O. Box 98518
Las Vegas, NV 89193-8518

Tel: 702-295-1212
Fax: 702-285-1371
Verif: -1369

Manager	Terry Baeth (A)	702-295-3211
Environmental Protection	Don Elle	-1146
WM Division Director	Frank DiSanza (A)	-5855

OAK RIDGE OPERATIONS OFFICE (OR)

U.S. Department of Energy
Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, TN 37831

Tel: 423-576-5454
Fax: -1063
Verif: -1058

Manager	Jim Hall	576-4444
Assistant Manager	Edward G. Cumesty	-0723
Dir., Energy Programs	Thomas Jelinek	-4876
Dep. AM Energy R&D	Ronald Hultgren	-4523
Laboratory EPD	Thomas Jelinek	-4876

(contd next page)

OAK RIDGE OPERATIONS OFFICE (OR) (contd)

Fusion/Nuclear Tech.	Martha J. Kass	-0717
Environmental Mgmt.	Doug Underwood	-0728
Dir., WM/Tech. Dev.	Larry Radcliffe	-9212

OAKLAND OPERATIONS OFFICE (OAK)

U.S. Department of Energy
Oakland Operations Office
1301 Clay Street
Oakland, CA 94612

Tel: 510-637-1640
Fax: -2001
Verif: -1585

Manager	James M. Turner	-1800
Envir. Safety & Health Div.	Joe Juelten	-1592
Envir. Technical Resources	Edward Ballard	-1594
Operational Safety	Ralph Kopenhaver	-1597

RICHLAND (HANFORD) OPERATIONS OFFICE (RL)

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

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

Manager	J. D. Wagoner	509-376-7395
Deputy Manager	R. D. Izatt	-6278
Employee Concerns Program	L. G. Musen	-0000
Chief Counsel	S. R. Brechbill	-7311
Manager, Total Quality	D. Combs	-4137
Director, External Affairs	K. K. Randolph	-7503
Director, Training	R. P. Saget	-18[illegible]
Director, Environment, Safety and Health	P. W. Kruger	-7387
Director, Performance Assessment	G. M. Bell	373-2656
Director, Quality, Safety and Health Programs	W. B. Scott	376-7461

(contd next page)

RICHLAND (HANFORD) OPERATIONS OFFICE (RL) (contd)

Director, Environmental Assurance, Permits, and Policy	J. E. Rasmussen	-5441
Director, Human Resources	J. D. Bauer	-7217
Director, Human Resource Services	R. Cruz (A)	-6657
Director, Procurement Services	A. R. Valdez	-7271
Director, Business Management	R. J. Light	372-3241
Assistant Manager, Office of Tank Waste Remed. System	J. E. Kinzer	376-7591
Senior Lead Advisor	D. Wodrich	-5237
Senior Technical Advisor	D. L. Vieth, Sr.	-7591
Technical Advisors	C. Sohn	-3591
	T. R. Sheridan	-3591
Director, Characterization	S. T. Burnum	-3214
Director, Tank Safety Analysis	R. E. Gerton	-9106
Director, Tank Operations	A. B. Sidpara	372-1507
Deputy Director	A. Hon	-2025
Director, Tank Waste Retrieval, Treatment and Immobilization	W. J. Taylor	376-6406
Deputy	L. Ericksen (A)	-8409
Director, Tank Waste Projects	L. Nicoll (A)	-7391
Director, Program Integration	C. P. Bader	373-9109
Assistant Manager for Waste Management	C. A. Hansen	376-7434
Deputy	P. M. Knollmeyer	Fax: 372-2610
Senior Technical Advisor	P. G. Loscoe	376-7434
Director, Waste Programs	T. K. Teynor	-1366
Director, Spent Nuclear Fuels Project	E. D. Sellers	-7465
Director, Waste Operations	F. T. Daniels	373-9317

(contd next page)

RICHLAND (HANFORD) OPERATIONS OFFICE (RL) (contd)

Assistant Manager for Facility Transition	L. Piper	376-7435
Director, Transition Program	J. E. Mecca	-7471
Director, Site Operations	K. A. Benguiat	-6600
Director, Site Infrastructure	W. A. Rutherford	-7597
Director, Project Management	S. H. Wisness	373-9337
Assistant Manager for Environmental Restoration	L. K. McClain	376-6628
Director, Restoration Projects	R. A. Holten	-7277
Director, Restoration Projects Support	R. D. Freeberg	-7167
Assistant Manager for Technology Management	R. M. Rosselli	372-4017
Deputy	J. W. Wiley	-4005
Technical Assistant	J. Hennig	-4025
Director, Technology Development	R. F. Christensen	-4900
Director, Laboratory Management	D. E. Trader	-4005
Director, Safeguards and Security	J. L. Spracklen	376-7441
Chief Financial Officer	A. Q. Murphy	-6657
Director, Budget	A. E. Lorenz	-8669
Director, Contract Finance and Review	D. A. O'Toole	373-3352
Director, Planning and Integration	E. W. Higgins	372-2500
Director, Financial Management	J. K. Absher	376-2901

SAVANNAH RIVER OPERATIONS OFFICE (SR)

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

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

Manager	Mario Fiori	-2277
AM, ER/Solid Waste	Tom F. Heenan	-8074
Deputy Assistant Manager	Michael C. Sellers	-8571
Dir., Solid Waste	William L. Noll	-2219
Dir., ER Division	C. V. Anderson	-3966
Prg. Mtg. & Coord.	Karen L. Hooker	-9615
AM, HLW	Lee Watkins	-6053

DOE CONTRACTORS

ANL

Argonne National Laboratory
9700 South Cass Avenue
Argonne, IL 60439

Tel: 708-252-2000
Fax: -2343
-2206
Verif: -2209

Director	Alan Schriesheim	-3872
Env. Mgmt. Prog. Office	James E. Helt	-7335
Separations Science/Tech.	George Vandegrift	-4513
Pyroprocessing	James J. Laidler	-4479
Special Projects	Charles E. Klotz	-6385
ANL-West (ID)	Charles E. Till	208-533-7000

Fuel Cycle and Waste Management Activities: Remedial action for formerly used AEC sites (FUSRAP) and for surplus facilities management program (SFMP); D&D of ANL-East (Argonne, IL) contaminated facilities; mixed waste treatment and disposal; groundwater treatment; LLW/TRU waste technologies; TRUEX process development; pyrometallurgical and pyrochemical fuel reprocessing; electrorefining; Environmental Restoration and Waste Management support for DOE; applied R&D program

(contd next page)

ANL (contd)

support for DOE/EM; SARP review; Civilian Radioactive Waste Program: socioeconomic impact assessment, transportation planning, spent fuel and waste glass performance, interaction of waste package with repository environment; instrumentation development and characterization.

Major Facilities

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

ANL-West (Idaho Falls, ID): Experimental Breeder Reactor No. 2 (EBR-II); Zero Power Physics Reactor (ZPPR); Transient Reactor Test Facility (TREAT); Hot Fuel Examination Facility (HFEF); Radioactive Scrap and Waste Facility; Sodium Process Facility (SPF); Radioactive Liquid Waste Treatment Facility (RLWTF); Fuel Cycle Facility (FCF).

BCO

Battelle - Columbus Operations
505 King Avenue — Tel: 614-424-6424
Columbus, OH 43201 — Fax: -5601

Environmental Systems and Technology Division

General Manager	B. G. Maiden	-4822
Deputy General Manager	G. J. Kovacs	-7937
Pantex Div. Mgrs.	D. Watkins/G. Baker	806-424-5373
Mgr., ER	J. Means	614-424-5442
Mgr. WM/Pollution Prevention	C. MacDonald	-7960
Strategic ES&H Mgr.	W. Simmons	-3242
Nuclear Facilities Safety	D. Robinson	513-648-6768
Integrated Risk Mgmt.	S. Unwin	-5216
Strategic Planning and Resource Alignment	D. Moul	-6523
Albuquerque Office	G. Hanson	505-224-8022

(contd next page)

BCO (contd)

Fuel Cycle and Waste Management Activities: Site survey/ characterization; waste packaging; disposal technology; transportation; performance assessment; safety analysis reports; environmental/ socioeconomic assessments; decontamination and decommissioning; systems integration; quality assurance; licensing; nuclear engineering/ technology; policy support; institutional interactions; communications and outreach; safety and training; regulatory compliance.

Hazardous Chemical and Mixed Waste Activities: Transportation; risk assessment; modeling; regulation; waste management; policy support; regulatory compliance.

