PNNL-11677
UC-721

International Waste Management Fact Book

J.P. Amaya
M.N. LaMarche
J.F. Upton

October 1997

Prepared for
the U.S. Department of Energy
Office of Environmental Management's
Waste Management
under Contract DE-AC06-76RLO 1830

Pacific Northwest National Laboratory
Richland, Washington 99352

Preface

Over the years, the U.S. Department of Energy (DOE) and many foreign nuclear programs have mutually benefited from technical exchanges and cooperative programs to address their major environmental management problems. In fact, some problems are of a global scale, and thus require multi-national solutions. The Department is seeking to promote cooperation to solve technical needs within its current programs as well as provide the results of its programs to international organizations to solve their problems. This fact book was established to bring problem holders together with solution providers, wherever they may be. Users will include policy makers, program managers, technical specialists, company representatives, and a variety of stakeholders interested in these programs. The information included has been selected to inform and provide contacts for detailed interactions.

The information contained in the International 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; EC, 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 on our website and in future editions.

Pacific Northwest National Laboratory
International Waste Management Fact Book
Tel: 509-372-4486 - Fax: 509-372-6273
Email: fact.book@pnl.gov
Website: http://etd.pnl.gov:2080/fac/

Contents

Introduction

Introduction

Many countries around the world are faced with nuclear and environmental management problems similar to those being addressed by the U.S. Department of Energy. The purpose of this Fact Book is to provide the latest information on U.S. and international organizations, programs, activities and key personnel to promote mutual cooperation to solve these problems. Areas addressed include all aspects of closing the commercial and nuclear fuel cycle and managing the wastes and sites from defense-related, nuclear materials production programs.

Using the Fact Book

The Fact Book is organized as follows:

- **National Summaries** – a section for each of the 23 countries that provides:
  - quick facts such as information on holidays, passport/visa, currency exchange rates, and direct dialing information;
  - a large-scale map of the country showing major rivers, cities, and geopolitical boundaries;
  - international relationships; and
  - a description of the countries energy production and capacity, nuclear fuel cycle and material production, and organizational facts and contacts.
- **International Agencies** – a section listing the international agencies that have a significant fuel cycle involvement.
- **Glossary** – a list of definitions for acronyms and other specialized terms.

A Website has been developed to provide users ready access to the information and to facilitate the process of keeping the Fact Book current. We welcome your input for improving this service and invite you to visit our site at http://etd.pnl.gov:2080/fac.

National Summaries

Argentina

Updated 9/24/96

Argentina

Major Public Holidays (1997)

Jan	1	New Year	Jun	20	Flag Day
Mar	27	Holy Thursday	Jul	9	Independence Day
Mar	28	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**
Daylight Savings Time Period: **10/26/97 - 03/02/98**

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. $ = 7.94 Peso

per foreign exchange rates via internet, 05/01/97. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

Direct Dialing

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

U.S. Embassy - Buenos Aires

American Embassy
4300 Colombia
1425 Buenos Aires
Argentina

Tel: 54-1-777-4533/4
Fax: 54-1-777-0197

Science Counselor — Kenneth D. Cohen

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	**17%**	**nuclear**
	2000	**13%**	**nuclear**

Nuclear Power

Policy: Pressurized heavy water reactors (PHWR) with natural uranium and indigenous fuel cycle; currently government ownership and operation of all nuclear power plants—other options being evaluated; development of nuclear plants and services export capability.

Nuclear Power Capacity	1993	1.0	GWe
	1995	1.6	GWe
	2000	1.6	GWe
Reactor Mix	1994	HWR	2 (1974/83)
			1 (1997)

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 tHM
	2000	3,300 tHM

Demonstration/Production Activities

- D_2O production (200 t/a): D_2O enrichment plant started in 1995.
- Uranium mining and milling (t/a): 1987—100; 1993—130.
- Uranium enrichment (kg/a): Capacity being redefined.
- Conversion of yellowcake to UO_2: fabrication of UO_2 fuel (t/a): 1993—200; 1995—300.
- Fuel fabrication: Two of three planned fabrication lines produce 5,880 elements/year.

Major Milestones

- Dry SF Interim Storage (Embalse, Córdoba) 1993
- HLW Geologic Repository (under study)
- D_2O Plant 1995
- MLW Near-Surface Engineered Disposal Facility 1998

International Relationships

Member of IAEA; Treaty of Tlatelolco and non-proliferation treaty (NPT) has been signed and ratified. Quadripartite safeguards agreement 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)
Headquarters
Avenida del Libertador 8250
1429 Buenos Aires, Argentina

Tel: 54-1-704-1000
Fax: 54-1-704-2045

President	Dr. Manuel A. Mondino
Regulatory Authority	Dr. Dan J. Beninson
Nuclear Fuel Cycle	Roberto Cirimello

CNEA EZEIZA

Comisión Nacional de
Energia Atómica (CNEA)
Centro Atómico Ezeiza
1842 Ezeiza, Argentina

Tel: 54-1-480-0141
Fax: 54-1-480-0815

Location: 30 km southwest of Buenos Aires, near airport.

Deputy	Dr. Roberto Marquez
Regulatory Affairs	Pedro Sajaroff
LLW Radioactive Waste Mgmt.	Dr. Jaime Pahissa Campá

Facilities

- **Fuel fabrication**: The first of three planned fabrication lines started up 1982, second line 1985; produce 380 elements/yr for Atucha I and 5,500 elements/yr for Embalse; third line to produce Atucha II fuel elements.

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

Nomina De Autoridades De La Comision Nacional De Energia Atomica

President
Lic. Eduardo Francisco Santos
Avda. Libertador 8250 Tel: 54-1-704-1201/1202/1463
(1429) Capital Federal 54-1-703-2420 702-5046
Fax: 54-1-701-2436

Board of Directors
Dr. Jaime Pahissa Campa Tel: 54-1-704-1345/1435/1475
Sr. Horacio Augusto Osuna Fax: 54-1-701-2436
Dr. Roberto Garcia Moritan
Ing. Guillermo Padin
Lic. Agustin Blanco

Avda. Libertador 8250
(1429) Capital Federal

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

Avda Libertador 8250
1429 Capital Federal

Gerencia De Technologia
Manager:
Ing. Santiago Harriague Tel: 54-1-704-1143

Avda Libertador 8250
1429 Capital Federal

Gerencia Centro Atomico Bariloche
Manager:
Dr. Francisco Lovey Tel: 54-944-61002
Fax: 54-944-61006

Avda. E. Bustillo KM. 9.5
8400 San Carlos De Bariloche
PCIA. De Rio Negro

Gerencia Centro Atomico Constituyentes
Manager:
Dr. Miguel Audero
Tel: 54-1-754-7260 755-3137
Fax: 54-1-754-7371

Avda. Gral. Pax Y De Los Constituyentes
1650 San Martin
PCIA. Buenos Aires

Complejo Minero Fabril Malargue
Head Department:
Ing. Gualberto Avila Cadena
Tel: 54-627-71712
Fax: 54-627-71159

C.C. 13
5613 Malargue
PCIA. De Mendoza

Complejo Fabril Arroyito
Head Department:
Ing. Fernando Roici
Tel: 54-99-480703/5/7
Fax: 54-99-480713/480704

Regional Cuyo
Head Department:
Dr. Eduardo Lardone
Tel: 54-61-223521
Fax: 54-61-350468

Regional Centro
Head Department:
Lic. Jorge Apesteguia
Tel: 54-51-706495

Regional Patagonia
Head Department:
Dr. Aldo Benitez
Tel: 54-965-80586/32904

Regional Noroeste
Head Department:
Dr. Sergio Gorustovich
Tel: 54-XXX-XXXXX/XXXXX
Fax: 54-XXX-XXXXX/XXXXX

Departamento Relaciones Publicas
Head Department:
Lic. Luis J. Colangelo
Tel: 54-1-704-1209/1011/1230
Fax: 54-1-704-1154

Avda. Libertador 8250
1429 Capital Federal

Departamento Secretaria Y Despacho
Head Department:
Ing. Ruben Cancio
Tel: 54-1-704-1410
Fax: 54-1-704-1152

Avda. Libertador 8250
1429 Capital Federal

Gerencia Centro Atomico Ezeiza
Manager:
Ing. Angel Mehlich
Tel: 54-1-379-8284
Fax: 54-1-379-8570

Agencia Minipost
1842 Ezeiza
PCIA. De Buenos Aires

Gerencia De Cooperacion Y Transferencia De Technologia
Manager:
Dr. German Guido Lavalle
Tel: 54-1-704-1045
Fax: 54-1-704-1101

Avda. Libertador 8250
1429 Capital Federal

Gerencia De Administracion
Manager:
Lic. Ricardo Deza
Tel: 54-1-704-1203
Fax: 54-1-704-1159

Avda. Libertador 8250
1429 Capital Federal

Responsible De Ciclo De Combustible
Responsibly Deputy:
Ing. Jose E. Gregui
Tel: 54-1-704-1217
Fax: 54-1-704-1165

Avda. Libertador 8250
1429 Capital Federal

Complejo Minero Fabril Cordoba
Head Department:
Dr. Eduardo Perez
Tel: 54-51-703450/639679
Fax: 54-51-703679

Rodriguez Pena 3250
5000 Cordoba

Complejo Minero Fabril San Rafael
Head Department:
Ing. Carlos Martin
Tel: 54-627-30833/30087
Fax: 54-627-30833/30087

C.C. 527
5600 San Rafael
PCIA. De Mendoza

President
Dr. Julio Martinez Ceballos
Tel: 54-1-701-0407
Fax: 54-1-701-0407

Arribenos 3619
1429 Capital Federal

General Manager
Ing. Oscar J. Quihillalt
Tel: 54-1-701-0359
Fax: 54-1-701-0407

Arribenos 3619
1429 Capital Federal

Central Nuclear Atucha I (NPP)
Manager:
Ing. Miguel A. Joseph
Tel: 54-487-24671 al 76
Fax: 54-953-0370

Casilla De Correo 20
2800 Lima
PCIA. De Buenos Aires

Central Nuclear Embalse (NPP)
Manager:
Ing. Eduardo Diaz
Tel: 54-571-22000/22434
Fax: 54-51-244577

C.C.3
Embalse Rio III
PCIA. De Cordoba

Ente Nacional Regulador Nuclear (Enren)

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

Avda. Libertador 8250 1 PISO
1429 Capital Federal

General Manager

Ing. Antonio Oliveira

Tel: 54-1-704-1348
Fax: 54-1-704-1151

Avda. Libertador 8250 1 PISO
1429 Capital Federal

Australia

Updated 11/5/96

Australia

Major Public Holidays (1997)

Jan	1	New Year	Jun	9	Queen's Birthday
Jan	27	Australia Day	Oct	6	Labor Day
Mar	28	Good Friday	Dec	25	Christmas
Mar	31	Easter Monday	Dec	26	Boxing Day
Apr	25	Anzac Day			

Time

Standard Time Washington, D.C. (New South Wales) **+ 15 hours**
Daylight Savings Time Period: **10/26/97 - 3/16/98**

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. $ = 1.28 Australian Dollar

per Foreign Exchange Rate via Internet, 1/22/97. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

Direct Dialing

Individual numbers for direct dial to Australia are complete as listed, after dialing international access code: **011**. Country code is **61**; listed local numbers include city code. A 9 has now been added to the local number for Sydney telephone and fax numbers. (61-2-9123-4567)

U.S. Embassy

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

Tel: 61-2-9373-9200
Fax: 61-2-9221-0573

Scientific Attaché — Zachary Z. Teich

Energy

Electric Power Capacity	1994	37.3	GWe
	1995	38.2	GWe
	2000	40.1	GWe
Electric Power Production	1994/5	160.1	TWh
		81%	coal
		11%	hydro
		8%	other fossil fuels

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, United Kingdom, France, China, and Russia.

ANSTO has now adopted the term Synroc rather than the previously used SYNROC. Joint research programs with Japan, France, Russia and China continue under collaborative agreements between ANSTO and the major national nuclear research organization in each country.

The Australian agreement with Singapore is not a bilateral safeguards agreement of the type concluded with the other 13 countries and Euratom, but rather an Exchange of Notes dealing with physical protection.

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	Prof. Helen Garnet
Chairman	C. Ralph Ward-Ambler
Dep. Executive Dir.	Dr. Colin Chipperfield
Environment	Dr. Wally Zuk
	Fax: 61-2-543-9260
Environmental Chemistry	Dr. Richard Lowson
Environmental Physics	Dr. Ian Ritchie
Chemical Waste Engineering	Dr. Des Levins
Economical Impacts	Dr. Peter Airey
Materials	Dr. Adam Jostsons
	Tel: 61-2-717-3265
	Fax: 61-2-543-7179
Synroc Development	Dr. E. R. Vance
Synroc Process Developments & Operations	Alan Ridal
Materials Science	Dr. 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.

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 Tel: 61-6-249-4228
Canberra 2600, Australia Fax: 61-6-249-5989

Director Dr. Sue Kesson

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

Belarus

Updated 10/11/96

Belarus

Major Public Holidays (1997)

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
Mar	15	Constitution Day	Nov	2	Memorial Day
Apr	6-7	Easter (Orthodox)	Nov	7	Revolution Day
Apr	13-14	Easter	Dec	25	Christmas
Apr	17	Radunica			

Time

Standard Time Washington, D.C. **+ 7 hours**
Daylight Savings Time Period: **03/30 - 10/26/97**

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 due to continuing fluctuations. Payment in U.S. currency is not acceptable. Most major credit cards are accepted. 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 **375**; listed local numbers include city code.

U.S. Embassy - MINSK

American Embassy
ul. Starovilenskaya 46
Minsk, Belarus

Tel: 375-17-234-7761 or -6537
375-17-231-5000
Fax: 375-17-234-7853

Economic Section

George Krol

Energy

Electric Power Capacity	1995	6.3 GWe
	2000	6.2-10.9 GWe
		0% nuclear
	2005	6.4-12.1 GWe
		>8% nuclear
Electric Power Production	1995	32.5 TWh
		55% oil
		40.6% gas
		0.1% hydro/geothermal
		<2.5% coal/peat
		<1.8% solids
	2005	60 TWh
		5% nuclear

Nuclear Power

Though Belarus currently produces no nuclear power, approximately 5% 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 has stated that nuclear power is a necessity in the future of Belarus. In 1996 three competitive sites for construction of a nuclear power plant were chosen.

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 source. Spent fuel from decommissioning the research LWR was sent to Russia for reprocessing. Fresh and spent fuel from decommissioning two mobile nuclear power units designed and produced by Nuclear Power Engineering Institute has been stored in an interim storage at Sosny facilities.

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 Fuel & Energy**
  - controls all electric power production and its industrial consumption, operates electric power network
  - provides and conducts the National Power Development Program and Nuclear Power Development Program
- **Atompromnadzor** (Committee on Supervision of Industrial and Nuclear Safety/Ministry of Emergencies)—regulation, controls of radiation-emitting facilities, licensing of nuclear installations, inspections.
- **Ministry of Emergencies** (former Chernobyl Committee)—responsible for National Chernobyl Program.

Industrial/University Responsibilities

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

- **GSP POLESJE** (State Specialized Enterprise POLESJE/Ministry of Emergencies)—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 & Pilot Manufacture/Academy of Sciences)—design/production of pilot installations related to nuclear power plant, engineering, waste management technologies.

BEL NIPI ENERGOPROM

Belarus Research and Design
Institute of Power
Industry
ul. Romanovskaja sloboda 5A
220048 Minsk, Belarus

Tel: 375-17 226-5277
Fax: 375-17 226-5317

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
220039 Minsk, Belarus

Tel: 375-17 224-5119
Fax: 375-17 224-3700

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.

Ministry of Emergencies and Population Protection from the Chernobyl NPP Catastrophe Consequences

Ministry of Emergencies
ul. Lenin 14
220030 Minsk, Belarus
Tel: 375-17 227-4987
Fax: 375-17 222-3439

Chairman — Ivan A. Kenik
Dep. Chairman, WM/Science/R&D, International Relations — Dr. Igor V. Rolevich, 375-17 227-0770

Board on Protective Measures/D&D/WM — Dr. Gennady V. Antzypov, 375-17 227-0762

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

GSP POLESJE

State Specialized
Enterprise "POLESJE"
ul. Karpovich 11
246017 Gomel, Belarus
Tel: 375-23 253-1584
Fax: 375-23 253-7486

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: 375-17 226-0698
Fax: 375-17 246-7055

Director — Prof. A. A. Mikhaevich, 375-17 246-7475

Material Properties/ WM Technologies — Dr. Alexandre J. Grevenkov, 375-17 246-7542

Nuclear Reactor Physics — Dr. Igor A. Savushkin, 375-17 246-7434

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: 375-17 246-7253
Fax: 375-17 246-7615

Director — Prof. George A. Sharovarov
Radiochemistry — Dr. Yuri P. Davydov

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: 375-17 246-7538
Fax: 375-17 246-7403

Director — Dr. 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 Tel: 375-17 246-7512
220109 Minsk, Belarus Fax: 375-17 246-7615

Director General Dr. 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 "EKOREZ" Tel: 375-17 246-7539

Director Victor B. Ivanov

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

Belgium

Updated 9/16/96

Belgium

Major Public Holidays (1997)

Jan	1	New Year	Jul	21	National Day
Apr	8	Easter Monday	Aug	15	Assumption
May	1	Labor Day	Nov	1	All Saints
May	16	Ascension	Nov	11	Armistice
May	27	Pentecost Monday	Dec	25	Christmas

Time

Standard Time Washington, D.C. **+ 6 hours**
Daylight Savings Time Period: **03/30 - 10/26/97**

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. $ = 34.49 Franc

per Foreign Exchange Rate 1/22/97. 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

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; dismantling of former Eurochemic reprocessing plant in progress.

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

Cumulative SF Arisings (LWR)	1990	1,290	tU
	1996	9,670	tU
		+110	tU/year
	2000	3,000	tU

Major Milestones

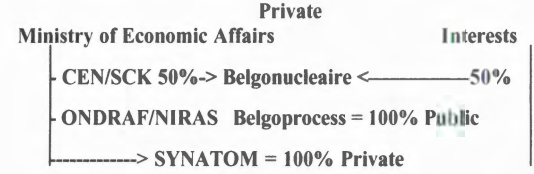
- Selection/characterization of site for LLW disposal facility 1990-97
- Storage facility for waste from Belgian fuel reprocessed abroad 1994
- Safety assessment/feasibility report for demonstration of HLW disposal operations in proposed clay repository 1995
- Construction start of HLW repository 2025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



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/a for LWR or 10 t/a for FBR).

BP

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 h) to Mol.]

Managing Director	Robert Vandenplas
General Manager	Jef Claes
Waste Processing	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 CEN/SCK; treatment/conditioning of all categories of low-, medium-, and high-level waste; from 1986 to 1991 joint operation with WAK of Pamela vitrification plant.

Owner: ONDRAF/NIRAS

Facilities

- **Eurobitum** (bituminization plant)
  Mission: Immobilize ILW
  Design Basis: Batch chemical pretreatment; screw extruder-evaporator (continuous); capacity, 650 m^3/a 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 GE Section) and operated by WAK/Belgoprocess team] Presently used for treatment and conditioning of HLSW.