BNL

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

Tel: 516-282-2123
Fax: -4486
Verif: -3807

Director	N. P. Samios	-2772
Environmental & Waste Technology Center	Paul Moskowitz	-5062

Fuel Cycle and Waste Management Activities: Waste stabilization/ solidification processes; mixed waste form performance criteria and testing protocol; subterranean waste confinement barriers; performance and risk assessment; geochemistry of contaminated soils and sediments; materials characterization and evaluation.

Major Facilities: Hot and Cold Development Laboratories: Cobalt-60 Gamma Irradiation Facility; National Synchrotron Light Source; Alternating Gradient Synchrotron; High Flux Beam Reactor; Scanning Transmission Electron Microscope.

ETEC

Energy Technology Engineering Center
Rockwell International
P.O. Box 7930
Canoga Park, CA 91309-7930

Tel: 818-586-5326
Fax: -5118
Verif: -5326

General Manager	D. Clark Gibbs	-5326
Program Manager	Bruce B. Gillies	-5301
Tech. PM	G. Subbaraman	-5625

Fuel Cycle and Waste Management Activities: D&D of structures (test reactors and hot cells) and open sites; D&D technology development; liquid metal (sodium and NaK) waste destruction; characterization and final remediation surveys; pathway analysis models; statistical treatment of survey data for regulatory compliance; statistical/ computational code for estimating and displaying spatial contaminant distribution.

Major Facilities: Radioactive Materials Disposal Facility (RMDF)

INEL

Idaho National Engineering Laboratory
Lockhead Martin Idaho Technologies
785 DOE Place
Idaho Falls, ID 83402

Tel: 208-526-4646
Fax: -8339

General Manager	John W. Denson	-4600
Environmental Restoration/WM	George E. Ellis	-1014
Power Reactor Program	Harry B. Barron	-4437
Waste Technology Development	Richard N. Gurley	-5958

Fuel Cycle and Waste Management Activities: National LLW technology; D&D operation of SWEPP for TRU waste; LLW disposal operation; cask systems development; SF cask transport and testing; treatment and disposal of hazardous and mixed wastes; pollution prevention; WIPP support activities; remediation and treatment of buried TRU waste.

(contd next page)

INEL (contd)

Major Facilities: Radioactive Waste Management Complex (RWMC); Waste Experimental Reduction Facility (WERF); Stored Waste Examination Pilot Plant (SWEPP) for TRU wastes; Test Area North Spent Fuel Storage Area (TAN); Advanced Test Reactor (ATR); Transuranic Storage Area; Idaho Chemical Processing Plant (CPP).

LMIT

Lockheed Martin Idaho
Technologies Co.
P.O. Box 4000 Tel: 208-526-0111
Idaho Falls, ID 83415 Fax: 208-526-8342

President	W. John Denson	526-4600
VP/Director, Applied Technology	Bart Krwetz	526-4661
VP/Manager Operations	Henry B. Barron	
	Steve M. Halupa	526-4437

Fuel Cycle and Waste Management Activities: Receive and store spent nuclear fuel from Navy and other DOE sources, including characterization and technology development for final disposal; manage and process liquid and solid LLW and HLW (including necessary technology development) for final disposal.

Major Facilities: Fluorinel and Storage Facility (FAST), New Waste Calcining Facility (NWCF), Liquid Effluent Treatment and Disposal (LET&D) facility, Remote Analytical Laboratory (RAL), Idaho Research Center (IRC), and Fuel Processing Facility (FPF) - not yet complete.

LANL

Los Alamos National Laboratory
University of California
P.O. Box 1663
Los Alamos, NM 87545

Tel: 505-667-5061
Fax: -1754
Verif: -5113

Director	Siegfried S. Hecker	-5101
Director, Envir. Mgmt.	Thomas Baca	-2211
PM, EM	Jorg Jansen	-6295
PM, WM	Micheline Devaurs	-1519
PM, TD	Bruce Erdal	-8914
Director, Nuclear Materials	Paul Cunningham	-9807

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

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

LLNL

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

Tel: 510-422-1100
Fax: -1370
Verif: -0672

Director	C. Bruce Tarter	-4169
Dir., YMP	Willis L. Clarke	-423-4571
Energy Director	Robert N. Schock	-422-6199

Fuel Cycle and Waste Management Activities: SNM disposition; waste form characterization; near-field environment characterization (geochemistry, geohydrology, geomechanics); engineered barrier system (EBS) concept development; scientific bases for waste package design; EBS

(contd next page)

LLNL (contd)

materials selection and characterization; EBS performance analysis; international programs (spent fuel, introduced materials, natural analogs).

Major Facility: Large Block Test at Fran Ridge-Yucca Mountain, Nevada.

MOUND

EG&G Mound Applied Technologies Tel: 513-865-4020
P.O. Box 3000 Fax: -3742
Miamisburg, OH 45343-3000 Verif: -3575

General Manager	Earl N. Fray	-3576
Tritium Technology	Ken Armstrong	-3395
Environmental Restoration	Monte Williams	-4543
Waste Management	Raymond J. Finney	-3097

Fuel Cycle and Waste Management Activities: Mixed waste treatment with glass melter; TRU waste technology/record systems; tritium recovery from scrap; D&D of ^{238}Pu facilities.

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

ORNL

Oak Ridge National Laboratory
Martin Marietta Energy
Systems, Inc.
P.O. Box 2008
Oak Ridge, TN 37831

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

Director	Alvin Trivelpiece	576-2900
Dir., WM/Remedial Action	Bob Mason	574-1365
Dir., Robotics/Process Systems	Joe Herndon	-7065
Dir., OCRWM Programs	Ronald Pope	-6461
Dir., Env. Tech. Devel.	Tony Malinauskas	576-1092

Waste Management Activities: Operate waste management facilities, including disposal; develop LLW and TRU waste treatment technology, including assay and package certification; hazardous waste remedial actions; waste operations control center; UMTRA radiological survey; environmental restoration and facilities upgrade; waste management R&D.

Major Facilities: LLW disposal/storage facilities; Waste Examination Assay Facility (WEAF); Tower Shielding Facility (fuel/waste cask drop tests); TRU storage/certification facilities; liquid LLW processing/storage; waste processing/disposal; Tumulus LLW Disposal Facility; Non-Radiological Wastewater Treatment Plant; Hazardous Waste Storage and Packaging Facility.

Fuel Cycle and Reprocessing Activities: Develop reprocessing, remote systems, safeguards technologies, and facilities design optimizations.

Major Facilities: Integrated Equipment Test Facility, including fuel element disassembly and shearing systems; Continuous Rotary Dissolver; Chemical Rack Systems; Advanced Integrated Maintenance System; and Environmental Test Chamber.

PACIFIC NORTHWEST NATIONAL LABORATORY

Battelle, Pacific Northwest
Laboratories
902 Battelle Boulevard
P.O. Box 999 Tel: 509-375-2121
Richland, WA 99352 Fax: 509-375-3876

Director	W. J. Madia	375-6600
Environmental and Energy Sciences Division	M. L. Knotek	375-2272
Energy Division	J. L. Work	375-2999
Health Division	R. A. Walters	375-4532
National Security Division	T. R. Fox	376-0299
Emerging Technologies	G. M. Stokes	375-3816
Environmental Technology Division	B. D. Shipp	372-2921
Systems and Risk Analysis Dept.	S. W. Heaberlin	372-4143
Intnl. Program Support	P. M. Molton	375-6485
Tank Waste Remediation	G. H. Beeman	372-6444
International Reactor Safety	L. R. Dodd	372-4423
Tanks Focus Area	R. K. Quinn	375-6625

Fuel Cycle and Waste Management Activities: Waste storage and transportation; LLW, HLW, mixed, and TRU waste characterization and treatment; waste tank remediation; international program support in waste management/environmental remediation; radioisotope separation and use; damaged spent fuel stabilization; in situ treatment and barriers for contaminated sites; disposal performance assessment; reactor safety and advanced design; integration of geologic disposal systems; management of surplus plutonium; D&D planning and technologies; assessment of past radioactive releases; environmental information systems; public involvement processes; risk management tools and health effects; analysis of environmental regulations; and integrated environmental planning and management approaches.

(contd next page)

PNNL (contd)

Major Facilities: Hot and cold analysis laboratories and development laboratories; hot cells for pilot scale programs; facilities for large-scale demonstrations and major basic science research.