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

  Beta/Gamma Waste Incinerator: Capacity of 100 kg/h solid waste and 40 l/h 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/a; 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; super-compaction capacity of 220 lb drums per hour, incineration at 900 C, incineration capacity 100 kg/h solid waste and 40 l/h of liquids, supercompaction of ashes and cementation of all treated LLW in 400L 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 VanDenhore

Function: Fabrication of fuel assemblies for LWR (capacity: 300 t/a, 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 Tel: 32-2-206-4111
1210 Brussels, Belgium Fax: 32-2-206-5710

Ministry of Public Health and Environment

Ministère de la Santé Publique
et de l'Environnement
Quartier Vésale 2-3 Tel: 32-2-210-4966
1010 Brussels, Belgium 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

Chairman, Board of Directors J.M. Streydid
Chair., Perm. Tech. Committee F. Decamps, a.i.
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
2400 Mol, Belgium

Tel: 32-14-33-2111
Fax: 32-14-31-5021

Chairman of the Board — Frank DeKoninck
General Manager — Paul Govaerts
Waste/Disposal — Bernard Neerdael
Decommissioning — Guy Collard

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 the Belgian nuclear utilities.

Owners: Belgian Utilities (100%).

Brazil

Updated 8/28/96

Brazil

Major Public Holidays (1997)

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**
Daylight Savings Time Period: **10/12/97 - 02/09/98**

Passport/Visa

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

Currency Exchange Rate

1 U.S. $ = .094 (R$)

per foreign exchange rates via Internet, 1/22/97. 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

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).

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

Demonstration/Production Activities

- Uranium mining and milling: 300 tU_3O_8/a—in operation.
- U_3O_8 to UF_6 conversion: (1984) 90 tU/a; planned expansion delayed indefinitely.
- Uranium enrichment (gas centrifuge): small experimental demonstration (1987).
- Uranium enrichment (Becker nozzle process) at Resende:
  - First Cascade, 24 stages; 6 k SWU/a (1985); interrupted in 1993.
- Fuel fabrication: 100 tU/a (1982); design capacity—400 tU/a.
- Spent fuel reprocessing: 10 kg/d pilot plant (1986 startup originally scheduled, currently delayed indefinitely).

International Relationships

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

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

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 Mauro Esteves Dos Santos
Director, Nuclear Safety Ayrton José Caubit 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
- 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 tU/a)
- 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

Updated 10/28/96

Canada

Major Public Holidays (1997)

Jan	1	New Year	Sep	1	Labor Day
Mar	28	Good Friday	Oct	13	Thanksgiving
Mar	31	Easter Monday	Nov	11	Remembrance Day
May	19	Victoria Day	Dec	25	Christmas
Jul	1	Canada Day	Dec	26	Boxing Day
Aug	4	Civic Day			

Time

Time zones correspond to those in the United States.
Daylight Savings Time period: **04/06 - 10/26/97**

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. $ = 1.37 Canadian Dollar
per Foreign Exchange Rate via Internet, 1/22/97. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

Direct Dialing

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

U.S. Embassy - Ottawa

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

Tel: 613-238-5335
Fax: 613-238-2588

Head of Econ. & Environmental
Science & Technology Section

Susan Lysyshyn

Energy

Electric Power Capacity	(MW)	1995	19,928	coal
			7,957	oil
			4,335	natural gas
			15,857	nuclear
			65,251	hydro
			1,125	other
		2000	19,869	coal
			8,080	oil
			5,514	natural gas
			15,857	nuclear
			66,559	hydro**
			1,426	other***
		2005	18,971	coal
			8,685	oil
			7,188	natural gas
			15,857	nuclear
			74,554	hydro**
			1,435	other***
		2010	19,911	coal
			8,667	oil
			7,346	natural gas
			15,177	nuclear
			74,890	hydro**
			1,435	other***

**Includes 20 MW of tidal power
***Generating capacity from woodchips and waste gases

	1994	101,730	GWh
		19%	nuclear
	2000	94,412	GWh
	2010	91,472	GWh
		14%	nuclear

Electric Power Production (MW)	1994	533,508	GWh
		61%	hydro
		20%	conventional/ thermal
		19%	**nuclear**
	2000	**15,857**	**nuclear**
	2005	15,857	nuclear
	2010	15,177	nuclear

Nuclear Power

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

Nuclear Power Capacity	1993	15.5	GWe
	1994	16.7	GWe
	1995	15.5	GWe
	2000	15.5	GWe
Reactor Mix	1996	PHWR	22 (1971-95)

Industrial Fuel Cycle

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

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

Cumulative Used Fuel (PHWR)

1991	1,060,478	bundles
1996	1,144,000	CANDU fuel bundles
2000	20,520	metric tonnes

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/used fuel storage, and intercomparison of performance assessment computer models and codes.

Member of IAEA and OECD/NEA—Exchange agreements with the following agencies and countries: DOE/U.S.; SKB/Sweden; UK NIREX/U.K.; PNC, JAERI/Japan; KAERI (agreement is still in effect but not with Waste Management)/Korea; POSIVA and OH/Finland; ANDRA (not as an exchange agreement, agreements for specific projects)/France; EURATOM (status of agreement is unknown at the time)/Europe; PAKS NPP/Hungary; Radwaste Administration (in effect until 1996 December)/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

- **Energy Supplied Allocation Board**
  - only exists in time of emergencies
- **Cape Breton Development Corporation**
- **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 System**
  - **AECL Chalk River and Whiteshell**
- **National Energy Board**
  - provide advice on energy related subjects such as economics, engineering, environment, finance, geology, law, energy market developments, and provide administrative and regulatory support.
- **Natural Resources Canada**

  Energy Sector

  Earth Sciences Sector
  - Geological Survey of Canada (GSC)
    - Sedimentary and Marine Geosciences Branch
    - Minerals and Regional Geoscience Branch
    - Polar Continental Shelf Project
  - Geomatics Canada

  Mineral and Metals Sector

Energy Supplies Allocation Board

Chairman	Mrs. Gene McCloskey The Deputy of Nat. Resources Tel: 613-992-3456
Secretary to the Board	Ms. Maureen Monaghan Tel: 613-992-1477

Cape Breton Development Corporation

Cape Breton Development Corporation PO Box 2500 Sydney, Nova Scotia B1P 6K9	 Tel: 902-842-2600 Fax: 902-842-2589
President Gen. Mgr.-Operation Services, Mr. Jim Martin	G. White Tel: 902-564-3899

AECB

Atomic Energy Control Board 270 Albert Street Ottawa, Ontario K1P 5SP Canada	 Tel: 613-995-5894 1-800-668-5284 Fax: 613-995-5086
President and CEO	Dr. Agnes Bishop
Dir. Gen. of Fuel Cycle/Materials Regulations	Murray Duncan
Dir. Wastes/Impacts Division	Cait Maloney
Dir. Materials Regulations Div	Mike Taylor
Dir. Standards Division	Ross Brown
Uranium Facilities Division (in Saskatoon)	Tom Viglasky
Dir. Gen. Reactor Regulation	Jim Harvie
Dir. Research & Safeguards Div	Harold Stocker
Dir Analysis/Assessment	John Waddington
Safety Evaluation (Analysis) Div	Peter Wigfull
Safety Evaluation (Engineering) Division	Kurt Asmis

AECL

Atomic Energy of Canada Limited-CANDU
Sheridan Park Research Communities
2251 Speakman Drive
Mississauga, Ontario L5K 1B2

Tel: 905-823-9040
Fax: 905-823-8006

Chairman — Robert Nixon
President and CEO — Reid Morden
Program Director-LLW Mgmt — Robert W. Pollock
Tel: 613-998-0066
Fax: 613-952-0760

Atomic Energy of Canada Limited—Waste Management Organization

AECL
- Whiteshell Laboratories (WL)
  - Physical & Environmental Sciences
    - Waste Technology
      - Applied Geoscience
      - Environmental/Safety Assessment
      - Geotechnical Science/Engineering
      - Environmental Science
      - Geochemistry Research
      - Fuel Waste Technology
      - Finance-Physical & Environmental Sciences
      - Nuclear Fuel Waste Management Program Communication Team
- Chalk River Laboratories (CRL)
  - Waste Management Operations
    - Wastes Processing Operations
      - Waste Treatment Center
      - Decontamination Center
      - Laundry
      - WMA Decontamination Facilities
      - Active Liquid Storage Facilities
      - Active Drain System
      - WTC Upgrade
      - Liquid Waste Vol. Reduction (including Oils Incineration)

- Storage and Disposal Operations
  - Radioactive Waste Storage
  - Radioactive Waste Disposal
  - Inactive Landfill
  - Hazardous Chemicals Disposal
  - Storage Facility Construction
- Head Office in Ottawa
  Low-level Radioactive Waste Management Office
  (operated by AECL on behalf of Natural Resources)

AECL-WL

AECL—Whiteshell Laboratories
Pinawa, Manitoba
ROE 1L0
Tel: 204-753-2311
Fax: 204-753-2455

Underground Research Laboratory
Tel: 204-345-8625
Fax: 204-345-8868

General Mgr Phys. & Earth Sciences	Dr. Collin J. Allan
Dir. Nuclear Fuel Waste Mgmt Program	Dr. Ken W. Dormuth
Mgr Applied Geoscience	Cliff Davison
Mgr Environmental & Safety Assessment	Dr. Alf Wikjord
Mgr Geotech Science & Engineering	Mitch Ohta
Dir Waste Technology	Dr. Keith Nuttall
Mgr Geochemistry Research	Dr. Peter Sargent
Mgr Fuel Waste Technology	Lawrence Johnson
Mgr Environmental Science	Dr. Reto Zach
Mgr Finance for Physical & Environmental Science	Bruce McClinton
Mgr Communications	Gary Leitch

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 meters below ground surface in granitic rock.

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

- **URL (Underground Research Laboratory):** Located about 20 km northeast of WL in the Lac du Bonnet granite batholith.
  Mission: Operate facility ensuring compliance with regulatory standards and high level of safety/quality control; design and implement in-situ and laboratory experiments/engineering demonstrations to investigate relevant issues.
  Design Basis: Access shaft and ventilation raised to 430-m depth with shaft stations at 130-m, 240-m, 300-m, and 420-m depths. Licensed radioactive sources and tracers may be used, but no radioactive wastes can be employed. A series of nine experiments is in progress on the 240-m 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.

- **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 ^{238}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.).

AECL-CRL

AECL-Chalk River Laboratories
Chalk River, Ontario
ROJ 1JO Canada

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

Dir. Environmental & Health Services — Dr. Richard V. Osborne
Gen. Mgr. Phys. & Environ. Sciences — Dr. Collin J. Allan

Facilities

- WTC (Waste Treatment Center)
  Mission: Development and operation of processes for the 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 emplaced.

National Energy Board

National Energy Board
311 6th Avenue SW
Calgary, Alberta T2P 3H2

Tel: 403-292-4800
Fax: 403-292-5503

Chairman — Roland Priddle
Dir-Environment Branch — Ken Sato
Mgr. Biological Sciences Div. — Jim McComiskay
Mgr. Physical Sciences Div. — Oleh Mycyk

Natural Resources Canada

Natural Resources Canada	
580 Booth Street	Communication Branch:
Ottawa, Ontario	Tel: 613-995-0947
K1A 0E4 Canada	Fax: 613-996-9094
Mgr. Energy Sector	FM Cleland
Mgr. Uranium & Nuc. Energy	Dr. Morrison 613-992-3370
Mgr. Energy Technology-CANMET	Mr. Cook 613-996-8109
Mgr. Deep River Disposal Prj	V. Lafferty 613-995-3539
Mgr. Earth Sciences Sector	Mr. Evaroll 613-992-9983
Mgr. Sedimentary & Marine Geoscience Branch	Mr. Haworth 613-995-2340
Mgr. Minerals and Regional Geoscience Branch	Mr. Duke 613-996-9223
Mgr. Polar Continental Shelf Prj	Bonnie Hrycyk 613-947-1601
Mgr. Geomatics Canada	Mike O'Sullivan 613-995-4341
Mgr. Minerals & Metals Sector	Ron Sully 613-992-2490

Ontario Hydro

Ontario Hydro	
700 University Avenue	
Toronto, Ontario	Tel: 416-592-5111
M5G 1X6 Canada	Fax: 416-592-4485
Mgr Nuclear Fuel Supply	EG Bazeley
Dir Design/Development Div	Hugh S. Irvine
Mgr. Reactor Engineering & Services	Don W. Souther

Mgr. Used Fuel Disposal — Dr. Peter Stevens-Guille
Supervising Design Engineer of the Nuclear Branch — PJ Armstrong
Supervising Design Engineer of the Waste & Environment Div. — Syed J. Naqvi
Unit Leader of Fin System Stn. Support Division — RA McEachran

RWOS (Radioactive Waste Operations Site)
Bruce Nuclear Power Development
Box 1540
Tiverton, Ontario
N0G 2T0 Canada — Tel: 519-361-2673

Waste Operations, Keith Mombourquette — Tel: -extn number 4844
Fax: 519-361-4345

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

Facilities

WVRF (Waste Volume Reduction Facility)

Processing equipment: Two-chamber pyrolysis incinerator with a capacity of 30 kg/h; 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:

6 above-ground warehouse-type buildings: Waste with a radiation field of <1 R/h at 30cm is stored in stackable containers with a storage capacity of 8000m^3 each.

15 trenches: Reinforced concrete structures ~3m below ground; designed for waste with radiation fields >1 R/h but <15 R/h; storage capacity rangers from 360m^3 to 680m^3 each.

408 in-ground containers: Welded steel liners concreted into augered holes; designed for storage of waste with radiation fields > 15 R/h, e.g., ion exchange resins, filters and reactor core components. In-ground storage consists of 224 1 m^3 capacity tile holes and 134 in-ground containers. In-ground container 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.

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

15 quadricells: Above ground, reinforced concrete structures; sufficient shielding for storage of waste with radiation fields of >15 R/h, e.g., ion exchange resins, filters, and reactor core components; storage capacity ranges from 1 to 18 m^3.

China

Updated 9/11/96

China

Major Public Holidays (1997)

Jan	1	New Year
Feb	15	Spring Festival
Mar	8	International Women's Day
May	1	International Labor Day
Oct	1	National Day

Time

Standard Time Washington D.C. **+ 13 hours**
Daylight Savings Time Period: **04/13 - 09/21/97**

Passport/Visa

A passport is needed to depart and re-enter the U.S., PRC; 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. $ = 8.32 Renminbi

per Foreign Exchange Rate via Internet, 1/22/97. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

Direct Dialing

Individual numbers for direct dial to China are complete as listed, after dialing international access code **011**. Country code is **86**; listed local numbers include city code.

U.S. Embassy - Beijing

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

Tel: 86-10-6532-3831 Ext. 453
Fax: 86-10-6532-6423

Science Counselor — Dr. Marco S. DiCapua

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

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 <1,000 tU, in transport/storage casks if >1,000 tU; interim storage, reprocessing, vitrification, and disposal all to be at one site, to be selected, 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 tU/a.

International Agreements

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

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 Tel: 86-10-6842-3311
Beijing 100840, PRC Fax: 86-10-6841-8086

Director Huang Fumin Ext. 2187
Director, Nuclear Waste Mgmt Wang Yuanchao Ext. 2802
Director, International Affairs Feng Weizhong Ext. 5067

CIAE

China Institute of Atomic Energy
P.O. Box 275 Tel: 86-10-6935-7676
Beijing 102413, PRC Fax: 86-10-6935-7008

Honorary Director Wang Ganchang
Director Fan Mingwu Ext. 86-10-6935-8032
Director, Radiochemistry Gu Zhongmao Ext. 86-10-6935-7891

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 Tel: 86-10-6851-2211
Beijing 100037, PRC Fax: 86-10-6851-2393

General Manager Zhang Zhifeng Ext. 5312

Function: Import/export company for the nuclear industry.

CNNC

China National Nuclear Corporation
P.O. Box 2102 Tel: 86-10-6851-2211
Beijing 100822, PRC Fax: 86-10-6851-2393

President — Jiang Xingxiong
Ext. 3340/3386
Nuclear Fuel Department Director — Qian Fuyuan
Nuclear Radiation Protection,
Environment/Health Department Director — Chen Zhuzhou

Function: 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
Beijing 100084, PRC
Tel: 86-10-6259-4533
Fax: 86-10-6256-4177

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

Function: 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

Director — Liu Qizhao

NFF

Nuclear Fuel Fabrication
P.O. Box 257
Chengdu, Yibin 610002
Tel: 86-0831-22-1811
Fax: 86-0831-22-3622

Director — Chen Baoshan

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

NNSA

National Nuclear Safety Administration
P.O. Box 8088 Tel: 86-10-6225-8583
Beijing 100088, PRC Fax: 86-10-6225-7804

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 Tel: 86-28-558-2199 Ext. 33171
Chengdu 610041, PRC 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 Road Tel: 86-021-6485-5415
Shanghai 200233, PRC Fax: 86-021-6439-0846

Director Geng Qirui
Foreign Affairs Ms. Du Li

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

Finland

Updated 3/18/97

Finland

Major Public Holidays (1997)

Jan	1	New Year	May	18	Whitsun
Jan	6	Epiphany	Jun	20-21	Midsummer Eve/Day
Mar	28	Good Friday	Nov	1	All Saints
Mar	30-31	Easter	Dec	6	Independence Day
May	1	May Day	Dec	24-25	Christmas
May	8	Ascension	Dec	26	Boxing Day

Time

Standard Time Washington D.C. **+ 7 hours**
Daylight Saving Time Period: **03/30 - 10/26/97**

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 Foreign Exchange Rate via Internet, 1/21/97. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

Direct Dialing

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

U.S. Embassy - Helsinki

American Embassy
Itaeinen Puistotie 14A
Helsinki
Finland

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

Economic Section

Robert W. Boehme

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
Reactor Mix	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 the Olkiluoto and Loviisa power plants will be stored at the power plant areas for about 40 years, then disposed of in crystalline bedrock. Posiva, a joint waste management company of the utilities TVO and IVO, is in charge of final disposal of spent fuel. 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), tU 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 Soviet-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.
- **Posiva**—a joint company established by IVO and TVO. Principal mission: final disposal of spent fuel. Started operations in 1996.

Advisory Committee on Nuclear Safety

Advisory Committee on Nuclear Safety
P.O. Box 14
Laippatie 4
FIN-00881 Helsinki Tel: 358-0-75-8881
Finland Fax: 358-0-75888500

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

IVO (National Power Company)

Imatran Voima Oy
Rajatorpantie 8 Tel: 358-0-85611
FIN-01019 IVO, Finland Fax: 358-0-563-6823

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

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

Owner: Government.

NEC (Nuclear Energy Commission)

Nuclear Energy Commission
Pohjoinen Makasiinikatu 6
FIN-00130 Helsinki — Tel: 358-0-160-4832
Finland — Fax: 358-0-160-2695

Chairman — Prof. 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 — Prof. 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 tU; construction completed 1987.
- **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 m^3; construction completed 12/1991.

VTT (Technical Research Centre of Finland)

VTT Energy
Nuclear Energy
Tekniikantie 4C, Espoo — Tel: 358-0-456-1
FIN-2044 VTT, Finland — Fax: 358-0-456-5000

Nuclear Energy Research — Prof. Lasse Mattila
Reactor Physics — Ms. Riitta Kyrki-Rajamäki
Nuclear Waste Management — Dr. 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 — Tel: 358-0-456-1
FIN-02044 VTT, Finland — Fax: 358-0-456-5000

Head — Dr. Markku Auer
Nuclear Waste — Dr. Arto Muurinen

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

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 Dr. 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 Prof. 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

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

POSIVA

Posiva Oy
Mikonkatu 15 A
FIN-00100 Helsinki

Tel: 358-9-2280-30
Fax: 358-9-2280-3719

Managing Director — Veijo Ryhänen
Manager for Georesearch — Timo Äikäs
Manager for Development — Dr. Juhani Vira
Manager for Financial Planning — Jussi Palmu

Function: Final disposal of spent nuclear fuel and other tasks of expertise within nuclear waste management

Owners: TVO (60%) and IVO (40%)

France

Updated 10/15/96

France

Major Public Holidays (1997)

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	White Suntide	Jun	5	White Monday
Jun	23	Pentecost	Dec	25	Christmas

Time

Standard Time Washington, D.C. **+ 6 hours**
Daylight Savings Time Period: **03/30 - 10/26/97**

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 for the visit. Most travel agencies can provide up-to-date information concerning requirements.

Currency Exchange Rate

1 U.S. $ = 5.64 Franc

per Foreign Exchange Rate via Internet, 1/22/97. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

Direct Dialing

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

U.S. Embassy - Paris

American Embassy
2 Avenue Gabriel
75382 Paris Cedex 08
France

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

Science Counselor — Jerome J. Bosken

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)(*)

* 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). LLW — immobilize in bitumen, concrete, or resin and dispose in engineered surface facility.

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

Industrial-Scale Activities

- Uranium mining and milling (tU/a): Moo (1994)
- Uranium enrichment (kSWU/a)
  - Eurodif, gaseous diffusion: 10,800
- Fuel fabrication (tHM/a)
  - UO_2: 1,600
  - MOX: 50 (LWR fuels)
- Spent fuel reprocessing (t/a)
  - 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 56.7%): commercial enrichment.
  - **SICN** (100%), **FRAGEMA** (50%), **FBFC** (49%), **COMMOX** (60%) — COGEMA subsidiaries: fuel fabrication.
  - **SGN** (COGEMA 66%) engineering.
  - **TRANSNUCLÉAIRE** (100% 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).
- **Framatone**

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 à partir ole juin 1996

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 - Michel Lefevre, Director
  du Centre de la Vallee du Rhone
  CE-Marcoule
  B.P. No. 171
  30207 Bagnols-sur-ceze-cedex
  - APM - Reprocessing (Metal)
  - FBR Fuel Cycle
  - Reprocessing
  - HLW
  - TRU Waste and LLW/ILW R&D

ANDRA (National Agency for Radioactive Waste Management)

ANDRA
Poore de la Oapix R. Pasichie
Pase de la Croix Blanche
1/7 Rue Jean Monnet
92290 Chatenay-Malabry Cedex
France

Tel: 33-1-46-11-8000

Director	Yues Kaluzny
Deputy Director	Armand Faussat
Director International Affairs	Pierre Barber
	Tel: 33-1-46-11-8068
	Fax: 33-1-46-11-8268

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, to be 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 the province 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: 33-38-64-38-65
France Fax: 33-38-64-36-43

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

CEA (Atomic Energy Commission)

Commissariat à l'Energie
Atomique (CEA)
Centre d'Etudes Nucléaires (CEN)
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 Tel: 33-1-46-54-70-80
France Fax: 33-1-47-35-14-23

Director	Philippe Vesseron
Dir., Nuc. Security Research	Michel Livolant-Dir. Adjoint
Dir., Safety	Daniel Queniart-Dir. dél ala Sureté
Safety Analysis	Christian Devillers
Dir., Safeguards	Annie Sugier-Dir. dél ala Protection
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).

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/a.
  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
France

Tel: 33-1-46-54-70-00
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
WM/Reproc. Program Coord.

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 Tel: 33-66-79-60-00
Marcoule, France Fax: 33-66-79-66-17

Director	Claude Vergne
Mgr., Reprocessing/HLW	Michele Viala-DCC-Saclay 33-40-56-12-17
Manager, HLW	Jean-Pierre Moncouyoux 33-66-79-63-78

Decommissioning (DERD/VOIN)

Facilities

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

- **PIVER** (Hot Pilot Plant — Vitrification)
  Mission: Test batch vitrification processes (1969-1973); produce samples for characterization and advanced (high-temperature) waste forms.

- **Design Basis:** Pot calciner/melter; capacity, 90 kg glass/batch or 25-30 m^3 HLW/a; product, borosilicate glass blocks, 25 cm dia by 2.5 m high.
  History: Decommissioned, then dismantled in 1991.

- **PIVER II** — Vitrification of HLW from APM. (Delayed)

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

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

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

COGEMA (Fuel Cycle Company)

Cogema Direction Generale
2, Rue Paul-Dautier
B.P. 4
78141 Velizy-Villacoublay Cedex
France

Tel: 33-1-39-26-30-00
Fax: 33-1-39-26-27-00

Chairman, CEO	Jean Syrota
Executive Vice President	Christian Gobert
V.P., Reprocessing Division	Jean-Louis Ricaud
V.P., Unarium Division	Yues Coupin
Sr. V.P., Corp. Strategy & Intl Development	Jean Pierre Rougeau

Cogema, Inc.
7401 Wisconsin Ave. Tel: 301-986-8585
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 Patrick Ledermann
33-33-03-60-01

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

Facilities

- **UP2** (Fuel Reprocessing Plant)
  Mission: Reprocess oxide fuels from LWRs and Phenix FBR (Phenix fuel has been reprocessed from 1979 to 1984, diluted with natural uranium fuel for criticality control).

Design Basis: PUREX flowsheet; oxide fuels: shear-leach HAO head-end; remote maintenance.
Capacity: 400 t/a of LWR fuels.
History: UP2 startup, 1967; HAO startup, 1976. From startup (06/76) through 12/93 total HAO throughput was 4,091 tHM fuel from LWRs and 10 tHM 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 tHM/a 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/a HLW feed three lines — 60 liters/h HLW, 25 kg/h glass; canister dimensions: 42 cm dia x 1.3 m high (400 kg glass)].
  Capacity: 800 tHM/a.
  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 tHM/a.
  History: Startup, 09/90. Throughput of 1,626 tHM as of 12/95. Combined UP2/UP3 MTU reprocessed as of June 1, 1996: 3,694

- **STE3** (Liquid Waste Treatment Facility)
  Mission: Processing/encapsulation in bitumen of liquid low- and intermediate-level wastes from reprocessing of spent fuel at the La Hague installations.
  History: Startup, 1989.

COGEMA-MARCOULE

Cogema, Centre de Marcoule
B.P. 170
30200 Bagnols-sur-Ceze Tel: 33-4-66-79-20-01
Marcoule, France Fax: 33-4-66-79-57-00

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

Director	Maurice Mellano
Reprocessing Plant	Daniel Pageron
AVM Manager	Jean- Pierremistral

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 tU/a of reactor fuel (gas/graphite).
  History: Startup, 1958; total gas/graphite power reactor fuels processed up to 12/93: 5,085 tU.

- **AVM** (Ateliers de Vitrification de Marcoule)
  Mission: Demonstrate AVM process: vitrify Marcoule UP1 wastes.
  Design Basis: Rotary calciner feeding an induction- heated metallic melter; nominal capacity 30-liters/h HLW feed and 360 kg/d (1 canister) borosilicate glass product; waste form, glass blocks 0.5 m dia x 1.0 m high.
  History: Hot startup, 06/78; as of 12/93, 2,145 glass canisters.

- **Incinerator**

- **Bituminization Facility**

- **Melox:** MOX fuel fabrication (120 tHM/a) - 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 — Dr. Ghislain de Marsily
Deputy Director — Dr. 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 — Tel: 33-1-47-96-56-00
France — 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 tHM/a.
- **Fuel Fabrication Plant** (Pierrelatte, France)
  Mission: Fabricate UO_2 fuels.
  Design Capacity: 400 tHM/a.
- **Fuel Fabrication Plant** (Dessel Belgium)
  Mission: Fabricate UO_2 fuels.
  Design Capacity: 450 tHM/a.

SGN

Société Générale pour les
Techniques Nouvelles

1 Rue des Hérons
Montigny-le-Bretonneux
78182 Saint-Quentin
en Yvelines Cedex — Tel: 33-1-30-58-60-00
France — 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 — Tel: 33-1-40-69-77-00
France — 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

Updated 6/3/97

Germany

Major Public Holidays (1997)

Jan	1	New Year	May	19	Pentecost Monday
Mar	27	Good Friday	Oct	3	Day of Unity
Mar	31	Easter Monday	Dec	25	Christmas
May	1	May Day	Dec	26	Boxing Day
May	8	Ascension			

Time

Standard Time Washington, D.C. **+ 6 hours**
Daylight Saving Time Period: **03/30 - 10/26/97**

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 Foreign Exchange Rate via Internet, 1/22/97. 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

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 and MOX fabrication 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 (mainly by foreign plants) and interim storage of HLW glass; disposal of reprocessing wastes and unreprocessed spent fuel 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	103,300 m^3 conditioned, radioactive waste with negligible heat production
Cumulative Heat-Producing Waste Arisings	2000	4,700 m^3 conditioned, radioactive waste with heat production

Industrial-Scale Activities

- Fuel fabrication capacity
  - UO_2 fuel: 400 t U/yr
- AFR spent fuel storage capacity
  - 3,800 t dry storage (Gorleben)
  - 1,500 t dry storage (Ahaus)
  - 620 t dry storage (Greifswald)

Major Milestones

- Acceptance of HLW from Cogema/La Hague and BNFL/Sellafield 1995
- Konrad (iron mine) repository not before 2000
- Gorleben repository, HLW not before 2013

International Relationships

DOE/BMBF 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 OECDEA. 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
- **State (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.

BMBF (Federal Ministry for Education, Science, Research and Technology)

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

- FZK (Research Center Karlsruhe)
  - 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
- FZJ (Jülich Research Center)
  - Waste treatment
  - Support work — LLL/ILW disposal, including HTGR fuel elements

BMWi (Federal Ministry for Economics)

- national energy policy
- peaceful use of nuclear energy

- BGR (Federal Institute for Geosciences and Natural Resources)
  - repository site selection, site investigations and characterisation
  - R&D for salt dome repository (salt properties, rock mechanics, geoengineering safety analysis)

BMF (Federal Ministry of Finance)

- EWN (German company responsible for the decommissioning of the 6 PWR's of the former GDR)
  - Decommissioning of 5 PWR's on Greifswald site, 1 prototype PWR on Rheinsberg site
  - Interim Storage North (on Greifswald site; dry storage of spent fuel; storage/buffer storage of decom-waste; waste treatment and conditioning)

BMU (Federal Ministry of Environment, Nature Conservation and Nuclear 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 (Federal Institute for Radiation Protection)
  - Transportation/storage/licensing
  - Responsibility for repository construction/operation

LÄNDER (State Governments)
- Licensing of nuclear installations
- 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

GNB — Owned by GNS and NUKEM
- Development and fabrication of transportation/interim storage/ disposal casks

GNS — Owned by Nuclear Utilities
- Waste treatment/conditioning
- Transportation of radioactive materials
- 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)

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: 49-30-811-2029

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: 49-531-592-0
38116 Braunschweig, Germany Fax: 49-531-592-7614

Director, Final Disposal Projects/Operation Bruno Thomauske
Tel: 49-531-592-7670
Fax: 49-531-592-7614

Director, Safety of Final Disposal/Storage of Nuclear Fuel/Nuclear Transport Helmut Röthemeyer
Tel: 49-531-592-7600
Fax: 49-531-592-7614

Director, Waste Disposal/Safety	Heinrich Illi 49-531-592-7620
• Radioactive Waste	Peter W. Brennecke 49-531-592-7641
• Geoscience	Gerhard Stier-Friedland 49-531-592-7639
• Radiology/Radiation Protection	Dietrich Ehrlich 49-531-592-7627
• Safety Analysis	Jürgen Preuss 49-531-592-7649
• Repository Planning	Dietmar Gentsch 49-531-592-7650
Director, Transport/Storage of Radioactive Material/Fuel Cycle	Wilhelm Collin 49-531-592-7679

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, responsible for construction and operation of repositories.

Facilities

- **Gorleben Site** (planned repository), 100 km northeast of Braunschweig.
  Mission: disposal of all types of solid radioactive waste.
  Repository Concept: 300- to 600-m-deep boreholes in tunnel floors at depths of about 850 m in the Gorleben salt dome.
  Milestone: startup of disposal not before 2013

- **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 not before 2000

- **Morsleben Site** (ERAM), 40 km west of Magdeburg, former salt mine
  Mission: LAW disposal facility
  Milestone: Startup of disposal 1971

BGR (Federal Institute for Geosciences and Natural Resources)

Bundesanstalt für Geowissenschaften und Rohstoffe
Stilleweg 2
Postfach 51 01 53 Tel: 49-511-643-0
30655 Hannover, Germany Fax: 49-511-643-2304

Director, Engineering, Geology/Geotechniques	Michael Langer 49-511-643-2420
Rock Mechanics	Manfred Wallner 49-511-643-2422
Engineering Seismology	Rolf Lüdeling 49-511-643-2864
Salt Mechanics	Udo Hunsche 49-511-643-2416
Salt Geology	Otto Bornemann 49-511-643-2417
Numerical Modeling	Stefan Heusermann 49-511-643-2429
Hydrogeology	Helmut Vierhuff 49-511-643-2394
Groundwater Geophysics	Klaus Schelkes 49-511-643-2616
Rock Mechanics in Mining	Dieter Meister 49-511-643-2874

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.

BMBF (Federal Ministry for Education, Science, Research and Technology)

Bundesministerium für Bildung, Wissenschaft, Forschung und Technologie
Heinemannstrasse 2
Postfach 20 02 40 Tel: 49-228-57-0
53175 Bonn, Germany Fax: 49-228-57-3605

Minister	Jürgen Rüttgers
Director General, Energy, Environment	Eckhard Lübbert
Dismantling of Nuclear Research Facilities	Klaus Komorowski 49-228-57-3759
Safeguards	Hans Hermann Remagen 49-228-57-3755
Waste Management and Disposal	Diethard Lummerzheim 49-228-57-3762

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

BMU (Federal Ministry for Environment, Nature Conservation and Nuclear Safety)

Bundesministerium für Umwelt, Naturschutz
und Reaktorsicherheit
Kennedyallee 5 Tel: 49-228-305-0
53175 Bonn, Germany Fax: 49-228-305-3225

Minister	Angela Merkel
Director, General, Nuc. Installation Safety/Radiation Protection/Nuclear Fuel Cycle	Gerald Hennenhöfer
Director, Nuclear Installation Safety	Hubert Steinkemper 49-228-305-2805
Director, Radiation Protection	Klaus Gast 49-228-305-2905
Director, Fuel Cycle	Arnulf Matting 49-228-305-2950
Policy	Dietmar Bröcking 49-228-305-2930
Reprocessing/Conditioning	Ulrich Alter 49-228-305-2821
Treatment/Storage/Transp.	Herbert Dreisvogt 49-228-305-2721
Final Repository	Manfred Bloser 49-228-305-2951 Alexander Nies 49-228-305-2959
Chairman, Reactor Safety Commission (RSK)	Adolf Birkhofer
Chairman, Radiation Protection Commission (SSK)	Christoph Reiners

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 Hans Jürgen Krug
Project Gorleben, Mgr.	Wolfgang Schulz 49-5171-43-250
Project Konrad, Mgr.	Bernward Hartje 49-5171-43-305
Project Morsleben, Mgr.	Christian Schrimpf 49-5171-91-7777
Project-Related R&D, Mgr.	Hans-Jürgen Engelmann 49-5171-91-7710

Repository:
Endlager für Radioaktive Abfälle Morsleben (ERAM)

Manager	Klaus Ebel 49-39050-8-200

Activities: Conceptual design and operation 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: Responsible for issues in connection with the withdrawal from industrial reprocessing. Shareholder of WAK GmbH.

EWN GmbH

Energiewerke Nord GmbH Rubenow
Postfach 11 25
17507 Lubmin, Germany

Managing Director — Dieter Rittscher
Tel: 49-38354-4-5000
Fax: 49-38354-22095

Project Manager — Dieter F. Leushacke
Tel: 49-38354-4-8120
Fax: 49-38354-22074

Head of Plant Operation Greifswald — Rolf Meyer
Tel: 49-38354-4-8020
Fax: 49-38354-4-8007

Head of Plant Operation Rheinsberg — Wolfgang Fiß
Tel: 49-33931-57200
Fax: 49-33931-2367

Function: German company responsible for the decommissioning of the 6 PWR's of the former GDR.

Activities

- Planning and decommissioning of 6 russian type PWR's of the former GDR (4 units VVER 440/230 and 1 unit VVER 440/213 on Greifswald site; 1 prototype unit VVER 70 on Rheinsberg site)
- Erection/operation of Interim Storage North facility (storage/buffer storage of decom-waste up to 175,000 m^3; interim storage for spent fuel in CASTOR casks; waste treatment and conditioning)

FZR (Research Center Rossendorf)

Forschungszentrum Rossendorf e.V.
P.O. Box 51 01 19 — Tel: 49-351-260-0
01314 Dresden, Germany — Fax: 49-351-260-0461

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

The FZR is engaged in pure and application oriented basic research. Research-topics are *Biomedicine/Chemistry, Radioecology, Materials Science, Safety Research, Nuclear and Hadron Physics*.

The FZR is funded in equal parts by the Federal Republic of Germany and the Free State of Saxony. Permanent staff are 436 people. Additionally, there is a scientific staff of about 170 people mainly based on project sources. The FZR operates several different linear accelerators and cyclotrons, radiochemistry laboratories, equipment for Positron-Emission-Tomography and other special experimental facilities.

Scientific Director: F. Pobell
Tel: 49-351-260-3344

Administrative Director: G. Pamiewski
Tel: 49-351-260-3374

- Research Divisions
- Technical Divisions
- Publications
- WWW

Research Divisions

Institutes:
- Ion Beam Physics and Materials Research
- Bioinorganic and Radiopharmaceutical Chemistry
- Radiochemistry
- Nuclear and Hadron Physics
- Safety Research

Director of the Institute of Radiochemistry: N. Nitsche
Tel: 49-351-260-3210

Function of the Institute of Radiochemistry:
Investigation of radionuclide transport in the environment. Specification and migration of radionuclides. Interaction of radionuclides with organic matter and molecular-biological studies. Chemistry of heaviest elements.

Scientific Departments

- Experimental Facilities and Information Technology
- New Accelerators
- Analytics

Technical Divisions

- Communication and Data Processing
- Library
- Investment, Technical Services
- Safety and Security

GNB (Company for Nuclear Casks)

GNB Gesellschaft für Nuklear-
Behälter mbH
Hollestrasse 7a
45127 Essen, Germany

Tel: 49-201-109-1828
Fax: 49-201-109-1125
Email: allen_jack.gns@gns.de

Managing Directors — Dieter Methling, Ralf Peters

Function: Design and development of casks for rad-waste.