RFP

Kaiser-Hill Rocky Flats, Inc.
Rocky Mountain Remediation Services — Tel: 303-966-7000
P.O. Box 464 — Fax: -4092
Golden, CO 80402-0464 — Verif: -2719

General Manager	Jim McAnally	303-701-2917
Waste Operations	Andy Power	-9874
Waste Minimization	Lavelle Knight	-4293
Technology Development	Thomas L. Rising	-3248

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

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

SNL

Sandia National Laboratory — Tel: 505-844-5678
P.O. Box 5800 — Fax: 505-844-1068
Albuquerque, NM 87185-5800 — Verif: -8917

President	Al Narath	844-7261
VP, Energy & Environment	Dan Hartley	845-9488
Energy & Environ.	Thomas O. Hunter	844-3763
Envir. & Transportation	Jim Rice	845-9730
Nuclear Waste Mgmt.	Felton Birghan (A)	848-0794
Nuclear Energy Technology	Nestor Ortiz	844-0577

(contd next page)

SNL (contd)

Reactor Engineering	Doris Ellis	845-7307
Carlsbad Operations Center	Paul Brewer	234-0025

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

Major Facilities: Research reactors and numerous test facilities.

SRS

Westinghouse Savannah River
Company (WSRC) Tel: 803-725-6211
Savannah River, TE Fax: 803-725-1660
P.O. Box 616 803-725-2978
Aiken, SC 29802 Verif: 803-725-5331

VP/Gen. Mgr.	Norm F. Boyter	952-6818
SW/ER		
Deputy General Manager	Gale K. Hovey	952-6824
Solid Waste	J.W. French	557-6305
Environmental Restoration	A.M. (Sam) Schwartzman	952-6828
Program Management	Clay B. Jones	644-4902
VP/Gen. Man.	Austin B. Scott	725-2585
HLW Tech. Dir., HLW	Harry D. Harmon	725-3887
HL Liquid Waste	G. Todd Wright	208-1527
DWPF	David B. Amerine	208-6060

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

(contd next page)

SRS (contd)

Major Facilities (existing and planned): Defense Reprocessing Plants; Canyon Mockup Shop; LLW Incinerator; HLW Tank Farm; Defense Waste Processing Facility (DWPF); Hazardous Waste/Mixed Waste Processing Facility; Consolidated Incinerator Facility (Hazardous, LLW, and Mixed Waste); Transuranic Waste Facility; LLW Preparation Facility.

Savannah River Technology Center

Westinghouse Savannah River Company (WSRC)	Tel: 803-725-6211
Aiken, SC 29808	Fax: 803-725-1660
	Verif: -2304

VP/Dir. SRTC	Susan Wood	725-3994
WM/Environ. Tech.	Lucien M. Padouchado	-3701
Mgr. Focus Area Programs	John L. Steele	-1830
Inter. Prog. Coord.	Gayle Baumgarner	-4602

Fuel Cycle and Waste Management Activities: Fuel reprocessing R&D; HLW storage and solidification R&D; HLW form development and characterization; HLW packaging R&D; TRU technology development; LLW technology development; defense HLW technology development; mixed/hazardous waste technology development; groundwater remediation technology development.

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

TRW

TRW Environmental Safety Systems Inc.	
2650 Park Tower Drive	Tel: 703-204-8500
Vienna, VA 22180	Fax: 703-204-8580

President/General Mgr.	Roland L. Robertson	204-8600
Asst. Gen. Mgr. Operations	Colin Heath	204-8563

(contd next page)

TRW (contd)

Asst. Gen. Mgr. Systems	Arthur S. Kubo	204-8680
Asst. Gen. Mgr. NV	L. Dale Foust	702-794-1804
		Fax: -1843

Function: Management and Operating Contractor (M&O) for the DOE Office of Civilian Radioactive Waste Management (OCRWM); supports OCRWM through systems engineering, design, development, and technical direction of the Civilian Radioactive Waste Management System. The OCRWM mission is permanent disposal of the nation's spent nuclear fuel and HLW in a manner that protects the health and safety of the public and the quality of the environment.

WHC

Westinghouse Hanford Company	Tel: 509-376-7411
P.O. Box 1970	Fax: 509-376-4668
Richland, WA 99352	Verif: 509-376-5777

President	A. LaMar Trego	376-7803
Dir., President's Office	Ronald E. Lerch	376-5107
Exec. VP, TWRS	William T. Alumkal	373-3563
VP, Transition Projects	Ronald J. Bliss	376-6427
VP, Solid Waste	Henry E. McGuire	376-1400
Dir., Spent Fuel	John C. Fulton	-373-5823

Fuel Cycle and Waste Management Activities: Hanford Site operating contractor; HLW tank storage; Cs/Sr recovery and encapsulation; HLW concentration and solidification; liquid LLW treatment and fixation; TRU waste assay; Hanford waste disposal; breeder fuel development and fabrication; spent fuel storage; solid waste disposal operations.

Major Facilities: Plutonium Finishing Plant; Fast Flux Test Facility; Fuel Development Laboratories; PUREX Plant (shut down 1992); UO_3 Plant; B Plant; Tank Farms.

WVNS

West Valley Nuclear Services Co., Inc.
P.O. Box 191
10282 Rock Springs Road
West Valley, NY 14171-0191

Tel: 716-942-3235
Fax: 716-942-4376
Verif: 716-942-4267

President	William G. Poulson	942-4344
Exec. VP/Deputy Project Mgr.	James L. Little	942-4750

Fuel Cycle and Waste Management Activities: Demonstration of HLW vitrification; supernatant treatment by ion exchange; LLW treatment using cement solidification.

Major Facilities: HLW Vitrification Facility; Integrated Radioactive Treatment System (supernatant processing, evaporation, remote cementation facility, product storage).

OTHER U.S. ORGANIZATIONS

EPA

Environmental Protection Agency
401 M Street S.W.
Washington, DC 20460

Tel: 202-260-2090
Fax: 202-260-7883
Verif: 202-260-2078

International Activities		
Assistant Administrator	William A. Nitze	260-4870
Multilat. Staff Dir.	Paul Cough (A)	260-4875
Radiation Programs		
Director	E. Ramona Trovato	233-9320
Criteria Stnds.	Lawrence Weinstock	233-9290
Waste Management	Albert Colli	233-9310
Solid Waste		
Director	Elliott P. Laws	260-4610
Dep. Dir., State Programs	Matthew Hale, Jr.	703-308-8404

(contd next page)

EPA (contd)

Function: Establish and enforce standards for protection related to radioactive and hazardous waste.

EPRI

Electric Power Research Institute
3412 Hillview Avenue
P.O. Box 10412
Palo Alto, CA 94303

Tel: 415-855-2000
Fax: 415-855-2800
Verif: 415-855-2674

President	Richard Balzhiser	855-2141
VP/Director, Nuc. Power	Robin Jones	855-2790
Fuel Performance Storage/ Disposal	Rosa Yang	855-2481
Low-Level Waste	Carol Hornsbrook	855-2022
Fuel Cycle	Rosa Yang	855-2481
HLW Repository Performance Assessment	John Kessler	855-2069

Fuel Cycle and Waste Management Activities: Dry and wet storage technology development, design and demonstration of spent fuel transfer facility; conceptual designs for LLW disposal sites; spent fuel transportation technology; fuel failures, fuel cladding corrosion, high-temperature operation, and extended burnup; fuel performance computer models; HLW repository performance assessment.

NRC

U.S. Nuclear Regulatory Commission
Washington, DC 20555

Tel: 301-415-7000
Fax: 301-415-7010

Chairman	Shirley A. Jackson	415-1759
Commissioner	Kenneth C. Rogers	415-1855

(contd next page)

NRC (contd)

Office of International Programs (OIP)		
Director	Carlton R. Stoiber	415-1780
Bilat. Cooperation/Asst.	James R. Shea	415-2336
Non-Prolif./Exp./ Multilat. Rel.	Ronald D. Hauber	415-2344
Office of Nuclear Material Safety and Safeguards (NMSS)		
Director	Carl J. Paperiello	415-7800
Fuel Cycle Safety/Safeguards	Elizabeth Q. Ten Eyck	415-7213
Indust./Medical Nuc. Safety	Donald A. Cool	415-7197
Waste Management	John T. Greeves	415-7437
Office of Nuclear Reactor Regulation (NRR)		
Director	William Russell	-1270
Reactor Projects I/II	Steven A. Varga	-1403
Reactor Projects III/IV/V	Jack W. Roe	-1354
Adv. Reactors/ License Renewal	Dennis M. Crutchfield	-1199
Project Support	Brian K. Grimes	-1163
Systems Safety/Analysis	Gary M. Holahan	-2884
Inspection and Support Programs	Frank P. Gillespie	-1275
Reactor Controls/Human Factors	Bruce A. Boger	-1004
Engineering	Brian W. Sheron	-2722
Technical Support	R. Lee Spessard	-2903
Office of Nuclear Regulatory Research (RES)		
Director	David L. Morrison	-6641
Engineering Technology	Lawrence C. Shao	-5678
Systems Technology	M. Wayne Hodges	-5728
Regulatory Applications	Bill M. Morris	-6207
Regional Offices		
Philadelphia-Region I	Thomas T. Martin	610-337-5299
Atlanta-Region II	Stewart D. Ebneter	404-331-5500

(contd next page)

NRC (contd)

Chicago-Region III	John B. Martin	708-829-9657
Dallas-Region IV	Leonard J. Callan	817-860-8225

Function: Issue regulations and licenses and enforce them for commercial nuclear activities and disposal of spent fuel and HLW, in compliance with general environmental standards issued by the EPA; carry out R&D to support regulatory function.