Ownership: 55 % GNS, 45 % Nukem

Activities

GNB delivers world-wide:

- transport and interim storage casks for spent fuel
- casks for transport, the interim and final storage of radioactive waste from reprocessing
- casks and containers for waste generated by the operation of nuclear power plants
- handling systems, air-lock systems, transfer systems, lifting equipment, handling equipment for casks, transport cradles with integrated shock absorbers and hood for CASTOR- and special casks in transport configuration

GNS (Company for Nuclear Service)

Gesellschaft für Nuklear-Service mbH
Hollestrasse 7A
45127 Essen, Germany

Tel: 49-201-109-0
Fax: 49-201-109-1100

Managing Directors

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

Function: Service to nuclear facilities, including waste treatment/conditioning, transportation of radioactive materials, 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 - 420 casks (in 183 x 138 x 19-m-high building).
  Capacity: 1500 t Ahaus, 3800 t Gorleben
  History: Ahaus went into operation in 1992, Gorleben in 1995.

- **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 1998.

GRS (Company for Nuclear and Industrial Plant Safety)

Gesellschaft für Anlagen- und
Reaktorsicherheit (GRS) mbH
Schwertnergasse 1
50667 Köln, Germany

Tel: 49-221-2068-0
Fax: 49-221-2068-888

Non-profit scientific-technical expert organisation for nuclear safety and industrial plant safety

Other company locations are in Garching near München, Braunschweig and Berlin. GRS has technical branch offices in Paris, Moscow and Kiev.

General Management: Adolf Birkhofer
Walter Leder

Function in waste management: GRS acts as advisor to the Federal Minister for the Environment, Nature Conservation and Nuclear Safety and other regulatory authorities and performs R&D as well as safety related analyses regarding nuclear waste management.

Contacts

Thermal Hydraulics and Process Engineering	Klaus F. Wolfert 49-89-32004-406
Systems Technology and Operating Experience	Dieter Rittig 49-221-2068-600
Waste Management Division	Wolfgang Thomas 49-89-32004-490
Final Repository Safety Research Division	Wernt Brewitz 49-531-8012-239
Fundamental Safety Issues & International Programmes Division	Ulrich Erven 49-221-2068-651

GSF/FB Asse (Research Center for Environment and Health/ Asse Research Mine)

GSF-Forschungsbergwerk Asse
Postfach 14 61 Tel: 49-5336-89-0
38284 Wolfenbüttel, Germany Fax: 49-5336-89-379

Manager	Manfred W. Schmidt 49-5336-89-219
Scientific Advisor	Klaus Kühn 49-5336-89-232
Works Management	Volker Schauermann 49-5336-89-211

Facilities

- Asse Research Mine (12 km southeast of Wolfenbüttel)
  38319 Remlingen, Germany Tel: 49-5336-89-0

Mission:

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

FZJ (Jülich Research Center)

Forschungszentrum Jülich GmbH
52425 Jülich, Germany
Tel: 49-2461-610
Fax: 49-2461-61-8100
Email: fzj@fz-juelich.de
Internet: http://www.kfa-juelich.de

(Convenient route from U.S. is by plane to Düsseldorf or Köln, then by car to Jülich)

Institute for Safety Research and Reactor Technology, Nuclear Waste Management Section (ISR 3)
Heiner Brücher
Tel: 49-2461-61-6409
Fax: 49-2461-61-2450
Email: h.bruecher@fz-juelich.de

Quality Assurance Control Group (PKS)
Reinhard Odoj
Tel: 49-2461-61-6190
Fax: 49-2461-61-2450

Central Research Reactor and Nuclear Operations Division, Decontamination Section (ZFK-DE)
Stephan Halaszovich
Tel: 49-2461-61-5288
Fax: 49-2461-61-2460

Central Research Reactor and Nuclear Operations Division, Hot Cell Facility Section (ZFK-GHZ)
Günter Pott
Tel: 49-2461-61-3196
Fax: 49-2461-61-6435

Activities: Characterization of radioactive waste products/packages, development of destructive/non-destructive methods for quality control of waste; development of advanced technologies for treatment, storage and disposal of waste; radiochemical studies on waste partitioning for isotope

transmutation; studies on long-term behaviour of spent fuel and radioactive waste under dry intermediate storage and repository conditions; decontamination of contaminated equipment; LLW incineration using Jülich furnace design.

FZK (Research Center Karlsruhe)

Forschungszentrum Karlsruhe GmbH
Postfach 36 40
76021 Karlsruhe, Germany

Tel: 49-7247-82-0
Fax: 49-7247-82-5070
Internet: http://www.fzk.de

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

Central Engineering Department (HIT) — Hermann Rininsland, 49-7247-82-3000

Program Management "Entsorgung" (PTE) — Klaus-Detlef Closs, Tel: 49-7247-82-5790, Fax: 49-7247-82-5796, Email: klaus-detlef.closs@pte.fzk.de

Decommissioning of WAK and research reactors, operated by FZK — Walter Müller-Dietsche, 49-7247-82-5930

Institute for Nuclear Waste Disposal Technology (INE) — Jae Il Kim, Tel: 49-7247-82-2230, Fax: 49-7247-82-4308, Email: kim@ine.fzk.de

- Performance Assessment — Bernd Grambow, 49-7247-82-5494, Email: grambow@ine.fzk.de
- Actinide Chemistry — Reinhard Klenze, 49-7247-82-4602, Email: klenze@ine.fzk.de
- Nuclear Material analysis — Klaus Gompper, 49-7247-82-4393, Email: gompper@ine.fzk.de
- Vitrification Technology — Siegfried Weisenburger, 49-7247-82-4288, Email: roth ine.fzk.de

Task of the Institute for Nuclear Waste Disposal Technology:

Safety research for nuclear waste disposal
- Thermomechanical and hydrogeological investigations for site characterization and scenario development
- Performance assessment of multibarriers
  - Engineered barriers
  - Geoengineered barriers
  - Geological barriers
- Barrier specific geochemical modelling and transport modelling
- Aquatic chemistry of actinides and long lived fission products
- Safety assessment and uncertainity analysis

Immobilization of high active waste
- Vitrification of WAK-HAWC

Installation and Facilities

Installations

Installations for investigation and identification of radioactive materials
- hot cells, glove boxes, inert gas glove boxes
- α/β/γ-spectroscopy, chemical-, element-/isotope-, solid/surface-analysis
- laser spectroscopy:, TRLFS, LPAS, LIBS

Facilities

- **Remote prototype vitrification facility PVA**
  Mission: Vitrification process development and demonstration with new ceramic-lined glass melter for the radioactive vitrification facility VEK to be erected on site FZK-WAK
  Design Basis: Liquid-fed, joule-heated glass melter, throughput capacity appr. 10 l/h and 5 kg/h of glass. Small scale plant, adjusted for the need of the site for vitrification of 80 m^3 HLLW containing 24 Mill. b/g radioactivity.
  History: Conceptional design 1995; Mark 1; Founding of VEK-Project by FZK 1996; Mark 2; Safety report for the active plant VEK end of 1996; Mark 3; Start-up of prototype facility 1998; Mark 4; Start-up of hot plant scheduled 2202/3; Mark 5

NMU (Lower Saxony Ministry of Environment)

Niedersächsisches Umweltministerium
Archivstrasse 2
Postfach 41 07 Tel: 49-511-120-0
30041 Hannover, Germany Fax: 49-511-104-3399
Email: poststelle@mu.land-ni.dbp.de

Minister Monika Griefahn
Director Nucl. Energy/Rad. Protection Klaus-Dieter Becherer
Final Repositories Klaus-Arno Beckers
49-511-120-3609
Email: klaus-arno.beckers@mu.land-ni.dbp.de
NFC (WM/Reprocessing/SF) Dietmar A. Kopp
49-511-120-3503
Email: dietmar.kopp@mu.land-ni.dbp.de

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

NUKEM Nuklear

NUKEM Nuklear GmbH,
Alzenau Tel: 49-6023-91-07
Industriestrasse 13 Fax: 49-6023-91-1222
63755 Alzenau, Germany Email: nukem_nuklear@nukem.de

Managing Directors Peter Piltz
Kurt Schreiber
Erwin Wehner

Nuclear Technology
Function:

- Plants and Processes for the Nuclear Industry
- Refurbishment of Nuclear Facilities
- Decommissioning of Nuclear Facilities
- Remote Handling Technology
- Transport and Storage Casks for Radioactive Materials
- Radioactive Materials
- Radioactive Waste Treatment

Fuel Cycle Services
Function:
- Procurement of Nuclear Fuel
- Financing
- Consulting and Information

DETEC

Decommissioning Technologies, GmbH
Industriestrasse 13
63755 Alzenau, Germany

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

Managing Directors — Gerwin H. Rasche, Peter Hildwein

Function: Engineering, supplies, and on-site services for D&D of nuclear facilities and installations; engineering and supplies of remote handling systems.

Siemens

Siemens AG Rückbauprojekte Hanau
Postfach 11 00 60
63434 Hanau, Germany

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

Production Manager — Helmut Rupar, 49-6181-58-3247

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

Decommission of the Hanau Fuel Fabrication Plant (U, MOX).

TUM (Technical University Munich)

Technische Universität München
Institut für Radiochemie
Walther-Meissner-Strasse 3
85747 Garching b. München, Germany

Tel: 49-89-2891-2202
Fax: 49-89-326-1115

Director — Franz Baumgärtner

VKTA (Nuclear Engineering/ Analytics Company)

Verein für Kernverfahrenstechnik
und Analytik Rossendorf e.V.
P.O. Box 51 01 19
01314 Dresden, Germany

Tel: 49-351-260-0
Fax: 49-351-260-3236

General Manager — Wolfgang Hieronymus
49-351-260-3272

Administrative Director — Axel Richter
49-351-260-3178

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

- **ESR** (Waste treatment plant for LLW)
  Plant for treating of low level liquid and solid wastes (waste characterization, waste pretreatment, conditioning, packaging, separating of remnants and radioactive wastes, volume reduction of wastes).
- **SWA** (Waste water treatment plant)
  Treatment consisting of mechanical filtration, ion exchange for low-salt wastes.
- **EKR** (High security building for nuclear fuel)
  EKR consist of three parts:
  - buildings for interim storage of fresh nuclear fuel; fresh nuclear fuel treatment facilities for disposal
  - departure hall for CASTOR-casks, loaded with spent fuels of Rossendorf research reactor
  - heavy safety wall; safety installations; guard-house
    Milestone: Startup, 1997
- **Radioisotope Production Facilities**

WAK (Fuel Reprocessing Company)

Wiederaufarbeitungsanlage Karlsruhe
Betriebsgesellschaft mbH
Postfach 12 63 Tel: 49-7247-88-0
76339 Eggenstein-Leopoldshafen, Germany 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 Executives	R. Heere
	49-7247-88-2800
	C.R. Jungmann
	49-7247-88-2900
Plant Manager	M. Weishaupt
	49-7247-88-2730
Decommissioning	H. Wiese
	49-7247-88-2747

Facilities

- **WAK Reprocessing Plant**
  Former activities: Reprocessing UO_2 and MOX fuels; recover plutonium for recycle; test advanced technology.
  Since 1991: Decommissioning of all reprocessing facilities.
  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, 1991; decommissioning/dismantling/waste disposal plans in progress.

- **VEK** (Pilot Vitrification Plant Karlsruhe), being planned and built by Karlsruhe Research Center on the WAK site and thereafter operated by WAK to vitrify the 80 m^3 high active waste concentrate from the WAK reprocessing activities. Construction to be started in 1998.

India

Updated 12/11/96

India

Major Public Holidays (1997)

Jan	26	Republic Day	Jun	9	Muharram
Feb	27	Mahashivvatri	Aug	10	Milad-un-Nabi
Mar	3	Idu'l Fitr	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. $ = 35.9 Rupee

per Foreign Exchange Rate via Internet, 1/22/97. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

Direct Dialing

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

U.S. Embassy - New Delhi

American Embassy
Shanti Path
Chanakyapuri
New Delhi 110021, India

Tel: 688-9033 and 611-3033
Fax: 91-11-687-2028 (Embassy)
Fax: 91-11-687-6033 (Science office)

Counselor for Economic and Scientific Affairs

Mr. Douglas A. Hartwick

Energy

Electric Power Capacity	1992	69	GWe
		<3%	**nuclear**
	1997	100	GWe
		<3%	**nuclear**
Electric Power Production	1992	302.7	TWh
		76%	coal
		22%	hydro
		<3%	**nuclear**
	1997	**10%**	**nuclear**

Nuclear Power

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

Due to resource and technical problems, it is doubtful that 1997 nuclear power forecasts (end of 8th five-year plan) can be met, commissioning of the 500 MWe 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 may fuel with UO_2-PuO_2.

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

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

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/a):	1993	719
• Uranium mining and milling (t/a):	1985	130
	1988	170
• UO_2 fuel fabrication (t/a):	1984	210
	2000	1,500
• Fuel reprocessing (t/a):		
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 of Governors of IAEA since its inception. Agreement with U.S. on peaceful nuclear cooperation. Elected Chairman of the Board of Governors of IAEA (Sept 94 - Sept 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 has 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 Tombay, 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
Fax: 91-22-556-0750

Director	Dr. A. Kakodkar
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 or 91-22-202-6823
Fax: 91-22-204-8476

Chairman — Dr. R. Chidambaram
Secretary — K. V. Mahadeva Rao

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

Minister, Science/Technology — Professor Y. K. Alagh

Atomic Energy Regulatory Board (AERB)
Chairman — Dr. P. Rama Rao

Function: Regulation and licensing of nuclear facilities.

Nuclear Power Corporation (formerly Nuclear Power Board)
Managing Director — Mr. 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
Tamil Nadu, India
Tel: 91-4117-40240
Tlx: 041-6244
Fax: 91-4117-40360

Fast Breeder Reactor Centre, Director — Dr. Placid Rodriguez

Located near Madras power station.

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

Facilities

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

KAPS

Kakrapar Atomic Power Station (2x220 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.

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 tHM/d for PHWR fuels, now increased to 200 tHM/a; cold operation, 1991.
- **WIP (Waste Immobilization Plant)-Kalpakkam**
  Construction startup, 1983; commissioning, 1993.

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

NAPS

Narora Atomic Power Station (2 x 220 Mwe PhwRo) U.P.

NFC

Nuclear Fuel Complex
Hyderabad, India

Facilities

- **Fuel Fabrication Plant**
  - Initial throughput of 50 t/a increased 1990 to 350 t/a; expected to go to 600 t/a.
  - Manufactures seamless stainless tubes and produces special materials. NFC has produced a special alloy of nioblung hafnium and titanium for India's space programs which 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 100-foot-high tower, can accelerate atoms up to 16 MeV.

RAPS

Rajasthan Atomic Power Station (100, 200 Mwe Phwrs) Rajasthan.

Function: Both reactors have been shutdown indefinitely since 4/95 due to core heavy water leakage.

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 tHM/a.
  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 liters/h HLLW, 125 kg glass/canister, 1 canister/d; product, borosilicate glass blocks.
  History: Construction completed, 1981; hot startup, 1990.
- **SSSF** (Solid Storage Surveillance Facility)
  Mission: Provide air-cooled storage for WIP products.
  Design Basis: Stack-induced natural draft air cooling; capacity for 20 years' storage of vitrified HLW from Tarapur and Trombay.
  History: Completion, 1990.
- **ILW Bituminization Plant**
- **Polymerization Facility**
- **Pilot (hot cell-sized) Mox Fuel Fabrication Facility (1990)**

Italy

Updated 1/22/97

Italy

Major Public Holidays (1997)

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

Time

Standard Time Washington, D.C. **+ 6 hours**
Daylight Savings Time Period: **03/30 - 10/26/97**

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. $ = 1705.00 Lira

per foreign exchange rates via Internet, 4/23/97. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

Direct Dialing

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

U.S. Embassy - Rome

American Embassy
Via Veneto 119/A
00187 Rome
Italy

Tel: 39-6-4674-2275
Fax: 39-6-4674-2663

Science Counselor — Gregory J. Dunn

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 should be returned, starting in 1999; canisters will be temporarily stored until a final repository is available. Dry storage on site is presently planned by ENEL. Activity for selection of a site repository for LLW is being initiated.

Cumulative SF Arisings	1990	342	tU LWR
		1,353	tU GCR

International Relationships

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

Organization

- **ENEA** (Agency for New Technologies, Energy and Environment)—radioactive waste conditioning, radioactive waste disposal (principally at Saluggia and Trisaia).
- **ANPA** (National Agency for Environmental Protection) — 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).
- **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 Prof. Nicolo Caribbo
Director General Dr. Fabio Pistella
Director, Energy Dept. Prof. Sergio Garribba
Director, Fusion Dr. Roberto Andreani
Deputy Dir., D&D/WM Dr. Guiseppe Rolandi
Manager, Rad. Waste Disposal Dr. 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 sectors departments: Fusion, Innovative Reactors, and Decommissioning, and Waste Management dismantling.

Nuclear Activities — Dismantling: Decommission facilities, including removal of stored nuclear material. Tasks: conditioning of liquid/solid radioactive wastes stored at the Eurex (Saluggia) and Itrec (Trisaia) plants and the Casaccia Center; removal of spent fuel from

reprocessing pilot plants; decontamination and dismantling of plants and laboratories, including plutonium oxide fuel fabrication laboratory, site repository for LLW selection.

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 C. Testa

Government body, responsible for all electric power production (privatization underway).

NUCLECO

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

Chairman Dr. G. Messore

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

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

Japan

Updated 6/27/97

Japan

Major Public Holidays (1997)

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 concerning requirements.

Currency Exchange Rate

1 U.S. $ = 116.45 Yen

per Foreign Exchange Rate via Internet, 1/22/97. 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. Eaton
Tel: 81-3-3224-5444/78
Fax: 81-3-3224-5769

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	tU
	1995	12,400	tU

Industrial-Scale Activities (Capacity)

- Uranium mining and conversion (tUF_6/a): 200
- Uranium reconversion (tU/a): 1,028
- Uranium enrichment (tSWU/a): 1981 50
  1988 250
  2000 3,000
- Fuel fabrication
  - UO_2 for LWR (tU/a): 1987 2,495
  - MOX for FBR (t/a): 1988 6
  - MOX for ATR (t/a): 1988 10
  1993 50
- Reprocessing (t/a): 1981 210
  2000 1,010

Major Milestones

- 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

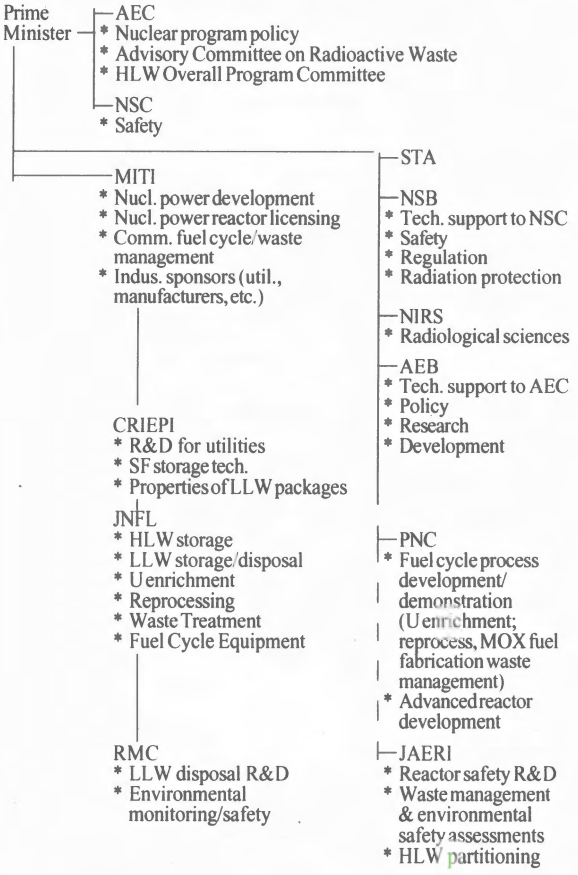
Scope: HLW/TRU waste; waste form development, assay, and characterization; treatment/packaging/transportation; storage/disposal; D&D; facility operations; environment/safety and public acceptance issues. Emphasis on information exchange of HLW and TRU waste conditioning technology.

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



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

STA/AEB

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

Tel: 81-3-3581-5271
Fax: 81-3-3581-2487

Director General	Yasuhiro Kato
Deputy Director General	Tsutomu Imamura
Director, Policy Div.	Yukihide Hayashi
Dir., Power Reactor Dev. Div.	Ryo Kimura
Dir., Nuclear Fuel Div.	Shinichiro Izumi
Dir., Research/Internatl. Div.	Susumu Nakamura

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

AEC

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

Chair (Minister of State for Science/Technology) Riichiro Chikaoka
Vice-Chairman Yoshinori Ihara

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

CRIEPI

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

President Susumu Yoda

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 Tel: 81-3-3480-2111
Komae-shi, Tokyo 201, Japan Fax: 81-3-3488-6697

Function: Laboratory under CRIEPI.

MITI/AIST/GIRIO

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

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

HITACHI

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

President	Tsutomu Kanai
Gen. Mgr., Nuc. Power Systems Div.	Tsutomu Hayashi
Associates	Atou Shimozato
Sr. Chief Engineer	Hisashi Yamamoto

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

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

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
Chiyoda-ku, Tokyo 100, Japan
Tel: 81-3-3244-5111
Fax: 81-3-3286-2440

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

IHI Research Institute
Yokohama Branch
1, Shin-nakaharacho, Isogo-ku
Yokohama 235, Japan
Tel: 81-45-759-2142
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	Masaji Yoshikawa
Vice President	Shojiro Matsuura
Vice President	Kenichi Murakami
Exec. Director, International	Hirofumi Satake

Location: JAERI headquarters and Radioisotope Center are in Tokyo; the Tokai and Oarai research establishments share government reservations at Tokai-mura and Oarai-machi with PNC; Tokai and Oarai are 120 and 100 km, respectively, northeast of Tokyo, near the ocean; these sites can be reached by train from Tokyo to the city of Mito, then by taxi; the 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 311-13, Japan

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

Director General — Toshio Fujishiro

JAERI: TOKAI

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

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

Director General	Shinzo Saito
Deputy Director General	Takeshi Tamazawa
Deputy Director General	Atsuo Kosaka
Deputy Director General	Kunihisa Soda

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)

  TRACY (Transient Experimental Critical Facility)

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

JGC

JGC Corporation
Nuclear and Advanced Technology
Shin-Ohtemachi Bldg.
2-1, Ohtemachi 2-chome
Chiyoda-ku, Tokyo 100, Japan
Tel: 81-3-3279-5441
Fax: 81-3-3273-8047

President	Dr. Eiji Watanabe
Director Advisor	Dr. Takao Nakajima
General Manager, Director	Dr. 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-ken 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.

Facilities

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

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

JNFL

Japan Nuclear Fuel Limited
1-2-15, Honcho, Aomori-shi Tel: 81-177-73-7171
Aomori 030, Japan Fax: 81-177-31-1553

President Tetsuo Takeuchi
Vice Presidents Shiro Sasaki
Shiro Tanuma
Shiro Mino
Hirokazu Iio

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
Fukoku Seimei Bldg.
2-2-2, Uchisaiwai-cho Tel: 81-3-3580-6911
Chiyoda-ku, Tokyo 100, Japan Fax: 81-3-3591-8723

Rokkasho Works Construction Office
504-22, Aza Notsuke, Oaza Obuchi
Rokkasho-mura, Kamikita-gun Tel: 81-175-72-3311
Aomori-ken 039-32, 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 tSWU/a initially; 1500 tSWU/a final capacity.
  History: Initial startup, 1992; 1500 tSWU/a ~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 equivalent to 3 million drums.
  History: Startup, 12/1992.

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

KOBE STEEL

Kobe Steel, Ltd.
3-18, Wakinohamacho
1-chome Fax: 81-78-251-1551
Chuo-ku, Kobe 651, Japan Fax: 81-78-232-3459

Director	Toru Abe
Gen. Mgr., Mech. Eng. Research Lab. (MERL)	Takao Mizoguchi
Gen. Mgr., Nuclear Engineering	Kiyoshi Asahina

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

MITI

Ministry of International Trade and Industry	Tel: 81-3-3501-1511
3-1, Kasumigaseki 1-chome	Fax: 81-3-3501-0643 or
Chiyoda-ku, Tokyo 100, Japan	81-3-3501-0644
Minister	Shinji Sato
V. Minister	Osamu Watanabe
International Affairs	Tadashi Ezaki

MITI/ANRE

Agency of Natural Resources and Energy	
Ministry of International Trade and Industry	Tel: 81-3-3501-1511
3-1 , Kasumigaseki 1-chome	Fax: 81-3-3501-0643 or
Chiyoda-ku, Tokyo 100, Japan	81-3-3501-0644
Director-General	Yasuo Hayashi
Dep. Director-General	Shinichiro Ota
Dep. Dir.-Gen., Nucl. Energy	Tomihiro Taniguchi
Dir., Nuclear Energy Industry	Tadashi Izawa
Dir., Internatl. Nuc. Energy Affairs	Naoyuki Hasegawa

MMC

Mitsubishi Materials Corporation	
5-1, Ohtemachi 1-chome	Tel: 81-3-5252-5200
Chiyoda-ku, Tokyo 100, Japan	Fax: 81-3-5252-5270
President	Dr. Yuumi Akimoto
Managing Dir., Nuc. Energy	Eiji Yagi
Gen. Mgr., Tech. Planning Dept.	Dr. Tamotsu Ishii

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

MOFA

Ministry of Foreign Affairs
2-1 Kasumigaseki 2-chome
Chiyoda-ku, Tokyo 100, Japan

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

Minister	Yukihiko Ikeda
Director General, Arms Control/ Scientific Affairs	Nobuyasu Abe
Director, Science and Nuclear Energy	Yoshihisa Endo

NIRS

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

Tel: 81-472-51-2111
Fax: 81-472-56-9616

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.

STA/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	Kaname Ikeda
Deputy Director-General	Norio Hinaka
Dir., Nuc. Mtls. Reg. Div.	Shoichiro Katayama
Dir., Nuc. Safety Policy Div.	Katsuyoshi Omori
Dir., Reactor Reg. Div.	Kenichi Takeyama
Dir., Safeguards Division	Kenji Seyama
Dir., Radiation Protec. Div.	Kenji Morita
Dir., Office of Nuclear Safety Policy Res.	Toshiro Asakawa

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 — Toshiyuki Kondo
Exec. Vice Presidents — Tadayoshi Suda
Kunihiko Uematsu
Exec. Dir., Nuc. Fuel/Reprocess. — Katsuhisa Ida
Exec. Dir., WM — Nobuyuki Sasao
Exec. Deputy Directors, WM — Sumio Masuda
Koichi Tsurumaki
Dir., Fuel Cycle Develop./Engineering — Tomio Kawata
Dir., International — Masami Katsuragawa
International Cooperation — Takeshi Kawamura

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

General Manager — Hironobu Okamoto

PNC: OARAI

PNC Oarai Engineering Center
Oarai-machi, Higashi Ibaraki-gun
Ibaraki-ken311-13, Japan
Tel: 81-292-67-4141
Fax: 81-292-67-7147

Director	Kunio Okabayashi
Gen. Mrg., Fuels/Materials Development	Shuichiro Nagai

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/a.
  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

Director	Osamu Yamamura
Deputy Directors	Hidechiyo Kashihara
	Kenji Koyama, Nukio Seino
Gen. Mgr., Reprocessing Plant	Atsushi Shibuya
Gen. Mgr., Technology Dev. Coord'n	Masayuki Iwanaga
Gen. Mgr., Health/Safety	Shuji Ishiguro
Gen. Mgr., Waste Technology Devel.	Noriaki Sasaki
Gen. Mgr., Reprocess. Tech. Devel.	Sakae Shikakura
Gen. Mgr., Nuc. Fuel Tech. Devel.	Takeshi Takahashi

Facilities

- **Fuel Reprocessing Plant**
  Mission: Reprocess low-enriched UO_2.
  Design Basis: Oxide fuels: chop-leach head-end; PUREX flowsheet; capacity, 0.7 tHM/d; remote maintenance of chop-leach equipment; contact maintenance of other components.
  History: Startup, 09/77; 509 tU spent fuel processed through 12/90.

- **Tokai Plutonium Conversion Development Facility**
  Mission: Demonstrate PNC microwave process for co-conversion production of MOX.
  Design Basis: 10 kg/d MOX (50% PuO_2, 50% UO_2).
  History: Startup of hot operation, 10/83.

- **Tokai Plutonium Fuel Fabrication Facility**
  Mission: Fabricate FBR and ATR fuels.
  Design Basis: FBR fuels--1 t/a (30% PuO_2 in enriched UO_2); ATR fuels--10 t/a (2% PuO_2 in UO_2).
  Throughput: Since 1979, 100 t MOX produced through 05/89.

- **Tokai Plutonium Fuel Production Facility**
  Mission: Fabricate large quantities of MOX fuel for FBR and ATR.
  Design Basis: FBR fuels, 5 t/a; ATR fuels 40 t/a.
  History: Startup of hot operation, 04/88.

- **EDF (Engineering Demonstration Facility)**
  Mission: Nonradioactive, full-scale and/or engineering mockup tests of processes and equipment for FBR spent fuel reprocessing.
  History: Startup, 04/82.

- **ETF (Engineering Test Facility)**
  Mission: Develop engineering test of HLW vitrification and ceramic melter technologies.
  Design Basis: Joule-heated melter.
  History: Startup, 02/80.

- **CPF (Chemical Processing Facility)** - reprocessing and HLW treatment.
  Mission: Radioactive studies of FBR spent fuel reprocessing and HLW solidification processes.

Design Basis: Five standard hot cells for breeder fuel reprocessing R&D, five cells for waste conditioning R&D; reprocessing, 1 kg/batch; HLW solidification, 10-liter/batch HLW.
History: Hot tests, 09/82.

- **KRF—Krypton Recovery Facility (pilot plant)**
  Mission: Demonstrate ^{85}Kr recovery from Tokai-mura reprocessing plant off-gas.
  Design Basis: Cryogenic distillation and pressurized cylinder storage.
  History: Hot test, 03/88; operation, 04/88.

- **Bitumization Demonstration Facility**
  Mission: Immobilize LLW concentrate.
  Design Basis: 200 liter/h.

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

- **PWTF (Plutonium-Contaminated Waste Treatment Facility)**
  Mission: Prepare PNC TRU wastes for disposal.
  Design Basis: Incineration of combustibles/chloride-containing wastes; mechanical volume reduction.
  History: Operation startup, 1987.

- **PWSF (Plutonium-Contaminated Waste Storage Facility)**
  Mission: Store PNC TRU waste.
  Design Basis: 6000-drum capacity.
  History: Operation startup, 1981.

- **TVF (Tokai Vitrification Facility)**
  Mission: Vitrify and store HLW from the Tokai reprocessing plant; demonstrate technology.
  Design Basis: Ceramic melter to produce a borosilicate glass; capacity, 0.35 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/h
  Milestone: Startup, 1994.

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

RWMC

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

President — Shozo Shimomura
Executive Director — Hiroyoshi Kurihara

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

Minister, Science/Technology — Riichiro Chikaoka
Vice Minister — Hiroto Ishida
Deputy Minister — Toshio Okazaki

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

Updated 4/11/97

Republic of Korea

Major Public Holidays (1997)

Jan	1-3	New Year	Jun	6	Memorial Day
Feb	18-20	Lunar New Year	Jul	17	Constitution Day
Mar	1	Independence	Aug	15	National Day
Apr	5	Arbor Day	Sep	9	Chusok (Thanksgiving)
May	5	Children's Day	Oct	3	National Foundation Day
May	14	Buddha's Birthday	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. $ = 894.5 Won (W)

per Foreign Exchange Rate via Internet, 1/22/97. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

Direct Dialing

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

U.S. Embassy - Seoul

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

Tel: 82-2-397-4114
Fax: 82-2-738-8845

Science Counselor — F. Ken Crosher

Energy

Electric Power Capacity	1993	27.654	GWe
		27.54%	**nuclear**
	1995	32.184	GWe
		6.771%	**nuclear**
	2000	42.3	GWe
		32%	**nuclear**
Electric Power Production	1995	184.661	TWh
		36.3%	**nuclear**
		26.43%	coal
		22.8%	oil
		2.97%	hydro
		11.53%	LNG
	1996	**36.11%**	**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
	1996	9.6	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. A part of Nuclear R&D Fund collected by utility surcharge of 1.5 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	tU
	1995	2,600	tU
	2000	4,400	tU

Industrial-Scale Activities

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

Internation 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 Seung Soo Han

Function: Decision-making body for policies regarding nuclear energy; R&D plan for nuclear fuel and nuclear energy applications; always chaired by Deputy Prime Minister; 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 3 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: 82-42-868-2000/2001
Republic of Korea Fax: 82-42-868-2702

President Dr. Seung Nyun Kim
82-42-868-2121

Sr. V.P., Nuclear Si Hwan Kim
V.P., MRR Project Sung Ki Chae
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 — Tel: 82-42-869-2114
Taejon 305-701, ROK — Fax: 82-42-869-2210/-2220

President — Dr. Duk Yong Yoon
Dean of Research Affairs & Nuclear Engineering — Prof. Kun Jai Lee

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

KEPCO

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

President — Chong Hun Rieh
Vice President & Gen. Mgr. of Nuc. Safety/Tech. — Ke Hwee Kim

Function: Develop power resources; generate/transmit electricity (operates all nuclear and conventional power plants in Korea); responsible to the government (MER); responsible for radiactive waste management.

KIER

Korea Institute of Energy Research
PO Box 103, Yusong-gu
302-343, Taejon — Tel: 82-42-860-3114
Republic of Korea — Fax: 92-42-861-6224

President Dr. Young Mok Son

Function: Development of energy technologies and exploitation of energy.

KINS

Korea Institute of Nuclear Safety Technology
P.O. Box 7
Daeduk-Danji, Taejon Tel: 82-42-868-2601
Republic of Korea Fax: 82-42-868-1700

President	Se Jong Kim
Vice President	Young Su Eun
Dir., Safety Review	Seung Hyuk Lee
Director, Safety Inspection	Won Ki Shin
Director, Standards Development	Sang Hoon Park

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

KIGAM

Korea Institute of Geology, Mining and Materials
30 Kajung-dong
Yusong-gu, Taejon 305-350 Tel: 82-42-868-3340/3341/3342
Republic of Korea Fax: 82-42-861-9720

President Pil Chong Kang

Function: Development and utilization of resources.

KNFC

Korea Nuclear Fuel Company, Ltd.
150 Tukjin-dong, Daeduk-gu Tel: 82-42-868-1000
Taejon, Republic of Korea Fax: 82-42-868-2380

President Chang Suk Lee

Function: Develop domestic nuclear fuel fabrication.

Owners: KEPCO (95%); KAERI (5%).

Facilities

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

KOPEC

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

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

President — 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.

MOTIE

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

Updated 9/30/96

Netherlands

Major Public Holidays (1998)

Jan	1	New Year	May	21	Ascension
Apr	12	Easter	May	31	Pentecost
Apr	13	Easter Monday	June	1	Pentecost Monday
Apr	30	Queen's Birthday	Dec	25	Christmas
May	5	Liberation Day	Dec	26	Boxing Day

Time

Standard Time Washington, D.C. **+ 6 hours**
Daylight Savings Time Period: **03/30 - 10/26/97**

Passport/Visa

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

Currency Exchange Rate

1 U.S. $ = 1.88 Guilder (Fl.)

per Foreign Exchange Rate via Internet, 1/22/97. 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

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	1995	77.4	TWh
		60.2%	gas
		32.8%	coal
		4.9%	**nuclear**
		0.1%	oil
		2.0%	others
	1996	**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 make; in general there is no need for additional capacity 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: Utilize single centralized waste collection service; extend interim storage of all wastes (50-100 years) until decisions are made regarding disposal; studies on final disposal of all radioactive wastes in geological formations are executed in the framework of the national research program (ILONA/CORA); ocean dumping of LLW and ILW has been terminated; the Netherlands contributed to NEA feasibility study regarding subseabed disposal; feasibility of disposal within international or bilateral framework is also being explored.

Cumulative SF Arisings (LWR)	1990	228	tU
	2000	369	tU

International Relationships

Member of EC, IAEA, and OECD/NEA.

Organization

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

Major Milestone

- Interim Storage Center 1994

COVRA (Central Organization for Radioactive Waste)

Centrale Organisatie Voor Radioactief Afval
Spanjeweg 1, P.O. Box 34
4453 ZG s'-Heerenbroek
Netherlands

Tel: 31-1196-13900
Fax: 31-1196-13950

Director — Dr. 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; scheduled to be fully operational in 1994.

ECN (Netherlands Energy Research Center)

Stichting Energieonderzoek Centrum Nederland
Westerduinweg 3
Postbus 1
1755 ZG Petten, Netherlands

Tel: 31-2246-4949
Fax: 31-2246-4480

Chairman, Governing Board — Dr. J.C. Terlouw

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

Research Center

Managing Director — Prof. Dr. F. W. Saris
Nuclear Energy Research — Dr. A. M. Versteegh
Nuc. Waste/Geologic Disposal — L. H. Vons
Safety Assessment — Dr. J. Prij
Radionuclide Migration — Dr. R.J.M. Koning
Actinide Burning — Dr. A. Abrahams

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

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

Geological Survey of the Netherlands

Geological Survey of the Netherlands
Richard Hokade 10
Postbus 157 Tel: 31-23-300300
2000 AD Haarlem, Netherlands Fax: 31-23-351614

Director a.i. A.L.E.W. Bovee
Deep Subsurface Dept. Dr. H. M. van Montfrans

KEMA (Research/Testing Electrochemical Materials Company)

N.V. Tot Keuring van Elektro-
technische Materialen Arnhem
Utrechtseweg 310
Postbus 9035 Tel: 31-85-569111
6800 ET Arnhem, Netherlands Fax: 31-85-515606

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

Function: Research and consulting development; services for utilities; waste management R&D; characterization, quality assurance, volume reduction, and storage of radioactive wastes.