NWTRB

U.S. Nuclear Waste Technical
Review Board
1100 Wilson Boulevard, Suite 910
Arlington, VA 22209

Tel: 703-235-4473
Fax: 703-235-4495
Verif: 703-235-4473

Chairman	John E. Cantlon
Executive Director	William D. Barnard
Dir., External Affairs	Paula N. Alford

Function: Established by Congress in the Nuclear Waste Policy Amendments Act of 1987 to provide independent review of DOE's technical and scientific program for disposal of commercial spent nuclear fuel and defense HLW. At full complement, eleven members serve on the Board; all are appointed by the President.

USGS

U.S. Geological Survey
106 National Center
12201 Sunrise Valley Drive
Reston, VA 22092

Tel: 703-648-4000
Fax: 703-648-5295
Verif: 703-648-5235

Director	Gordon P. Eaton	648-7411
Senior Advisor for Science Applications	James F. Devine	648-4423
Toxic Waste	David Morganwalp (A)	648-5720
YMP TPO (Denver Office)	Larry R. Hayes	303-776-0516

(contd next page)

USGS (contd)

Fuel Cycle and Waste Management Activities: Basic/applied research on hydrogeologic processes relevant to radioactive and toxic waste disposal; geologic/ hydrologic investigations to determine suitability of potential HLW repository site at Yucca Mountain; site investigations/research at DOE and DOD installations and EPA Superfund sites; consultant for EPA, DOE, DOD, Dept. of Agriculture (DOA), Bureaus of Land Management (BLM), Mines (BOM), and Reclamation (BOR), and state agencies.

INTERNATIONAL AGENCIES

CEC

Commission of the European Communities 200 Rue de la Loi 1049 Brussels, Belgium	Tel: 32-2-299-1111 Fax: 32-2-295-0138 or -0139, -0140
Commissioner for Science, Research and Development, Joint Research Centres	Edith Cresson
Director-General, Science/R&D	Paulo Fasella
Director-General, JRCs, Deputy Director-General, Science/R&D	Hendrik Tent
Director, Energy R&TD	Ezio Andretta 32-2-295-1660
Division, Fuel Cycle & Safety	Werner Balz (A) 32-2-295-4164
R&D Program RWM	Rainer Simon
Safety Studies	Henning von Maravic
Waste Form R&D	Michel Hugon
Disposal Studies	Henning von Maravić
URLs	Bertus Haijtink
R&D Program D&D Nuc. Inst.	Rainer Simon 32-2-295-6623
Radiological Protection Division	Jaak Sinnaeve
Director-General, Environment, Nuclear Safety & Civil Protection	Marius Enthoven
Director, Envir. Monitoring	George Fraser 32-72-32-211
Director, Euratom Safeguards	Wilhelm Gmelin 32-72-32-211
Dir. Gen., Euratom Supply Agency	Michael Goppel 32-2-295-7894

MEMBER STATES - EUROPEAN COMMUNITY (EC)

Belgium	Greece	Netherlands	Austria
Denmark	Italy	Portugal	Finland
France	Ireland	Spain	Sweden
Germany	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 (through tax on member states); conducted by Joint Research Centre establishments at Ispra (Italy) and Karlsruhe (Germany).

- **Shared-cost action** - coordinated and partly (50%) funded by CEC HQ under cost-sharing contracts; conducted by research centers, universities, and industries in the member states:
  - Radioactive waste management and disposal, including decommissioning
  - Nuclear reactor safety
  - Radiation protection.

Cooperation Programs

Participation/support in joint projects with various nations and/or other international organizations.

DOE/CEC AGREEMENT FOR WASTE MANAGEMENT TECHNOLOGY EXCHANGE

Term: 10-6-82 to 10-6-92

Scope: Characterization of waste forms; disposal in geologic formations; emphasis on R&D.

CEC-JRC: ISPRA

CEC Joint Research Center
Ispra Establishment
21020 Ispra (Varese)
Italy

Tel: 39-332-78-9111
Fax: 39-332-78-9045

(contd next page)

CEC-JRC: ISPRA (contd)

Location: Northern Italy; may be reached by air to Milan, ground transport to Ispra, about 50 km.

Safety Technology — H. Holtbecker
Nuclear Fuel Cycle R&D — H. Dworschak

Waste Management R&D: R&D in treatment and storage of radioactive wastes; volume reduction and conditioning TRU wastes; nuclide assay in wastes.

CEC-JRC: KARLSRUHE

Karlsruhe Joint Research Centre
(European Institute for
Transuranium Elements)
Postfach 2266
76125 Karlsruhe — Tel: 49-7247-821
Federal Republic of Germany — Fax: 49-7247-95-1590

Director — Jacques van Geel

Location: On the site of the German Nuclear Research Center, KfK, in Linkenheim, near Karlsruhe.

Function: Basic research in the transuranium elements, especially plutonium; reactor fuels development; R&D on actinide partitioning and transmutation.

Fuel Cycle R&D: Plutonium conversion and plutonium fuels.

Waste Management R&D: Characterization of vitreous HLW forms and SF when considered waste.

Safeguards R&D: Fissile material solution analyses.

IAEA

International Atomic Energy
Agency
Wagramer Strasse 5
P.O. Box 100 Tel: 43-1-2060
1400 Vienna, Austria Fax: 43-1-20607

Director-General	Hans Blix	-21111
Dep. Dir.-Gen. Nuc. Energy/Safety	Boris Semenov	-22600
Dir. Nuc. Fuel Cycle/Waste Mgmt.	Robert Baschwitz	-22650
Head, Waste Management	Donald E. Saire	-22674
Waste Mgmt./U.S. Staff	Candace Y. Chan	-22607
	John R. Wiley	-26097
RADWASS Program	Ernst Warnecke	-22676
Head, Nuc. Mtl./Fuel Cycle Tech.	Norubu Oi	-22766
Dep. Dir.-Gen. Safeguards	Bruno Pellaud	-21800
Dep. Dir.-Gen. Tech. Cooperation	Jijui Qian	-22300
Dep. Dir.-Gen. Research/Isotopes	Sueo Machi	-21600
Dep. Dir.-Gen. Administration	David B. Waller	-21020

MEMBER STATES

120 nations (U.N. members, including the U.S.).

FUNCTION

Autonomous intergovernmental organization established in 1957 in accordance with a decision of the General Assembly of the United Nations; authorized to foster research and development in the peaceful uses of nuclear energy and exchange of scientific and technical information, establish and administer safeguards against the diversion to military purposes of nuclear materials intended for use in civil nuclear programs, and to establish or administer health and safety standards.

WASTE MANAGEMENT ACTIVITIES

- Collect, prepare, review, and disseminate technical and scientific information on

(contd next page)

IAEA (contd)

- planning waste management systems and programs
- handling, treatment, storage, and conditioning of waste, including uranium mill tailings
- disposal of waste
- assessment of the radiological and environmental consequences of waste management
- decontamination and decommissioning of nuclear facilities
- environmental restoration.

- Develop and promote international consensus documents (safety fundamentals, standards, guidelines, and practices) in all areas of radioactive waste management, implemented through the Radioactive Waste Safety Standards Program (RADWASS).

- Provide direct assistance to member states through the

  - Waste Management Advisory Program (WAMAP), focused on developing nuclear programs
  - Waste Management Assessment and Technical Review Program (WATRP), an international peer review service for developed programs

- Serve as scientific and technical body for international conventions (e.g., London Convention) and multinational projects (i.e., International Arctic Seas Assessment Program (IASAP).

- Assist in and facilitate international/multinational projects (e.g., UNDP and UNEP)

- Promote and sponsor research work and development of data and technologies through technical assistance projects and coordinated research projects.