Ministry of Economic Affairs

Ministerie van Economische Zaken
Postbus 20101 Tel: 31-70-3798911
NL-2500 EC The Hague, Netherlands Fax: 31-70-3796358

Dir. Electricity/Nuclear Energy — J. W. Weehuizen, 31-70-3796471

Radioactive Waste — H.T. Cahen, 31-70-3797849

Ministry of Housing, Physical Planning and Environment

Ministerie van Volkshuisvestling
Ruimtelijke Ordening en
Milieubeheer
Postbus 20951
Rijnstraat 8
2500 EZ Den Haag
Netherlands

Tel: 31-70-3393939
Fax: 31-70-3391355

Director, Rad. Protection — Dr. C. M. Plug/ Dr. R. Dortland

Radioactive Waste — Dr. 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

Updated 1/15/97

Pakistan

Major Public Holidays (1997)

Jan	11	Bank Holiday	Aug	14	Independence Day
Feb	9	Eid-ul-Fitr	Sep	6	Defense of Pakistan Day
Mar	23	Pakistan Day	Sep	11	Anniversary of the Death of Quaid-i-Azam
Apr	18	Eid-ul-Azha			
May	1	May Day	Nov	9	Iqbal Day
May	8	Muharram	Dec	25	Christmas and Quaid-i-Azam's Birthday
July	1	Bank Holiday			
July	17	Eid-i-Milad-un-Nabi	Dec	31	Bank Holiday

Time

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

Passport/Visa

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

Currency Exchange Rate

1 U.S. $ = 35.9 Rupee

per Foreign Exchange via Internet, 1/22/97. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

Direct Dialing

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

U.S. Embassy - Islamabad

American Embassy
Diplomatic Enclave, Ramna 5
P.O. Box 1048
Islamabad, Pakistan

Tel: 92-51-82-6161
Fax: 92-51-21-6427

Economics/Science Officer — Malaika Walton

Energy

Electric Power Capacity	1992	13.7	GWe
		1.5%	**nuclear**
	1995	12,530	MW
		22,858	Hydro
		30,176	Thermal
		511	Nuclear
	2000	13.8	GWe
		1%	**nuclear**
Electric Power Production	1995	43%	hydro
		1%	nuclear
		54%	Gwh
		51%	gas/oil
		1%	coal

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	tU
	2000	440	tU

International Relationships

Member of IAEA; agreement with U.S. and other nations on peaceful nuclear cooperation; has not signed nonproliferation treaty.

Organization

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

PAEC

Pakistan Atomic Energy Commission
P.O. Box 1114 Tel: 92-51-920-4276
Islamabad, Pakistan Fax: 92-51-920-4908

Chairman Dr. Ishfaq Ahmad
Secretary Dr. Mukhtar Ahmad
Waste Management Raza-ur-Rehman

Function: Advocate increased nuclear energy generation to overcome serious energy shortages in a country substantially lacking in natural energy resources. In an effort to accelerate Pakistan's overall economic development, the Commission also promotes the use of nuclear technologies in other areas, such as enhancing agricultural production and for medical diagnosis/therapy.

Facilities[a]

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

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

- **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
  - Chinaturnkey construction of the Chasnupp plant now under construction

PINSTECH

Pakistan Institute of
Science & Technology
P.O. Nilore Tel: 92-51-452-350
Islamabad, Pakistan Fax: 92-51-429-533

Director-General Dr. Hameed Ahmed Khan

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 course in nuclear engineering, and fulfills training requirements in health physics, nuclear medicine, instrumentation, and basic nuclear orientation.

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

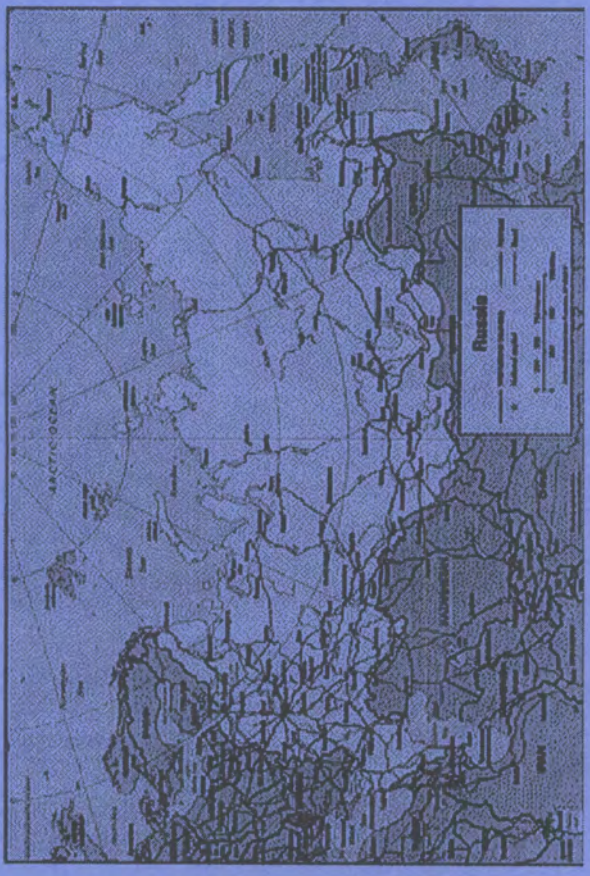
(a) Based on publicly available information, organizational responsibility and specific location of some facilities cannot be identified with certainty; e.g., some reports appear to discuss the same facility, but their location is referred to variously at Kahuta, Rawalpindi or Islamabad which are relatively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

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, lab scale; non-radioactive startup, 1982.

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

Russia



Updated 5/20/97

Russia

Major Public Holidays (1997)

Jan	1	New Year	May	9	Victory Day
Jan	7	Christmas (Orthodox)	June	12	Independence
Mar	8	Women's Day	Oct	9	Constitution
May	1-2	Labor Day	Nov	7-8	Revolutionary Days

Time

Standard Time Washington, D.C. (Moscow) **+ 8 hours**
Daylight Savings Time Period: **03/30 - 09/28/97**

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 concerning requirements.

Currency Exchange Rate

Local currency, the Russian Ruble, is only available upon entry into Russia. Exchange rates cannot be quoted due to continuing fluctuations. Payment in U.S. currency is apparently now prohibited. It is strongly recommended to consult with the U.S. embassy for up-to-date information. Purchasing in large cities with major credit cards is acceptable. Also, cash withdrawals from credit cards are possible in large cities from ATMs and banks.

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
Moscow, Russian Federation
121099

Tel: 1-502-224-1105
Fax: 1-502-224-1106

EST Section - Embassy Section
PSC-77
APO, AE 09721

Tel: 7-095-956-4029
Fax: 7-095-956-4296

Environment, Science and Technology
Minister/Counselor

John Zimmerman
E:mail: usembest@glas.apc.org

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	LGR	1 (Indef.)
		PWR	1 (Indef.)
		FBR	1 (1981)
			2 (Indef.)
Reactors in operation	30 total		
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, followed by reprocessing to recycle fissile materials and separate a number of other specific radionuclides for beneficial uses and different disposition; HLW is vitrified for disposal in a future geologic repository; 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. 36 other, regional facilities exist for medical, industrial, and radioactive waste disposal. Efforts are underway 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.

DOE/MAPI

Memorandum of Cooperation in the Fields of Environmental Restoration and Waste Management

Term: 09-18-90 to 09-17-95
Scope: Technology information exchange related to policy and practices; evaluation of problems in environmental remediation, D&D of

facilities and materials; R&D; analysis/investigations of waste partitioning; vitrification, and geologic disposal of radioactive wastes.

Member of IAEA and WANO.

Organization

Nuclear Program Control

- **MINATOM RF** (Ministry for Atomic Energy, Russian Federation)—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 Scientific Research Institute for Inorganic Materials**, Moscow—reprocessing, solidification, and disposal of HLW; properties of solid waste forms).
- **All-Russian Scientific Research Institute for Nuclear Power Plants**, 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 Research Center), Moscow—nuclear power R&D.
- **RPA V. G. Khlopin Radium Institute**, St. Petersburg—reprocessing, HLW partitioning/solidification, solid waste form properties, off-gases, waste storage/disposal, environmental remediation.
- **Scientific Research Institute of Chemical Engineering**, Ekaterinburg—vitrification/bitumenization pilot plants.

- **VNIPIET** (All-Russian Design and Research Association for Energy Technology), St. Petersburg—design of SF reprocessing facilities, SF transportation/storage.

All-Russian Scientific Research Institute for Inorganic Materials

All-Russian Scientific Research
Institute for Inorganic Materials
Rogov Str. 5a
123060 Moscow, Russia

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

Director — Dr. Mikhail I. Solonin
Deputy Director — Dr. Anatoliy C. Mamayer

Function: R&D on SF reprocessing, radioactive waste processing/solidification (bitumenization/vitrification, etc.), off-gases.

All-Russian Scientific Research Institute for Nuclear Power Plants

All-Russian Scientific Research
Institute for Nuclear Power Plants
Ferganskaya Str. 25
109507 Moscow, Russia

Tel: 7-095-376-1550
Fax: 7-095-376-8333

Director General — Prof. A. Armen Abagyan
Department Head — Leonid P. Khanyanov

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: 7-095-272-4710
Fax: 7-095-278-8090

Chairman	Yuri G. Vishnevsky
1st Deputy Chairman	Alexandre Gutsalov
Administration	Valentin A. Rekunov

Function: Supervision of all safety aspects of Russian nuclear industry.

KHLOPIN

Research Production Association
V. G. Khlopin Radium Institute
2nd Murinski ave. 28
194021 St. Petersburg Tel: 7-812-247-5737
Russia Fax: 7-812-534-7752

Director-General	Dr. Alexander A. Rimski-Korsakov
Deputy Directors	Dr. Evgeniy B. Anderson
	Dr. Evgeniy V. Korolev
	Dr. Valeriy N. Romanovsky
Scientific Secretary	Dr. Sergey V. Butomo
Chief Scientist	Dr. 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, geo-chemistry, studies on solidified waste properties; environmental remediation, protection and monitoring.

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 Research Center
Kurchatov Institute
Kurchatov Square 1
123182 Moscow, Russia

Tel: 7-095-196-7300
Fax: 7-095-196-2073

President — Acad. Evgeniy P. Velikhov
Vice-President — Acad. 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'
Leninstr. 31
454065 Chelyabinsk-65
Russian Federation

Tel: 7-351-513-1659
Fax: 7-351-513-3826

Director — Victor Fetisov
Chief Engineer — Alexander P. Suslov
Dir., Radiochemical Plant — Vladimir K. Sazhnov
Chief Engineer, Radiochem. Plant — Evgeniy G. Dzekun

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 tU reprocessed to 1989.

- **Fully Radioactive HLW Vitrification Plant**
  Design Basis: Single-stage joule-heated ceramic melter with a feed rate of 500-liter/h; about 160 t of HLW phosphate glass was produced from 1987-1988; melter was shut down due to electrode

problems; similar melter was modified and started operation in 6/1991. As of 4/1992, 50 MCi of HLW have been incorporated into phosphate glass.

MINATOM

Ministry for Atomic Energy of the Russian Federation	
Staromonetny per.26	Tel: 7-095-233-1718
109180 Moscow, Russia	Fax: 7-095-230-2420
Minister	Viktor N. Mikhaylov
First Deputy Minister	Vitaly F. Konovalov
Deputy Ministers	Nikolai N. Yegorov
	Yuri I. Tychkov
	Alexander G. Meskov
	Alexander Usanov
	Yevgeny Reshetnikov
	Victor A. Sidorenkov
	Alexander G. Makarov
International Relations	Mikhail N. Ryzhov

Function: Manages all aspects of nuclear power industry. Established 1/92 on an interim basis; successor to MAPI, the former USSR Ministry of Atomic Power and Industry.

Mining/Chemical Enterprise

Mining and Chemical Enterprise	
Lenin Str. 53	
660033 Krasnoyarsk-33	Tel: 7-391-232-1251
Russia	Fax: 7-391-232-0374
Director	Valeriy A. Lebedev
Chief Engineer	Yuri 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 — Dr. Igor A. Sobolev
Vice Director-General — Dr. Sergey A. Dimitriev
Specialist — Dr. 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 (ca. 170 acres) with capacity for 3500 m^3 (including 500 m^3 liquids) waste per year (capacity at 15 other facilities <1000 m^3/a each); waste from scientific, industrial, medical, and other producers; waste characteristics similar to reactor waste, including spent radiation sources, liquid concentrates, combustible liquids, highly active research reactor core components (with short-lived nuclides and limited alpha emitters); treatment/conditioning of wastes is by compaction, combustion, cementation, bitumenization, vitrification, and special immobilization in metal matrix; disposal is in engineered concrete in-ground structures.

Scientific Research Institute 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

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 liters/h HLLW, 20 kg/h glass; 160-180 kg glass/batch; product, phosphate glass in crucibles.
  History: Startup, ca. 1975.

VNIPIET (All Russian Design/Research Association)

VNIPIET
All-Russian Association
Savushkin Str. 82
197228 St. Petersburg
Russia

Tel: 7-812-239-0134
Fax: 7-812-239-1898

Director-General	Prof. Vladimir A. Kurnosov
Chief Engineer	Valentin M. Simanovsky
Dep. Chief Engineer	Dr. Vasily M. Dubrovsky

Function: Design plants/facilities for SF reprocessing, waste processing, storage/disposal; SF transport/storage; decontamination.

South Africa

Updated 9/20/96

South Africa

Major Public Holidays (1997)

Jan	1	New Year	June	16	Youth Day
Mar	21	Human Rights Day	Aug	9	National Women's Day
Mar	28	Good Friday	Sept	24	Heritage Day
Mar	31	Family Day	Dec	16	Day of Reconciliation
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 concerning requirements.

Currency Exchange Rate

1 U.S. $ =4.65 Rand

per Foreign Exchange Rate via Internet, 1/22/97. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

Direct Dialing

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

U.S. Embassy - Johannesburg

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

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 post-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 reactor 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	tU
	2000	520	tU

Major Milestones

- Dry SF storage facility (Koeberg) 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
  - Valindaba 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	Dr. Waldo E. Stumpf
Senior General Managers:	
Nucl. Fuel Production	L. S. Snyders
Technology Development	Dr. K. F. Fouche
Engineering	R. M. Dube
Business Development	Dr. A. G. M. Jackson
Sr. Mgr., Nuc. Waste Management	Dr. 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 how closed and 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/a 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 tU/a conversion.

CNS

Council for Nuclear Safety
P.O.B. 7106 Tel: 010-27-12-663-5500
Hennopsmeer 0046, South Africa Fax: 010-27-12-663-5513

Chairman	Prof. J. B. Martin
Vice-Chairman	Prof. K. Bharuth-Ram

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

Updated 10/18/96

Spain

Major Public Holidays (1997)

Jan	1	New Year	Oct	12	Columbus 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: **03/30 - 10/26/97**

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 Foreign Exchange Rate, 1/22/97. 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: 34-1-587-2293
Fax: 34-1-587-2292

Science Attaché — Marshall Carter-Tripp

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	1992	7.4	GWe
	2000	7.4	GWe
Reactor Mix	1994	PWR	7 (1969-88)
		BWR	2 (1971-85)

Industrial Fuel Cycle

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

Waste Management Strategy: Store spent fuels at the reactor sites for at least 10 years; reracking in some reactor pools and dry storage in

dual-purpose casks planned to provide additional capacity until geologic repository is ready to receive HLW (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 of 1992.

Cumulative SF Arisings (LWR)	1990	950	tU
	1995	1,800	tU
	2000	2,000	tU

Industrial-Scale Activities (Capacity)

- U mining/milling: 270 tU/a
- U enrichment: 11.1% interest in Eurodif
- Fuel fabrication: 200 tU/a
- Intermediate SF storage: 3,000 tU

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 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: 34-1-346-6000/1
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 — Tel: 34-1-346-0100
28020 Madrid, Spain — Fax: 34-1-346-0471

President	J. M. Kindelán
Commissioners	A. Alonso Santos
	R. Caro Manso
	A. Martin
	J. A. Azuara

Function: Independent body, responsible to Parliament, with regulatory powers on nuclear safety and radiation protection matters.

ENRESA (National Waste Management Company)

Empresa Nacional de Residuos Radiactivos S.A.
7, Emilio Vargas — Tel: 34-1-566-8100
28043 Madrid, Spain — Fax: 34-1-566-8169

President, J. A. Pina Barrio	34-1-566-8239
Director of Projects & Operations of Science & Technology, J. M. Gravalos	34-1-566-8170
Director, G. Gavela	34-1-566-8132
International Relations, A. Rodriguez	34-1-566-8207

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 Society of Industrial Participation (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 — Josep Piqué I Camps
Secretary General,
Energy/Mineral Resources — Nemesio Fernández Cuesta
General Director of Energy — María Luisa Huidobro Arreba

Sweden

Updated 10/28/96

Sweden

Major Public Holidays (1997)

Jan	1	New Year	Jun	24-25	Midsummer
Apr	14	Good Friday	Nov	1	All Saints
Apr	17	Easter Monday	Dec	24-25	Christmas
May	25	Ascension	Dec	26	Boxing Day
June	5	Pentecost Monday			

Time

Standard Time Washington, D.C. **+ 6 hours**
Daylight Savings Time Period: **03/30 - 10/26/97**

Passport/Visa

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

Currency Exchange Rate

1 U.S. $ = 7.60 Krona (SEK)
per Foreign Exchange Rate via Internet, 1/22/97. 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

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	1995	143	TWh
		47%	hydro
		47%	**nuclear**
		6%	coal, oil, solids, gas
	2000	**44%**	**nuclear**
	2005	**46%**	**nuclear**

Nuclear Power

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

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 for waste management and future decommissioning of nuclear power plants are paid by fees collected from the nuclear utilities.

Waste Management Strategy: Store spent fuel for 30-40 years in an underground pool storage facility; encapsulate spent fuel in a highly corrosion-resistant canister; emplace in a deep geologic (crystalline rock) repository.

Cumulative SF Arisings (LWR)	1995	2,305	tU
	2010	7,800	tU
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 tU/a.

Major Milestones (SF Repository)

• Feasibility Studied	1995
• Site Investigations, Design, and Engineering	1997
• Licensing Preparation	1998-2003
• FIA Process/Regulatory Review	1997-2005

International Relationships

Member of IAEA and OECD/NEA; waste management cooperative agreements with Canada, EC, Finland, France, Spain, Switzerland, Germany, Japan, and USA. 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
412 96 Goeteborg, Sweden
Tel: 46-31-72-10-00
Fax: 46-31-16-84-94

Nuclear Chemistry — Jan-Olof Liljenzin

Waste Management R&D: Radionuclide transport by groundwater, sorption on natural clays and rock minerals.

KEMAKTA

Kemakta Konsult AB
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
Nuclear Chemistry — T. Eriksen

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.

GEOSIGMA

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

Function: Develop plan, construct and operate facilities and systems for the management and disposal of spent nuclear fuel and radioactive wastes from the Swedish nuclear power plants. Responsible for all handling, transport and storage of the nuclear wastes outside of the nuclear power production facilities. Handles stockpiling of uranium for the Swedish nuclear power industry and provides assistance to owners.

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, 05/80; startup operation, 1985.

- **SFR** (Swedish Final Repository for LLW and ILW, located in rock 50 m below seabed, 1 km outside Forsmark harbor on Gulf of Bothnia).
  Design: Concrete silos inside cylindrical rock caverns isolated by layer of bentonite clay backfill between silo and rock for 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 to 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 Zellman

SKB Äspö Hard Rock Laboratory
Site Office, Pl 300 Tel: 46-491-82000
570 93 Figeholm, Sweden Fax: 46-491-82005

Site Manager Olle Zellman

Underground research laboratory (located on Äspö Island at Simpevarp); startup/operation 1995.

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 — Lars-Erik Holm
Radwaste Group, Head (A) — Gunnar Johansson

Function: Responsible for establishing and enforcing radiation protection regulations.