PARTIAL IAEA ORGANIZATION

Director General	Hans Blix
— Dep. Dir. Gen Safeguards	Bruno Pellaud
— Dep. Dir. Gen. Tech. Cooperation	Jihui Qian
— Dep. Dir. Gen. Research/ Isotopes	Sueo Machi
— Dep. Dir. Gen. Nuc. Energy/Safety	Robert Baschwitz
— Dir., Nuclear Fuel Cycle/WM	
— Waste Management	Donald E. Saire
— Predisposal	Vladmir Tsyplenkov
— Disposal	Arnold Bonne
— D&D	Mike Laraia
— Rad./Env. Effects	Gordon Linsley
— RADWASS/WATRP	Ernst Warnecke
— Nuc. Mtl. FC Tech.	Nohoru Oi
— Raw Materials	Mohamad Tachid
— Fuel Tech/Perform.	Georgi Sukhanov
— SF Management	Ferec Takats
— Dir., Nuclear Safety	Morris Rosen
— Dir., Nuclear Power	Poong-Eil Juhn
— Dir., Sci/Tech Information	Joyce Amenta

IAEA (contd)

U.S. Mission to IAEA (UNVIE)
Obersteinergasse 11 — Tel: 43-222-36-3152
1190 Vienna, Austria — Fax: 43-1-364-1585

Nuclear Policy	Michael J. Lawrence
Nuclear Technology	Bruce Cooper
Safeguards	Marvin Peterson
Science Attaché	Lisa Hilliard

ICRP

International Commission
on Radiological Protection
Clifton Avenue
Sutton, Surrey SM2 5PU
United Kingdom — Tel: 44-81-642-4680

Chairman, Main Commission	Roger Clarke
Scientific Secretary	Hyton Smith

FUNCTION

Provide principles of radiation protection as a basis for each country to use in establishing technical codes of practice.

OECD

Organisation for Economic
Cooperation and Development
2, Rue André-Pascal — Tel: 33-1-45-24-82-00
F-75775 Paris Cedex 16, France — Fax: 33-1-45-24-85-00

Secretary General	Jean Claude Payne
Dep. Secretary General	Robert A. Cornell
Dep. Secretary General	Pierre Vinde
Dep. Secretary General	M. Taniguchi

(contd next page)

OECD (contd)

U.S. OECD Mission
19 Rue Franqueville
75016 Paris, France

Tel: 33-1-45-24-74-77
Fax: 33-1-45-24-74-80

DOE Representative — Carol Lee, 33-1-45-24-74-24

OECD/NEA

OECD Nuclear Energy Agency
le Seine Saint Germain
12 Boulevard des Isles
92130 Issy-les-Moulineaux, France

Tel: 33-1-45-24-11-12
Fax: 33-1-45-24-11-10

Director General	Kunihiko Uematsu, 33-1-4524-1000
Directors	Samuel Thompson, 33-1-4524-1002
	Makoto Takahashi, 33-1-4524-1004
	Philippe Savelli, 33-1-4524-1006
Radiation Protection/Waste Mgmt.	Jean-Pierre Olivier, 33-1-4524-1040
Nuclear Safety	Giani Frescura, 33-1-4524-1050
NEA Data Bank	Nigel Tubbs, 33-1-4524-1070
Nuclear Development	Geoffrey Stevens, 33-1-45-24-10-60

MEMBER STATES

Australia	Austria	Belgium	Canada
Denmark	Finland	France	Germany
Greece	Iceland	Ireland	Italy
Japan	Luxembourg	Netherlands	Norway
Portugal	S. Korea	Spain	Sweden
Switzerland	Turkey	U.K.	U.S.

FUNCTION

Promote orderly development of peaceful uses of nuclear energy through cooperation among member states. Initiate, encourage, and coordinate cooperative work in reactor and nuclear fuel cycle studies, radiation protection and waste management, nuclear safety, regulatory matters, and nuclear data collection.

ACTIVITIES

- Workshops, technical meetings, symposia, and publications
- Joint R&D programs
- Data bank.

U.S. PARTICIPATION IN WASTE MANAGEMENT ACTIVITIES

- **Radioactive Waste Management Committee (RWMC)** - Established in 1975; composed of senior experts and government representatives from member countries; responsible for national policy, regulation, and program development/implementation; information exchange and discussion forum on waste management policy, regulations, technical, and scientific issues; participation of CEC and IAEA.

  - **Performance Assessment Advisory Group** (PAAG) - Initiated in 1985 to provide a broad forum for discussion of performance assessment and to advise the RWMC on technical aspects of system performance assessments.

  - **Coordinating Group on Site Evaluation and Design of Experiments for Radioactive Waste Disposal** (SEDE) - Established in 1990, forum for discussions of site characterization issues and promotion of specific studies in this area.

(contd next page)

OECD/NEA (contd)

- **Liaison Committee for Cooperative Program on Decommissioning**
  Participants: Belgium, Canada, France, Germany, Italy, Japan, Spain, Sweden, U.K., U.S.
  Term: 1990-1995 (Phase 2).
  Scope: Exchange of scientific and technical information as nuclear installation decommissioning projects.

- **Committee on Radiation Protection and Public Health (CRPPH)**

  - **Coordinated Research and Environmental Surveillance Program** (CRESP) - Related to sea disposal of radioactive waste.
    Participants: Belgium, Canada, Denmark, France, FRG, Italy, Japan, Netherlands, Portugal, Spain, Sweden, Switzerland, U.K., U.S., IAEA; IMO is an associate member.
    Term: 1981-1995.
    Scope: Investigate oceanographic and biological characteristics of the northeast Atlantic disposal site and perform related scientific work; as of 1987, extended to cover land-based discharges.

- **Committee for Tech./Econ. Studies on Nuclear Energy Development and Fuel Cycle (NDC)**

  - Assess, review, and evaluate technical and economic implications related to the nuclear fuel cycle.
    Participants: Open to NEA members, IEA, IAEA, CEC.
    Term: 10-26-77 - unspecified.
    Scope: Provide governments and scientific communities with competent and reliable information, based on a very wide field of expertise and matured in international debate, to assist in policy discussions.

PARTIAL NEA ORGANIZATION

Director General
Kunihiko Uematsu

Dep. Dir. General
Samuel Thompson

Safety and Regulation

Radiation Protection/Waste Management
Jean-Pierre Olivier
Oswaldo Ilari
Bertrand Ruëgger
Edward Lazo
Edward Patera
Claudio Pescatore
- CRPPH - Committee for Radiation Protection/Public Health
- RWMC - Radioactive Waste Management Committee

Nuclear Safety
Giani Frescura
Jacques Royen
- CSNI - Committee for Safety of Nuclear Installations
- CNRA - Committee for Nuclear Regulatory Activities

Nuclear Development
Geoffrey Stevens
James Joosten
Pierre Girouard
- NDC - Committee for Technical/Economic Studies on Nuclear Energy Development/ Fuel Cycle

Science and Information Processing
Philippe Savelli
Nigel Tubbs
- NSC - Nuclear Science Committee

NUCLEAR SOCIETIES

AUSTRALIA

Australian Nuclear Association (ANA)
P.O. Box 445
Sutherland, N.S.W. 2232 Tel: 61-2-528-8529
Australia Fax: 61-2-543-9263

BELGIUM

Forum Nucléaire Belge (ASBL)
Avenue Lloyd George 7 Tel: 32-2-647-22-92
1050 Brussels, Belgium Fax: 32-2-647-04-54

Belgian Nuclear Society (BNS)
Ravensteinstreet 3 Tel: 32-2-774-0511
1000 Brussels, Belgium Fax: 32-774-0547

CANADA

Canadian Nuclear Association (CNA)
144 Front St. West, Suite 725
Toronto, Ontario M5J 2L7 Tel: 416-977-6152
Canada Fax: 416-979-8356

Canadian Nuclear Society (CNS)
144 Front St. West, Suite 725
Toronto, Ontario M5J 2L7 Tel: 416-977-7620
Canada Fax: 416-979-8356

CHINA

Chinese Nuclear Society (CNS)
P.O. Box 2125 Tel: 86-1-801-2211
Beijing 100822, China/PR Fax: 86-1-867-188

CIS

Nuclear Society International
Kurchatov Square
123182 Moscow, Russia
Tel: 7-95-196-2073
Fax: 7-95-943-0074

World Association of Nuclear Operators (WANO)
c/o State Institute for Nuclear Power Plant Operation
Fergankaya 25
109507 Moscow, Russia
Tel: 7-95-377-0104
Fax: 7-95-376-0897

EUROPE

European Nuclear Society (ENS)
P.O. Box 5032
3001 Bern, Switzerland
Tel: 41-31-320-6111
Fax: 41-31-382-4466

Forum Atomique Europeén (FORATOM)
22 Buckingham Gate
London SW1E 6LB, U.K.
Tel: 44-71-828-0116
Fax: 44-71-931-0646

FINLAND

Finnish Nuclear Society (ATS)
Loennrotinkatu 37
00180 Helsinki 18, Finland
Tel: 358-0-648-931
Fax: 358-0-603-626

FRANCE

Forum Atomique Français
48, rue de la Procession
75015 Paris, France
Tel: 33-1-45-67-07-70
Fax: 33-1-40-65-92-29

Section Française de l'ANS (SFANS)
c/o Framatome
Tour Fiat, Cedex 16
92084 Paris la Défense, France
Tel: 33-1-47-96-14-14
Fax: 33-1-47-96-30-31

Societé Française d'Energie
Nucléaire (SFEN)
48, rue de la Procession
75015 Paris, France
Tel: 33-1-44-49-60-00
Fax: 33-1-44-49-60-11

World Association of Nuclear
Operators (WANO)
39, Avenue de Friedland
75008 Paris, France
Tel: 33-1-40-42-30-78
Fax: 33-1-40-42-92-77

GERMANY

Deutsches Atomforum e.V. (DAtF)
Heussallee 10
53113 Bonn 1, Germany
Tel: 49-228-507-0
Fax: 49-228-507-219

Kerntechnische Gesellschaft e.V.
(KTG)
Heussallee 10
53113 Bonn 1, Germany
Tel: 49-228-50-7259
Fax: 49-228-50-7219

ITALY

ANS Sezione Locale Italiana
c/o Ansaldo S.p.A.
C.so Perrone 25
16161 Genoa, Italy
Tel: 39-10-655-8505
Fax: 39-10-655-8816

Forum Italiano dell'Energia
Nucleare (FIEN)
Palazzo Taverna
Via di Monte Giordano, 36
00186 Rome, Italy
Tel: 39-6-689-3091
Fax: 39-6-8528-2591

Società Nucleare Italiana (SNI)
Facolta di Ingegneria
Viale Risorgimento 2
40136 Bologna, Italy
Tel: 39-51-644-3400
Fax: 39-51-644-3411

JAPAN

Atomic Energy Society of Japan (AESJ)
1-1-13, Shimbashi
Minato-ku, Tokyo 105, Japan
Tel: 81-3-508-1261
Fax: 81-3-581-6128

Japan Atomic Industrial Forum (JAIF)
6th Floor, Toshin Bldg.
1-13, Shimbashi
Minato-ku, Tokyo 105, Japan
Tel: 81-3-508-2411
Fax: 81-3-508-2094

World Association of Nuclear Operators (WANO)
c/o Komae Institute, CRIEPI
2-11-1 Iwato-Kita
Komae-shi, Tokyo, Japan
Tel: 81-3-480-4809
Fax: 81-3-480-5379

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

Korean Nuclear Society (KNS)
No. 21, Yeoeuido-dong
Youngdungpo-Ku Box 109
Seoul 150-610, Korea
Tel: 82-2-786-5975
Fax: 82-2-786-5975

NETHERLANDS

Nederlands Atoomforum
P.O. Box 1
1775 ZG Petten, Netherlands
Tel: 31-2246-4082
Fax: 31-2246-3490

Netherlands Nuclear Society
c/o N.V. Kema
Utrechtsweg 310
6812 AR Arnhem, Netherlands
Tel: 31-85-56-2491
Fax: 31-85-45-8279

SPAIN

Forum Atómico Español
Boix y Morer, 6
28003 Madrid, Spain
Tel: 34-12-553-63-03
Fax: 34-12-535-08-82

Sociedad Nuclear Española (SNE)
Campoamor 17
28004 Madrid, Spain
Tel: 34-1-308-6318
Fax: 34-1-308-6344

SWEDEN

Swedish Atomic Forum (SAFO)
Box 1704
111 87 Stockholm, Sweden
Tel: 46-8-790-04-95
Fax: 46-8-10-78-28

Föreningen Kärnteknik (FK)
Box 1419
111 84 Stockholm, Sweden
Tel: 46-8-613-81-46
Fax: 46-8-796-71-02

SWITZERLAND

Schweizerische Vereinigung für Atomenergie (SVA)
Postfach 5032
3001 Bern, Switzerland
Tel: 4-31-22-58-82
Fax: 4-31-22-92-03

Schweizerische Gesellschaft der Kernfachleute (SGK)
c/o Paul Scherrer Institute
5232 Villigen-PSI, Switzerland
Tel: 41-56-99-2692
Fax: 41-56-98-2327

UNITED KINGDOM

British Nuclear Energy Society (BNES)
1-7 Great George Street
London SW1P 3AA, U.K.
Tel: 44-71-222-7722
Fax: 44-71-222-7500

British Nuclear Forum (BNF)
22 Buckingham Gate
London SW1E 6LB, U.K.
Tel: 44-71-828-0116
Fax: 44-71-828-0110

Institution of Nuclear Engineers (INucE)
Allan House
1 Penerley Road, Catford
London SE6 2LQ, U.K.
Tel: 44-81-698-1500
Fax: 44-81-695-6409

World Association of Nuclear Operators (WANO)
Chelsea Chambers
262a Fulham Rd.
London SW10 9EL, U.K.
Tel: 44-71-352-3617
Fax: 44-71-351-9678

UNITED STATES

American Nuclear Society (ANS)
555 North Kensington Avenue
La Grange Park, IL 60525
Tel: 312-708-6611
Fax: 312-708-0499

Nuclear Energy Institute
Suite 400, 1776 I Street NW
Washington, DC 20006-2495
Tel: 202-293-0776
Fax: 202-785-1898

World Association of Nuclear Operators (WANO)
Suite 1500
1100 Circle 75 Parkway
Atlanta, GA 30339-3064
Tel: 404-953-7602
Fax: 404-953-7549

YUGOSLAVIA

Professional Section of ETAN for Nuclear Technique and Technology (ETAN-NDE)
c/o Institut Jozef Stefan
Jamova 39
61000 Ljubljana, Yugoslavia
Tel: 38-61-371-321
Fax: 38-61-219-365

GLOSSARY

ORGANIZATIONS, FACILITIES, TECHNICAL AND OTHER TERMS

ORGANIZATIONS AND FACILITIES

AEO	.....	KS-8
AERB	Atomic Energy Regulation Board	IN-6
AESJ	Atomic Energy Society of Japan	INTL-15
AGIP	Nuclear fuel company	IT-3
	.....	IT-4
ANA	Australian Nuclear Association	AR-2
	.....	BR-4
	.....	INTL-12
ANDRA	Agence Nationale pour la Gestion des Déchets Radioactifs	CA-2
	.....	FR-4
	.....	FR-5
	.....	FR-7
	.....	SZ-2
ANL	Argonne National Laboratory	US-6
	.....	US-16
ANPA	National Agency for Environmental Protection	IT-2
ANRE	Agency of Natural Resources & Energy .	JA-15
ANS	American Nuclear Society	INTL-14
	.....	INTL-17
ANSTO	Australian Nuclear Science and Technology Organization	AU-1
	.....	AU-2
	.....	AU-3
ANU	Australian National University	AS-3
APM	Demonstration Reprocessing plant	FR-6
	.....	FR-12
Äspö	Hard rock laboratory	SW-6
ASBL	Forum Nucléaire Belge	INTL-12
Asse	Salt dome repository	GE-3
	.....	GE-4
	.....	GE-14
	.....	GE-15
	.....	GE-16
ATLAS	Advanced Testing Line for Actinide Separation	US-20
ATS	Finnish Nuclear Society	INTL-13
AVH	Ateliers de Vitrification de La Hague ...	FR-5
AVM	Ateliers de Vitrification de Marcoule ...	FR-5
	.....	FR-14

BMWi	Ministry for Economic Affairs	GE-8
BNES	British Nuclear Energy Society	INTL-16
BNF	British Nuclear Forum	INTL-17
BNFL	British Nuclear Fuels plc	GE-2
	.....	JA-3
	.....	UK-4
	.....	UK-5
	.....	UK-6
	.....	UK-8
	.....	UK-9
	.....	UK-10
	.....	UK-11
	.....	UK-12
	.....	UK-14
BNL	Brookhaven National Laboratory	US-6
	.....	US-18
BNS	Belgian Nuclear Society	INTL-12
BOM	Bureau of Mines	US-32
BOR	Bureau of Reclamation	RS-5
	.....	US-32
BRE	Building Research Establishment	UK-5
	.....	UK-12
BRGM	Bureau de Recherches Géologiques et Minières	FR-8

C

CANMET	Canadian Center for Mineral & Energy Technology	CA-4
	.....	CA-10
CDTN	Centro de Desenvolvimento de Tecnologia Nuclear de Nuclebras	BR-3
	.....	BR-4
CEA	Commissariat à l'Énergie Atomique	FR-3
	.....	FR-4
	.....	FR-5
	.....	FR-6
	.....	FR-8
	.....	FR-9
	.....	FR-10
	.....	FR-11