STUDSVIK Raswaste 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.

STUDSVIK Nuclear AB

Studsvik Radwaste AB
611 82 Nyköping, Sweden
Tel: 46-155-210-00
Fax: 46-155-630-44

Director Leif Eriksson

Function: Nuclear waste R&D to support SKB programme for fuel leaching.

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: Power producer (owner of Ringhals Nuclear Power Plants).

Switzerland

Updated 9/18/96

Switzerland

Major Public Holidays (1997)

Jan	1	New Year	May	18-19	Pentecost
Mar	28	Good Friday	May	29	Corpus Christi
Mar	30-31	Easter	Aug	1	National Day
May	8	Ascension	Dec	25-26	Christmas

Time

Standard Time Washington, D.C. **+ 6 hours**
Daylight Savings Time Period: **03/30 - 10/26/97**

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. $ = 1.47 Franc

per Foreign Exchange Rate via Internet, 1/22/97. 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 Tel: 41-31-357-7011
CH-3005 Bern, Switzerland Fax: 41-31-357-7336
General Information for American
Citizen Services Tel: 41-31-357-7234

Energy

Electric Power Capacity	1995	15.9	GWe
		20%	**nuclear**
	2000	17.0	GWe
		19%	**nuclear**
Electric Power Production	1995	60.4	TWh
		59%	hydro/geoth.
		39%	**nuclear**
		1%	oil
		1%	other
	2000	**36%**	**nuclear**

Nuclear Power

Policy: Federal government is in favor of nuclear power, but local opposition has delayed its expansion.

Nuclear Power Capacity	1995	3.0	GWe
	2000	3.2	GWe
Reactor Mix	1995	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.

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

Cumulative SF Arisings (LWR)	1990	1,090	tU
	2000	2,000	tU

Cumulative Waste Arisings*	LLW/ILW	100,000 or 100,000 m^3
(Planning basis: after	TRU waste	15,000 or 10,000 m^3
40 yr operation at 3 GWe)	HLW glass	500 or 160 m^3

* Two scenarios considered: complete reprocessing (left) or no reprocessing (right) after the year 2000.

Major Milestones

- Initial receipt of HLW glass from COGEMA (France) >1999
- 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 and Obayashi/Japan, NIREX/U.K., BfS, BMFT, GSF, BGR/Germany, ENRESA/Spain, POSIVA/Finland, NRC/USA.

ORGANIZATION

- **Nagra**—National Cooperative for the Disposal of Radioactive Waste—formed by utilities/government to handle fuel cycle/waste management activities.
- **GNN**—Genossenschaft für die nukleare Entsorgung, Wellenberg—new company formed in 1994 for the construction and operation of a L/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.

Regulatory Body

Federal Office of Energy
Nuclear Safety Inspectorate (HSK) Tel: 41-56-310-38-11
CH-5232 Villigen HSK, Switzerland Fax: 41-56-310-39-07

Waste Management Section Dr. Auguste Zurkinden

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: 41-56-437-11-11
CH-5430 Wettingen, Switzerland Fax: 41-56-437-12-07

President Hans Issler
Director, Science/Technology Dr. Charles McCombie
Chief Geologist Dr. Marc F. Thury
Site Characterization Dr. Ch. Sprecher
Nuclear Technology and Safety Dr. 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).
- **Genossenschaft für die nukleare Entsorgung Wellenberg**—c/o Nagra, Hardstrasse 73, CH-5430 Wettingen, Switzerland

President	P.U. Fischer
Directors	H. Beeler
	Dr. T. Von Weissenfluh
	Dr. E. Kowalski
	Dr. C. McCombie

PSI

Paul Scherrer Institut
CH-5232 Villigen, Switzerland
Tel: 41-56-310-2111
Fax: 41-56-310-2327

Director — Prof. Meinrad Eberle
Manager, Waste Mgmt. Laboratory — Dr. J. Hadermann

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

Waste Management R&D: Incineration of 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.**

ZWILAG (Interim Waste Storage Facility)

Zwischenlager Würenlingen AG
Parkstrasse 23
CH-5401 Baden, Switzerland
Tel: 41-56-200-38-54
Fax: 41-56-200-38-58

Director — Dr. Hans R. Lutz
41-56-200-38-55
Tech. Project Manager — Dr. C. Vuilleumier

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 started 1996, operation 1999) and to cost about U.S. $350 million; organization is a consortium of Swiss nuclear utilities.

Taiwan

Updated 9/2/96

Taiwan

Major Public Holidays (1997)

Jan	1-3	Commemoration Day	Sep	28	Confucius Birth
Feb	18-22	Lunar New Year	Oct	10	National Day
Mar	29	Youth Day	Oct	25	Taiwan Restoration
Apr	3	Women/Children's Day	Oct	31	Ch. Kai-Shek's Birth
Apr	4	Tomb Sweeping Day	Nov	12	Sun Yat-Sen's Birth
Jun	20	Dragon Boat Fest	Dec	25	Constitution Day
Sep	27	Mid-Autumn 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, although short-term visas are available under certain conditions. Most travel agencies can provide up-to-date information concerning requirements.

Currency Exchange Rate

1 U.S. $ = 27.52 Taiwan Dollar

per Foreign Exchange Rate via Internet, 1/22/97. 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 — Ann Breiter

Energy

Electric Power Capacity	1994	20.98	Gwe
		24.5%	**nuclear**
Electric Power Production	1994	110.3	Twh
		34.6%	coal
		30.4%	**nuclear**
		21.3%	oil
		4.5%	LNG
		1-2%	other
		8%	hydro
	1995	117.9	Twh
		36%	coal
		28.8%	nuclear
		14.3%	oil
		4.5%	LNG
		8.9%	other
		7.5%	hydro

Nuclear Power

Policy: Plan for nuclear power to meet rapidly growing demand for electric energy; continue with nuclear power at about 1/4 of total electricity.

Nuclear Power Plant Capacity	1994	5.1	GWe
	1995	5.1	GWe
	2000	7.1	GWe
Reactor Mix	1995	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: Evaluating spent fuel/HLW interim storage options; may reprocess (in other countries); maximize existing SF pool storage capacity by reracking; build MRS facility at existing reactor site for interim storage until final disposal in geologic repository; LLW stored in National Waste Storage Facility on Orchid Island and warehouses at power plant site; LLW/ILW will eventually be disposed in a shallow land facility.

Cumulative SF Arisings (LWR)	1996	1,714	tU
	2000	2,226	tU

Major Milestones

LLW Disposal Facility

• Selection of site/method	1996
• Site characterization, engineering, design and licensing	1999
• Completion, start of operation HLW Disposal Facilities	2002
• Commission MRS at Chinshan reactor site	1999
• Geologic repository site selection	2016
• Commission final repository	2032

Organization

- **TAIPOWER** (Taiwan Power Company)—operation of nuclear power plants; country's only electric utility.
- **AEC** (Atomic Energy Council)—regulatory functions.
- **INER** (Institute of Nuclear Energy Research)—nuclear R&D.

AEC

Atomic Energy Council
67, Lane 144
Keelung Road, Section 4
Taipei 106, Taiwan

Tel: 886-2-363-4180
Fax: 886-2-363-5377

Chairman	Dr. C.P. Hu
Sr. Vice Chairman	Prof. C.S. Su
Vice Chairman	Dr. Adrian M. C. Wang
Director, Fuel Cycle & Materials Admin.	S.T. Chiou

Tel: 886-2-964-7401
Fax: 886-2-964-7464

Dir., Planning	B.D. Lee 886-2-362-8567
Dir., Rad. Protection	W. L. Chen 886-2-362-6189
Dir., Nuc. Regulations	T. T. Huang 886-2-362-8571
Dir., Nuc. Technology	Yi-Bin Chen 886-2-366-0886

INER

Institute of Nuclear Energy Research
P.O. Box 3 Tel: 886-3-471-1400
Lung-Tan 32500, Taiwan Fax: 886-2-471-1064

Director	Dr. Der-Yu Hsia
Dep. Directors	Dr. Li-Fu Lin Dr. Ging-Shung Yu Dr. Gang Tin
Nuc. Engineering	Dr. Shih-Kuei Chen
Nuc. Instrumentation	Dr. Der-Sun Lee
Nuc. Fuel/Matls. Research	Dr. Tsing-Tyan Yang
Health Physics	Dr. 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.

TAIPOWER

Taiwan Power Company
20F, 242 Roosevelt Rd., Sec. 3 Tel: 886-2-365-1234
Taipei 107, Taiwan Fax: 886-2-367-8593

Chairman	Chang, Chung-Chien
President	S. C. Hsi
Vice President	M. C. Tsai
Dir., Nuc. Engineering	Victor Y.C. Liao 886-2-367-7967
Dir., Nuc. Operation	A. H. Jung 886-2-368-7126
Dir., Nuc. Safety	S. H. Soong 886-2-367-7341

United States

Updated 1/97

United States

Major Public Holidays (1997)

Jan	1	New Year	Sep	1	Labor Day
Jan	20	M. L. King Day	Oct	13	Columbus Day
Feb	19	Presidents Day	Nov	11	Veterans Day
May	26	Memorial Day	Nov	27	Thanksgiving
July	4	Independence	Dec	25	Christmas

Daylight Savings Time Period: **10/26/97 - 04/05/98**

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 Visitors to U.S. DOE Facilities

Foreign visitors to U.S. DOE facilities must complete and submit an IA-473 from (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.

Energy

Electric Power Generating Capacity	1993	700.0	GWe
		14%	**nuclear**
	1995	706.1	GWe
		14%	**nuclear**
	1997	710	GWe
		14%	**nuclear**
Total Energy Power Production	1996	22.61%	Coal
		7.17%	**Nuclear**
		19.58%	Natural Gas (dry)
		2.58%	Natural Gas (liquid)
		13.74%	Crude Oil
		7.06%	Renewable
		23.68%	Imports
Electric Power Production	1996	3077	Billion kilowatt-hours
		57.00%	Coal
		22.00%	**Nuclear**
		9.00%	Gas
		11.00%	Hydroelectric/ Renewable
		2.00%	Petroleum

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
	1996	100	GWe
	2000	101	GWe

Reactor Mix	1993	PWR	73 (1968-95)
		5 (Indef.)	
		BWR	37 (1965-90)
		1 (Indef.)	
	1996(1)	PWR	78
		BWR	41

Nuclear Fuel Cycle

Policy: Current U.S. commercial nuclear fuel cycle activities include all phases: uranium mining, milling, and enrichment; fuel fabrication; interim spent fuel and waste storage; transportation, conditioning, and disposal of radioactive waste; spent fuel reprocessing is determined by the nuclear industry, which has elected not to reprocess because of economic considerations. Mining, milling, fabrication of UO2 fuel, and LLW disposal are done predominantly by private firms; enrichment and HLW/spent fuel disposal are the responsibilities of the federal government; a private enrichment enterprise is being started. Increasing competition in the U.S. electricity industry, and the slow resolution of SNF waste disposal are key issues inhibiting the construction of new nuclear plants in the United States.

Waste Management Strategy: Disposal of U.S. commercial spent fuel in a geologic repository is planned, after interim storage at reactor sites and possible 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 SNF repository as mandated by the Nuclear Waste Policy Act (NWPA) of 1982 and its 1987 amendments (NWPAA). Progress is being made on site characterization at the SNF repository at Yucca Mountain, Nevada; however, sufficient information is not yet available to determine if Yucca Mountain is suitable for geologic disposal of SNF and high-level radioactive waste. The Office of Civilian Radioactive Waste Management has issued a draft plan setting a target for a license application to the Nuclear Regulatory Commission (NRC) by 2002.

Cumulative Spent Fuel Arisings	1993	27,800	tIHM
	1995	31,400	tIHM
	2000	40,400	tIHM

Major Goals and Milestones

Accelerate risk reduction and lifecycle cost reduction of nuclear weapons site cleanup

- Releasing the discussion draft of the Environmental Management Progress Plan for Cleanup for public review and comment by June 1997.
- Implementing the EM Integrated Planning, Accountability, and Budgeting System by September 1997.

Make progress on the treatment, storage, and disposal of radioactive waste

- Issuing the Final Waste Management Programmatic Environmental Impact Statement by June 1997.
- Issuing the Final Waste Isolation Pilot Plant (WIPP) Supplemental Environmental Impact Statement by September 1997.
- Issuing Records of Decision on treatment, storage, and disposal of transuranic waste by September 1997.

Find solutions to spent nuclear fuel storage

- Completing the excavation of the Exploratory Studies Facility main 5-mile loop and selected scientific instrumentation alcoves to support studies for a viability assessment of the Yucca Mountain site in September 1998 and subsequent site suitability determination and licensing.
- Submitting the Topical Safety Analysis Report to the Nuclear Regulatory Commission for a non-site specific Phase I interim storage facility design to assist in maintaining a readiness capability should interim storage be authorized by legislation.
- Issuing a Revised Notice of Proposed Policy and Procedures under Section 180(c) of the Nuclear Waste Policy Act, which provides for technical and financial assistance to States and Indian Tribes for training public safety officials through whose jurisdictions spent nuclear fuel and high-level waste would be transported, in preparation for an orderly transportation activity.
- Issuing a draft request for proposals to provide waste acceptance and transportation services and equipment for commercial spent nuclear fuel, to carry on collaboration with the nuclear utilities and other stakeholders to resolve issues, and develop the management and logistical capability in the private sector.

International Relationships

Member of OECD/NEA and IAEA. Bilateral agreements for cooperation (extension of several agreements in process) Canada, EC, 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, SNF, 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 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.

    EH (Office of Environment, Safety and Health) - Serves as the Departmental advocate for excellence in programs to protect the environment, as well as the health and safety of DOE workers and the public. The office serves as a Department-wide resource.

    OCRWM (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.

M&O 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
- EH - Office of Environment, Safety and Health
- OCRWM - Office of Civilian Radioactive Waste Management
- PO - Office of International Research and Development Policy, Assistant Secretary for Policy, Planning, and Program Evaluation
- Other Offices
- Operations Field Offices
  - Operations Office - Albuquerque (AL)
  - Chicago Operations Office (COO)
  - Idaho Operations Office (ID)

- Nevada Operations Office (NV)
- Oak Ridge Operations (OR)
- Oakland Operations Office (OAK)
- Richland Operations Office (RL)
- Savannah River Operations Office (SR)

NRC (Nuclear Regulatory Commission) Partial Organization

Chairman
Commissioners
- Executive Director for Operations
  - OIP - Office of International 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
Forrestal Building
1000 Independence Avenue, S.W.
Washington, DC 20585

Tel: 202-586-5000
Fax: 586-5049
Verif: 586-5100

U.S. Department of Energy
19901 Germantown Road
Washington, DC 20874-1290

Tel (Operator): 301-903-3000
Tel (Lobby): 301-903-4511

Office of the Secretary of Energy

Secretary Federico F. Peña

Tel: 202-586-6210
Fax: 586-4403

Office of Environmental Management (EM) [Proposed Organization]

EM-1	Assistant Secretary	Alvin L. Alm	202-586-7710
EM-2	Princ. Deputy Assist. Sec.	James Owendoff	586-7709
EM-4	Safety & Health	Carol Peapody (Acting)	586-0383
EM-10	DAS/Management & Evaluation	Barry Clark (Acting)	586-1665
EM-20	DAS/Planning, Policy & Budget	Dan M. Berkovitz	586-9103
EM-22	Intergovernmental & Public Reliability	Don Beck (Acting)	
EM-23	Budget	Eli B. Bronstein	
EM-24	Strategic Planing & Analysis	James D. Werner	
EM-30	DAS/Waste Management	Mark W. Frei (Acting)	202-586-0370
	Deputy Assist. Sec.	Eugene C. Schmitt	
	Executive Assistant	Linda Long	
EM-32	Eastern Operations	Ralph E. Erickson	
EM-33	Business Management	Richard J. Blaney	
EM-34	Central Operations	James A. Turi (Acting)	
EM-35	Planning & Analysis	Patrice M. Bubar	
EM-36	Western Operations	James A. Turi	
EM-37	Technical Services	James V. Antizzo	
EM-38	Hanford Operations	Ralph E. Erickson (Acting)	
EM-40	DAS/Enviro. Restoration	James J. Fiore	202-586-6331
EM-42	Eastern Area Programs	William Murphie (Acting)	
EM-43	Program Integration	William Wisenbaker	
EM-44	Northwestern Area Programs	Sally A. Robison	
EM-45	Southwestern Area Programs	Ralph G. Lightner	
EM-46	Special Projects	A. John Ahlquist	
EM-47	Program Initiatives	Kelvin J. Kelkenberg	
EM-50	DAS/Science & Technology	Gerald Boyd (Acting)	202-586-6382
EM-52	Science & Risk Policy	Mark A. Gilbertson (Acting)	
EM-53	Technology Systems	Tom Anderson	
EM-54	Technology Integration	John M. Lankford	
EM-60	DAS/Nuclear Material & Facility Stabilization	David G. Huizenga	202-586-5151
EM-62	Program Integration Office	Rick Martinez	
EM-63	Savannah River Office	John A. Ford	
EM-64	Rocky Flats Office	Barry A. Smith	

EM-65	Northwest/Oakridge/ ChicagoOffice	BethBilson(Acting)	
EM-66	Nuclear Material Stabilization Office	G. Frank Cole (Acting)	
EM-67	Spent Fuel Mgmt. Office	Ken A. Chacey (Acting)	
EM-70	DAS/Site Operations	Eeugene A. Schmitt (Acting)	202-586-8754
EM-72	Site Integration	Steven P. Schneider	
EM-73	Mound & Pinellas Project Office	Jay Thompson	
EM-74	Program Integration	Steven P. Schneider	
EM-75	Enviro. & Reg. Analysis	Martha Crosland	
EM-76	Trans., Emergency Mgmt. & Analytical Services	Richard W. Brancato	
EM-77	Pollution Prevention	J. Kent Hancock	

Office of Civilian Radioactive Waste Management (OCRWM)

RW-1	Director	Lake A. Barrett (Acting)	202-586-6842
RW-2	Deputy Director	Lake Barrett	586-6850
RW-3	Quality Assurance	Donald G. Horton	702-794-7675
RW-40	Waste Acceptance, Storage & Trans.	Ronald Milner	202-586-9694
RW-50	Program Management & Administration	Samuel Rousso	586-9116
International Programs		Renee Jackson	586-2283

Office of Environment, Safety and Health

EH-1	Assistant Secretary	Tara Toole	202-586-6151
EH-3	DAS/Nuclear and Facility Safety	Orin F. Pearson	586-2407
EH-4	DAS/Environment	Ray P. Berube	586-5680

Office of Policy and International Affairs

PO-1	Assistant Secretary	Marc Chupka (Acting)	202-586-5800
PO-5	DAS/Materials Asset -Management and Net Security Policy Analysis	Robert Alvarez	586-4640

PO-7	DAS/Intl Energy Policy Trade and Investment	David J. Jhirad	586-5493
PO-8	DAS/Science & Tech. Policy & Cooperation	Robert Price	586-6770

DOE Operations Offices

Albuquerque Operations Office (AL)

U.S. Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, NM 87185-5400

Tel: 505-845-4154
Fax: 845-6058
Verif: 845-6034

Manager, Bruce G. Twining
Albuquerque Operations Office
845-6050

Asst Manager, D. John Arthur, III
Office of Environment/Prj
845-6210

Chicago Operations Office (COO)