CEA	.....	FR-12
	.....	SZ-2
CEC	Commission of the European Communities	BE-2
	.....	IT-1
	.....	US-3
	.....	INTL-1
	.....	INTL-2
	.....	INTL-3
	.....	INTL-9
	.....	INTL-10
CECE	Combined Electrolysis Catalytic Exchange System	US-21
Cédra	Société coopérative nationale pour l'entreposage de déchets radioactifs	SZ-4
CEN-CA	Centre d'Études Nucléaires de Cadarache	FR-9
CEN-FaR	Centre d'Études Nucléaires de Fontenay-aux-Roses	FR-10
CEN-G	Centre d'Études Nucléaires de Grenoble .	FR-11
CEN-S	Centre d'Études Nucléaires de Saclay ...	FR-11
CEN/SCK	Studiecentrum voor Kernenergie/ Centre d'Études de l'Énergie Nucléaire .	BE-3
	.....	BE-4
CEN-VRH	Centre d'Études Nucléaires de la Vallée du Rhône	FR-12
CHALMERS	Technical University	SW-3
CIAE	China Institute of Atomic Energy	CH-2
	.....	CH-3
CIEMAT	Centro de Investigaciones Energéticas, Medio Ambientales y Tecnologicas ...	SP-3
	.....	SP-4
Cisra	Società cooperativa nazionale per l'immagazzinamento di scorie radioattive	SZ-4
CIS	Commonwealth of Independent States ..	INTL-13
CLAB	Central storage for spent fuel	SW-6
CNA	Canadian Nuclear Association	INTL-12
CNEA	Comision Nacional de Energia Atomica	AR-3

CNEIC	Chinese Nuclear Energy Industry Corporation	CH-3
CNEN	Comissão Nacional de Energia Nuclear	BR-3
		BR-4
CNNC	China National Nuclear Corporation	CH-2
		CH-4
CNRA	Committee for Nuclear Regulatory Activities	INTL-11
CNS	Canadian Nuclear Society	INTL-12
CNS	Chinese Nuclear Society	INTL-12
CNS	Council for Nuclear Safety	SA-2
		SA-4
CNS	Center for Nuclear Studies	PK-4
COGEMA	Compagnie Generale des Matières Nucléaires	FR-3
		FR-4
		FR-5
		FR-12
		FR-13
		FR-14
		FR-15
		GE-2
		JA-3
		SZ-2
COMMOX	COGEMA subsidiary	FR-3
COMURHEX	Uranium conversion company	FR-3
COVRA	Centrale Organisatie Voor Radioactief Afval	NL-2
		NL-3
CPF	Chemical Processing Facility	JA-20
CRESP	Coordinated Research and Environmental Surveillance Programme (NEA)	INTL-10
CRIEPI	Central Research Institute of Electric Power Industry	JA-4
		JA-7
		JA-8
		INTL-15
CRL	Chalk River Laboratories	CA-5
		CA-6
		CA-7

DOE	.....	UK-4
	.....	UK-5
	.....	UK-17
	.....	US-3
	.....	US-4
	.....	US-6
	.....	US-8
	.....	US-9
	.....	US-10
	.....	US-11
	.....	US-12
	.....	US-16
	.....	US-19
	.....	US-27
	.....	US-32
	.....	INTL-2
	.....	INTL-8
DoE	Department of the Environment	UK-12
DOI	Department of Interior	US-5
DOT	Department of Transportation	US-5
Drigg	Waste disposal facility	UK-6
	.....	UK-11
DWK	Deutsche Gesellschaft für Wiederaufarbeitung von Kernbrennstoffen	GE-6
	.....	GE-11
	.....	GE-15
	.....	GE-21
DWPF	Defense Waste Processing Facility	US-25

E

EARP	Enhanced Actinide Removal Plant	UK-11
EC	European Community	BE-2
	.....	FR-3
	.....	GE-3
	.....	IT-1
	.....	NL-2
	.....	NL-5
	.....	SW-3
	.....	SZ-2

EC	.....	UK-3
	.....	INTL-1
ECN	Stichting Energieonderzoek Centrum Nederland	NL-2
	.....	NL-3
	.....	NL-4
EdF	Electricité de France	FR-4
EdF	Engineering Demonstration Facility	JA-19
EM	DOE Environmental Management	US-4
	.....	US-6
	.....	US-8
	.....	US-9
	.....	US-10
	.....	US-16
	.....	US-19
ENEA	Ente per le Nuove Technologie, l'Energia l'Ambiente	IT-2
	.....	IT-3
	.....	IT-4
ENEL	Ente Nazionale per l'Energia Elettrica ..	FR-4
	.....	IT-1
	.....	IT-2
	.....	IT-3
ENI	Ente Nazionale Idrocarburi	IT-2
ENRESA	Empresa Nacional de Residuos Radioactivos	CA-2
	.....	SP-4
ENS	European Nuclear Society	INTL-13
ENSM	Ecole Nationale Supérieure des Mines de Paris	FR-16
ENUSA	Empresa Nacional del Uranio	SP-4
EPA	Environmental Protection Agency	US-5
	.....	US-31
	.....	US-32
EPB	Electric Power Bureau	KS-3
	.....	KS-5
	.....	KS-9
EPRI	Electric Power Research Institute	US-29
ERAM	Endlager für Radioaktive Abfälle Morsleben	GE-5
	.....	GE-11

G

H

HMIP	H.M. Inspectorate of Pollution	UK-4
	.....	UK-5
	.....	UK-13
	.....	UK-14
HQ	DOE-Headquarters	CA-3
	.....	UK-6
	.....	US-4
	.....	US-9
	.....	US-10
	.....	US-11
	.....	INTL-2
HSE	Health and Safety Executive	UK-5
HSK	Nuclear Safety Inspectorate	SZ-3

I

IAEA	International Atomic Energy Agency ...	AR-3
	.....	AU-1
	.....	BL-2
	.....	BE-2
	.....	BR-2
	.....	CA-2
	.....	CH-2
	.....	FI-2
	.....	FR-3
	.....	GE-3
	.....	IN-3
	.....	IT-1
	.....	JA-3
	.....	KS-2
	.....	NL-2
	.....	PK-2
	.....	RS-3
	.....	SA-2
	.....	SP-2
	.....	SW-3
	.....	SZ-2
	.....	UK-3
	.....	US-3
	.....	INTL-3
	.....	INTL-4

K

KAERI	Korea Atomic Energy Research Institute	CA-2
		KS-3
		KS-5
		KS-7
KAIF	Korea Atomic Industrial Forum	INTL-15
KAIST	Korea Advanced Institute of Science/Technology	KS-3
		KS-6
KALPAKKAM	Fuel reprocessing laboratory	IN-2
		IN-3
		IN-4
		IN-5
		IN-6
		IN-7
		IN-8
KANUPP	Karachi Nuclear Power Plant	PK-3
KEMA	N.V. Tot Keuring van Electrotechnische Materialen Arnhem	NL-4
		NL-5
		INTL-15
KEMAKTA	Kemakta Konsult	SW-3
KEPCO	Korea Electric Power Corporation	KS-3
		KS-6
		KS-7
KEWA	Kernbrennstoff Wiederaufarbeitungstechnik GmbH	GE-11
		GE-15
KFA	Kernforschungszentrum Jülich	GE-4
		GE-16
KfK	Kernforschungszentrum Karlsruhe	GE-4
		GE-17
		GE-18
		GE-22
		INTL-3
Khlopin	Khlopin Radium Institute	RS-3
		RS-5
		RS-6

LBRMF	Large Block Radionuclide Migration Facility	CA-9
LLNL	Lawrence Livermore National Laboratory	US-6
		US-21
LMIT	Lockheed Martin Idaho Technologies Company	US-19

M

M&O	Management and Operating Contractor	US-27
MAFF	Ministry of Agriculture, Fisheries and Food	UK-4
		UK-5
		UK-13
		UK-14
MAPI	Ministry of Atomic Power and Industry	RS-2
		RS-3
		RS-7
MAPS	Madras Atomic Power Station	IN-7
		IN-8
Mayak	Production Association	RS-6
		RS-7
MET	Mineral/Energy Technology	CA-4
		IN-1
MINATOM	Ministry for Atomic Energy of the Russian Federation	RS-3
		RS-7
MITI	Ministry of International Trade & Industry	JA-4
		JA-14
		JA-15
		JA-21
MMC	Mitsubishi Metal Corporation	JA-15
MOD	Ministry of Defense	UK-5
MOFA	Ministry of Foreign Affairs	JA-15
MOST	Ministry of Science and Technology	AR-6
		BE-9
		BR-8

MOST	.....	CA-14
	.....	FI-9
	.....	GE-24
	.....	IT-6
	.....	JA-24
	.....	KS-3
	.....	KS-4
	.....	KS-5
	.....	KS-8
	.....	NL-8
	.....	PK-6
	.....	RS-2
	.....	RS-12
	.....	SA-6
	.....	SZ-1
	.....	SZ-8
MRS	Monitored Retrievable Storage	TW-2
	.....	US-2
	.....	US-3
	.....	US-4

N

Nagra	Nationale Genossenschaft für die Lagerung Radioaktiver Abfälle	SZ-2
	.....	SZ-3
	.....	SZ-4
NCS	Nuclear Cargo Service	GE-6
NDC	NEA Technical/Economic Studies	INTL-10
	.....	INTL-11
NEA	Nuclear Energy Agency (OECD)	AU-1
	.....	BE-2
	.....	CA-2
	.....	FI-2
	.....	FR-3
	.....	GE-3
	.....	IT-1
	.....	JA-3
	.....	NL-2
	.....	SP-2
	.....	SW-2

O

P

PAMELA	.....	GE-22
Pelindaba	National Nuclear Research Center	SA-2
	.....	SA-3
PEV	Prototype vitrification facility	FR-12
PFR	Reprocessing plant	UK-2
Phenix	French FBR	FR-4
	.....	FR-14
PINSTECH	Pakistan Institute of Science/Technology	PK-2
	.....	PK-3
	.....	PK-4
PIVER	Hot pilot plant - vitrification	FR-12
PIVER II	HLW vitrification facility	FR-12
PKA	Pilot fuel conditioning plant	GE-6
	.....	GE-13
PKS	Quality assurance project	GE-16
PNC	Power Reactor and Nuclear Fuel Development Corporation	CA-2
	.....	CA-9
	.....	JA-3
	.....	JA-4
	.....	JA-5
	.....	JA-10
	.....	JA-17
	.....	JA-18
	.....	JA-19
	.....	JA-20
	.....	JA-21
	.....	SZ-2
PNL/PNNL	Pacific Northwest National Laboratory .	US-6
	.....	US-23
PREFRE	Fuel reprocessing plant	IN-10
PSAG	Probabilistic System Assessment Group (NEA)	INTL-9
PSI	Paul Scherrer Institute	SZ-3
	.....	SZ-5
	.....	INTL-16
PWSF	Pu-contaminated Waste Storage Facility	JA-20
PWTF	Pu-contaminated Waste Treatment Facility	JA-20

R

RADWASS	Radioactive Waste Safety Standards ...	INTL-4
	.....	INTL-5
	.....	INTL-6
RES	NRC Office of Nuclear Regulatory Research	JA-16
	.....	UK-5
	.....	US-7
	.....	US-31
RF	Russian Federation	RS-3
RFP	Rocky Flats Plant	US-6
	.....	US-24
RIVM	Rijksinstituut voor Volksgezondheid en Milieuhygiene	NL-6
RLWTF	Radioactive Liquid Waste Treatment Facility	US-16
RMDF	Radioactive Materials Disposal Facility	US-18
RPA	Research Production Association	RS-3
RSK	Reaktor Sicherheitskommission	GE-10
RW	DOE-Office of Civilian Radioactive Waste Management	US-4
	.....	US-6
	.....	US-9
RWMAC	Rad. Waste Management Advisory Committee	UK-5
RWMC	Radioactive Waste Management Center .	JA-21
	.....	US-19
	.....	INTL-9
	.....	INTL-11
RWMC	Rad. Waste Management Committee (NEA)	INTL-10
RWOS	Radioactive Waste Operations Site	CA-11

S

SAE	Strategic Business Secretariat	BR-3
SAFO	Swedish Atomic Forum	INTL-16
Saluggia	ENEA nuclear research center	IT-2
	.....	IT-3

SBH	Siemens Brennelementewerk Hanau ...	GE-6
	.....	GE-19
	.....	GE-20
SCK/CEN	Studiecentrum voor Kernenergie/ Centre d'Études de l'Énergie Nucléaire	BE-6
	.....	BE-7
SEDE	Site Evaluation and Design of Experiments for Radioactive Waste Disposal (NEA)	INTL-9
SFANS	Section Française d'Energie Nucléaire ..	INTL-13
SFEN	Societé Française d'Energie Nucléaire ..	INTL-14
SFMP	Surplus Facilities Management Program	US-16
SFR	Swedish Final Repository	SW-6
SGAB	Sveriges Geologiska	SW-4
SGK	Schweizerische Gesellschaftder Kernfachleute	INTL-16
SGN	Société Générale pour les Techniques Nouvelles	FR-3
	.....	FR-17
	.....	JA-14
	.....	PK-3
SICN	COGEMA subsidiary	FR-3
SKB	Svensk Kärnbränslehantering	CA-2
	.....	SW-2
	.....	SW-3
	.....	SW-5
	.....	SW-6
	.....	SZ-2
SKI	Statens Kärnkraftinspektion	SW-3
	.....	SW-7
SNE	Sociedad Nuclear Española	INTL-16
SNI	Belgian utility	BL-8
SNI	Società Nucleare Italiana	INTL-14
SNIIP	Scientific Engineering Center	RS-4
SNL	Sandia National Laboratories	US-6
	.....	US-24
SRS	Savannah River Site	US-25
	.....	US-26
SSI	Statens Straalskyddsinstitut	SW-3

T

Y

Z

TECHNICAL AND OTHER TERMS

(A)	acting
AS	assistant secretary
AFR	away-from-reactor
AGR	advanced gas-cooled reactor
AR	at-reactor
ATR	advanced thermal reactor
BWR	boiling water reactor
CAD	computer aided design
CAM	computer aided manufacturing
CANDU	Canadian deuterium uranium reactor
CEO	Chief Executive Officer
CIP	cold isostatic pressing
COB	Chairman of the Board
COO	Chief Operating Officer
CTC	computer training center
/d	per day
DAM	Deputy Assistant Manager
DAS	Deputy Assistant Secretary
D&D	decontamination and decommissioning
DOG	dissolver off-gas
FBR	fast breeder reactor
FBTR	fast breeder test reactor
FRP	fuel reprocessing plant
GCHWR	gas-cooled, heavy water moderated reactor
GCR	gas-cooled, graphite moderated reactor
GSP	gel-supported precipitation
GWd	gigawatt day
GWe	10^9 watts of electricity (1000 MWe)
/hr	per hour
HAO	head-end oxide
HAWC	high acid waste content
HEPA	high-efficiency particulate absolute

HIP	hot isostatic pressing
HLLW	high-level liquid waste
HLW	high-level waste
HM	heavy metal
HTGR	high-temperature, gas-cooled reactor
HTR	high-temperature reactor
HWLWR	heavy water moderated, light water cooled reactor (same as LWCHW)
HWR	heavy-water reactor
ILW	Intermediate-level waste
kg/hr	kilograms per hour
kgHM	kilograms heavy metal
kgU	kilograms uranium
kPa	kilopascal
kW	kilowatt
L/hr	liters per hour
LEU	low enriched uranium
LGR	light-water cooled, graphite moderated reactor
LHGW	low heat generating waste
LLLW	low-level liquid waste
LLW	low-level waste
LTR	low-temperature district heating reactor
LMFBR	liquid metal fast breeder reactor
LWCHW	light-water-cooled heavy-water-moderated reactor (same as HWLWR)
LWR	light water reactor
m	meter
MEV	million electron volts
MLW	medium-level waste (same as intermediate-level)
MOX	mixed (plutonium/uranium) oxide
MTR	materials test reactor
MTIHM	metric tons initial heavy metal
MTU	mega tons uranium
MW	megawatts
MWd/t	megawatt days per ton
MWe	megawatts electric
MWt	megawatts thermal

NPT	Non-Proliferation Treaty
OTD	Office of Technical Development
PFR	prototype fast reactor
PHWR	pressurized heavy water reactor
PLWR	pressurized light water reactor
PM	program manager
Pu	plutonium
PUREX	Pu/U redox extraction process
PWR	pressurized water reactor
QUAD	10^{15} Btu
R&D	research and development
SBR	fast breeder reactor (European acronym)
SF	spent fuel
SS	stainless steel
SWU	separative work (U enrichment)
SYNROC	synthetic rock (for waste immobilization)
t	metric ton
TD	technical development
Th/U	thorium/uranium
THTR	thorium high-temperature reactor
TPO	technical program officer
TRU	transuranic
TWh	terawatt hour (million megawatt hours)
U	uranium
UF_6	uranium hexaflouride
UO_2	uranium dioxide
VOG	vessel off-gas
yr	year