U.S. Department of Energy
Chicago Operations Office
9800 South Cass Avenue
Argonne, IL 60439

Tel: 630-252-2001
Fax: 252-2343
Verif: 252-2209

Manager, Cherri J. Langenfeld 252-2110

Environmental Programs, A.L. Taboas	Tel: 252-2236
Envir. Restoration, Michael Ferrigan	252-2570
Technical Support, Antanas Bindokas	252-2692
Waste Management, Raymond Lang	252-2230
Technology Development, Richard Baker	252-2647

Idaho Operations Office (ID)

U.S. Department of Energy
Idaho Operations Office
850 Energy Drive
Idaho Falls, ID 83401-1562

Tel: 208-526-5665
Fax: 526-5406
Verif: (recipient)

Manager, John M. Wilcynski	526-5665
Deputy Manager, Warren Bergholz	526-2497
Executive Assistant, (Acting), Lisa Green	526-0417
Program Execution, (Acting), Jerry Lyle	526-1148
Spent Fuel Program, Bob Stump	526-1448
R&D, Neil Burrell	526-1984
Environmental Restoration, Lisa Green	526-0417
Waste Management, Joel Case	526-6795

Nevada Operations Office (NV)

U.S. Department of Energy	
Nevada Operations Office	Tel: 702-295-1212
P.O. Box 98518	Fax: 295-1371
Las Vegas, NV 89193-8518	Verif: 295-1369

Manager, Terry Vaeth	295-3211
EM Asst. Manager, Leah Dever	295-7063
WM Div. Director, Runore Wycoff	295-0250
Public Affairs Director, Darwin Morgan	295-3521

Oak Ridge Operations Office (OR)

U.S. Department of Energy	
Oak Ridge Operations Office	Tel: 423-576-5454
P.O. Box 2001	Fax: 576-1063
Oak Ridge, TN 37831	Verif: 576-1058

Manager, James C. Hall	576-4444
ORNL Dep. Site Manager, Thomas Jelinek	576-4376
ORNL Site Manager, Ronald Hultgren	576-4523
Program Manager, Connor Matthews	576-1952
Chief, Programs Branch, Martha J. Kass	576-0717
Chief, Waste Oper. Branch, Doyle Brown	574-9244
Dir., WM Tech. Div., Larry Radcliffe	576-9212

Oakland Operations Office (OAK)

U.S. Department of Energy	
Oakland Operations Office	Tel: 510-637-1640
1301 Clay Street; Suite 700N	Fax: 637-2001
Oakland, CA 94612	Verif: 637-1585

Manager, WM, Phil Hill	637-1625
Envir. Safety/Support, Daniel Nakahara	637-1840
Environmental Radiation, Edward Ballard	637-1594
Rad. Safety, Ralph Kopenhaver	637-1597

Richland (Hanford) Operations Office (RL)

U.S. Department of Energy
Richland Operations Office
825 Jadwin Avenue — Tel: 509-376-7411
P.O. Box 550 — Fax: 376-6540
Richland, WA 99352 — Verif: 376-7317

Manager, John D. Wagoner	509-376-7395
Deputy Manager, Lloyd Piper	376-6278
Performance Assessment, Chris J. Bosted	376-7661
Site Infrastructure Division (SID), William A. Rutherford	376-7597
Operations & Maintenance, Steve T. Burnum	376-8409
Information Management, Theo O. Schmeeckle	376-1572
Real Estate & Property Mgmt., Bill (W.F.) Edwards	372-1291
AM, Envir. Restoration, Linda K. Bauer	376-6628
Restoration Projects, Richard A. Holten	376-7277
AM, Waste Management, Charles A. Hansen	376-7434
Spent Nucl. Fuel Waste Prog., T.K. Teynor	376-1366
Project Division, Elizabeth D. Sellers	376-7465
Waste Operations, Fred T. Daniels	373-9317
Tank Waste Remediation System, Jackson E. Kinzer	376-7591

Savannah River Operations Office (SR)

U.S. Department of Energy
Savannah River Operations Office — Tel: 803-725-6211
P.O. Box A — Fax: 725-2033
Aiken, SC 29801 — 725-1259

Manager, Mario Fiori	725-2277
AM, for Envir. Restoration/Solid Waste, Tom F. Heenan	725-8074
Deputy Assistant Manager, Michael C. Sellers	725-8571
Dir., Solid Waste, William L. Noll	725-2219
Dir., ER Division, C.V. Anderson	725-3988
Prg. Mtg. & Coordination Division, Karen L. Hooker	725-9615
Director, HLW, Lee Watkins	208-6053

DOE Laboratories and Other Field Facilities

Argonne National Laboratory (ANL)

Argonne National Laboratory
9700 South Cass Avenue
Argonne, IL 60439

Tel: 630-252-2000
Fax: 252-2343
252-2206
Verif: 252-2209

Argonne-West
P.O. Box 2528
Idaho Falls, Idaho (83402)

Tel: 208-526-0111

Director	
and Chief Executive Officer, Dean Eastman	252-2481
Env. Mgmt. Prog. Office, James E. Helt	252-7335
Separations Science/Tech.,George Vandegrift	252-4513
Pyroprocessing, James J. Laidler	252-4479
ANL-West (ID), Charles E. Till	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 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 Conditioning Facility (FCF).

Argonne is operated by the University of Chicago for the U.S. Department of Energy.

Columbus Area Office, Columbus Environmental Management Project (CEMP)

Battelle - Columbus Laboratories Operations
505 King Avenue
Columbus, OH 43201

Tel: 614-424-6424
Fax: 424-5601
Verif: numbers below

Fuel Cycle and Waste Management Activities: Site survey/characterization; waste packaging; disposal technology; transportation; performance assessment; safety analysis reports; environmental/socio-economic 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.

The DOE-CEMP office manages environmental restoration of areas in 15 buildings at two sites owned by Battelle Memorial Institute (BMI). CEMP operates under the Ohio Field Office.

Brookhaven National Laboratory (BNL)

Brookhaven National Laboratory
Box 5000
Upton, NY 11973-5000

Tel: 516-344-2123
Fax: 344-4486
Verif: 344-3807

Director (Interim), Peter D. Bond 516-344-4063
Environmental & Waste
Technology Ctr, Paul Moskowitz 344-5062

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: CO-60 Gamma Irradiation Facility; National Synchrotron Light Source; Alternating Gradient Synchrotron; High Flux Beam Reactor; Scanning Transmission Electron Microscope.

Energy Technology Engineering Center (ETEC)

Energy Technology Engineering Center
Rockwell International — Tel: 818-586-5326
P.O. Box 7930 — Fax: 586-5118
Canoga Park, CA 91309-7930 — Verif: 586-5326

Director & Program Mgr, Mark Gabler — 586-5326
EM Program Mgr, Majelle Lee — 586-5283

Fuel Cycle and Waste Management Activities: Decontamination and decommissioning (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 Handling Facility (RMHF).

Idaho National Engineering & Environmental Laboratory (INEEL)

Idaho National Engineering & Environmental Laboratory
Lockhead Martin Idaho Technologies Co.: — Tel: 208-526-4646
P.O. Box 1625 — Fax: 526-4563
Idaho Falls, ID 83415-3898 — Verif: (recipient)

General Manager, John W. Denson	526-4600
Environmental Restoration/WM, George E. Ellis	526-1014
Power Reactor Program, Harry B. Barron	526-4437
Waste Technology Development, Richard N. Gurley	526-5958

Background: The U.S. Atomic Energy Commission established INEEL to build, test, and operate various types of nuclear reactors, support plants, and associated equipment. Since its establishment in 1949, over 52 reactors have been built at INEEL. In support of the DOE reactor research program and as part of the SNF reprocessing program, INEEL has received SNF from more than 30 offsite sources.

Fuel Cycle and HLW Management Activities: DOE Laboratory for National Spent Nuclear Fuel Integration. Spent fuel R&D and characterization. Receive and store spent nuclear fuel from Navy and other DOE sources, including characterization and technology development for final disposal; construct dry fuel storage facility and transfer fuel from wet to dry storage; manage and process liquid and solid LLW and HLW including necessary technology development for final disposal.

Mixed Low Level Waste Management Activities: DOE Lead Lab for Mixed Waste Technology Development. Retrieve, store, repackage, and treat MLLW from Navy, INEEL, and other DOE sources. Treatment includes incineration and stabilization with future encapsulation capabilities in FY 98-99. The MLLW treated residues are shipped back to the generators and/or shipped to off site disposal facilities.

Low Level Waste Management Activities (for on-site INEEL LLW only): Store, retrieve, volume reduce, treat and dispose of INEEL LLW. Low-level waste from the DOE and Navy facilities at INEEL is stored at their individual facilities. Waste is shipped from these INEEL facilities to the INEEL WROC. The waste is volume reduced as appropriate, compacted and/or sized, and the combustible waste is incinerated. LLW is then shipped to the INEEL disposal facility.

Major Facilities

Argonne National Laboratory-West (ANL-W) - ANL-W conducts nuclear research and development and operates facilities for the Department of Energy (DOE). The main Argonne laboratory is located near

Chicago, and is operated by the University of Chicago for DOE. Research is typically focused on areas of national concern including energy, nuclear safety, dealing with spent nuclear fuel, proliferation, decommissioning and decontamination technologies. A number of major facilities at the present Argonne West site are used in research activities.

Experimental Breeder Reactor I (EBR-1) - EBR-1 was the first reactor in the world to generate usable amounts of electricity. Today EBR-1 is a Registered National Historic Landmark, open to the general public.

Idaho Chemical Processing Plant (ICPP) - The ICPP complex houses one-of-a-kind reprocessing facilities for government-owned defense and research spent fuels. The reprocessing mission was discontinued in 1992. Facilities at ICPP include spent fuel storage and reprocessing areas, a waste solidification facility and related waste storage bins, remote analytical laboratories and a coal-fired steam generating plant.

Naval Reactor Facility (NRF) - NRF is where U.S. Nuclear Navy Prototype reactors for both surface ships and submarines were developed. The site is operated under the direction of the Office of Naval Reactors by Bettis Atomic Power Laboratory and continues to carry our research on Naval spent fuel and irradiated materials used in Naval reactors.

Power Burst Facility (PBF) - For years PBF served as the testing ground for nuclear fuels that power commercial nuclear reactors. PBF has been leased to the Idaho Brian Tumor Center for potential use in brain cancer treatments for the Boron Neutron Capture Therapy (BNCT) program.

Radioactive Waste Management Complex (RWMC) - Various high-tech strategies for waste storage, processing and disposal are studied at RWMC, established in 1952 as a controlled area for disposal of solid radioactive wastes generated in INEEL operations. Since 1954 the facility has received defense wastes for storage. The Stored Waste Examination Pilot Plant (SWEPP), a state-of-the-art waste certification facility, is used to nondestructively examine defense waste before permanent disposal at an offsite repository.

Test Area North (TAN) - TAN, consists of facilities for handling, storage, examination and research and development of spent nuclear fuel. Facilities include one of the world's largest hot shops, storage pools, and examination operations supporting research into the 1979 Three Mile Island accident.

Test Reactor Area (TRA) - TRA, the world's most sophisticated materials testing complex, houses extensive facilities for studying the effects of radiation on materials, fuels and equipment for the nuclear Navy. The Advanced Test Reactor (ATR), located at TRA, produces a neutron flux that allows simulation of long-duration radiation effects on materials and fuels. ATR is also used for production of isotopes used in medicine, research and industry.

Los Alamos National Laboratory (LANL)

Los Alamos National Laboratory
University of California
P.O. Box 1663
Los Alamos, NM 87545

Tel: 505-667-5101
Fax: 667-1754
Verif: 667-5113

Director, Siegfried S. Hecker	667-5101
Director, Envir. Mgmt., Thomas E. Baca	667-2211
PM, EM, Jorg Jansen	665-6295
PM, WM, Micheline Devaurs	667-1519
PM, TD, Thomas J. Hirons	667-5590
Director, Nuclear Materials, Paul Cunningham	667-9807

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); waste management; waste treatment; science and technology development.

Major Facilities: Waste Disposal Field Experimental Facility; Size Reduction Facility; TRU Waste Assay Systems; Advanced Testing Line for Actinide Separations (ATLAS); Plutonium Facility; Radioactive Waste Water Treatment Facility.

LANL is operated by the University of California for the U.S. Department of Energy.

Lawrence Livermore National Laboratory (LLNL)

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

Tel: 510-422-1100
Fax: 423-1997
Verif: 423-0672

Director, C. Bruce Tarter 422-4169
Dir., Yucca Mtn Site, Willis L. Clarke 423-4571
Energy Programs, Robert N. Schock 422-6199

Fuel Cycle and Waste Management Activities: SNF disposition; waste form characterization; near-field environment characterization (geochemistry, geohydrology, geomechanics); engineered barrier system (EBS) concept development; scientific bases for waste package design; EBS materials selection and characterization; EBS performance analysis; introduced materials and natural analogs.

Major Facility: Large Block Test at Fran Ridge-Yucca Mountain, Nevada. Long Term Comprehensive Corrosion Test Facility.

LLNL is operated by the University of California for the U.S. Department of Energy

Mound Plant

EG&G Mound Applied Technologies
P.O. Box 3000
Miamisburg, OH 45343-3000

Tel: 513-865-4020
Fax: 865-3742
Verif: 865-3575

General Manager, Earl N. Fray 865-3576
Tritium Technology, Ken Armstrong 865-3395
Environmental Restoration, Monte Williams 865-4543
Waste Management, James J. Zahora 865-4032

Fuel Cycle and Waste Management Activities: 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).

Mound Plant is operated by EG&G Mound Applied Technologies for the U.S. Department of Energy.

Nevada Test Site

U.S. Department of Energy
Nevada Operations Office
P.O. Box 98518
Las Vegas, NV 89193-8518

Manager, Terry A. Vaeth	702-295-1876
Office of Environmental Management	
Assistant Manager, Gertrude L. Dever	702-295-7063
Waste Management, Runore C. Wycoff	702-295-3181

Waste Management Activities: Established as the Atomic Energy Commission's on-continent proving ground, the Nevada Test Site has seen more than four decades of nuclear weapons testing. Since the nuclear weapons testing moratorium in 1992 and under the direction of the Department of Energy (DOE), test site use has diversified into many other programs such as hazardous chemical spill testing, emergency response training, conventional weapons testing, and waste management and environmental technology studies.

Major Facilities: Big Explosives Experimental Facility (BEEF); Device Assembly Facility; Hazardous Materials (HazMat) Spill Center; U1a tunnel complex (site of subcritical experiments).

Bechtel Nevada manages and operates the work at the test site and its related facilities for the U.S. Department of Energy Nevada Operations Office. Bechtel Nevada is a consortium of three companies: Betchel Nevada Corporation; Johnson Controls Nevada, Inc.; and Lockheed Martin Nevada Technologies, Inc.

Oak Ridge National Laboratory (ORNL)

Oak Ridge National Laboratory
Lockheed Martin Energy Research Inc. Tel: 423-576-5454
P.O. Box 2008 Fax: 576-2912
Oak Ridge, TN 37831-6023 Verif: 576-6068
Director, Alvin Trivelpiece 576-2900
Dir., WM/Remedial Action, Bob Mason 574-1365
Dir., Robotics/Process Systems, Joe Herndon 574-7065
Dir., OCRWM Programs, Ronald Pope 574-6461
Dir., Env. Tech. Development, Tony Malinauskas 766-1092

Waste Management Activities: Operate waste management facilities, including disposal; develop LLW & TRU waste treatment technology, including assay and package certification; hazardous waste remedial actions; waste operations control center; 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 remediation technologies, remote systems, safeguards technologies, and facilities design optimizations.

Major Facilities: Integrated Equipment Test Facility, Continuous Rotary Dissolver, Chemical Development Systems, Advanced Integrated Maintenance Systems, and Environmental Test Process Chamber.

ORNL is managed by Lockheed Martin Energy Research Corporation for the U.S. Department of Energy

Pacific Northwest National Laboratory (PNNL)

Director, WJ Madia	509-375-6600
Environmental & Health Science, GM Stokes	375-3816
Energy Division, GL Work	375-2999
Natl Sec. Division, M Kluse	
International Programs, EW Pearson	375-2285
Env. Molecular Sciences Lab, TA Fryberger	376-6688
FFTF Standby Project Office, WJ Apley	376-1000
Environmental Technology Division, BD Ship	372-2921
Environmental Technology Program Office, MS Hanson	375-6812
International Nuclear Safety Program, LR Dodd	372-4423

Fuel Cycle and Waste Management Activities: Science, policy, and technology supporting 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; domestic and international 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.

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. State of the art Environmental Molecular Science Laboratory.

PNNL is operated by Battelle Memorial Institute for the U.S. Department of Energy

Rocky Flats Environmental Technology Site

Kaiser-Hill Rocky Flats, Inc.	Tel: 303-966-7000
P.O. Box 464	Fax: 966-7183
Golden, CO 80402-0464	Verif: 966-2272

General Manager, Jim McAnally	370-2917
Waste Operations, Andy Power	370-9874
Waste Minimization, Lavelle Knight	370-4293
Technology Development, Thomas L. Rising	370-3248

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.

Rocky Flats is operated by the Kaiser-Hill, L.L.C., for the U.S. Department of Energy.

Sandia National Laboratories (SNL)

Sandia National Laboratory	Tel: 505-845-9588
P.O. Box 5800	Fax: 844-6953
Albuquerque, NM 87185-5800	Verif: 844-8917

President, C. Paul Robinson	844-7261
VP, Energy & Environment, Joan Woodard	845-9917
Envir. & Transportation, Jim Rice	845-9730
Nuclear Waste Mgmt., Felton Birghan, Dep.	848-0794
Nuclear Energy Technology, Nestor Ortiz	844-0577
Carlsbad Operations Center, Les E. Shepard	234-0033

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.

Sandia is operated by Sandia Corp., a Lockheed Martin Co., for the U.S. Department of Energy.

Savannah River Site (SRS)

Westinghouse Savannah River Company (WSRC)

	Tel: 803-725-6211
Savannah River, TE	Fax: 725-1660
P.O. Box 616	725-2978
Aiken, SC 29802	Verif: 725-5331

VP/Gen Mgr. Environ. Rest., Dick Harbert	952-6818
Deputy Gen Mgr, Gale K. Hovey	644-4918
VP/Gen Mgr. Solid Waste, Sam Kelly	557-6343
Environmental Restoration, A.M. (Sam) Schwartzman	644-6841
Transition, D&D, Bill Austin	644-5021
Program Management, Clay B. Jones	952-7917
VP/Gen. Manager, Austin B. Scott	725-2585
HLW Tech. Director, HLW, Dave Amerine	728-6060
HL Liquid Waste, G. Todd Wright	557-1527
DWPF, Neil Brosee	558-6079

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.

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.

The SRS is operated by the Westinghouse Savannah River Company for the U.S. Department of Energy.

Savannah River Technology Center
Westinghouse Savannah River Company (WSRC)
Savannah River, TE
Building 773A Fax: 803-725-1660
Aiken, SC 29808 Verif: 725-2304

Vice President/Director, Susan Wood	725-3422
WM/Environment, Lucien M. Padouchado	725-3701
Inter. Prog. Coord., Bruce G. Kitchen	725-5331

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.

WIPP

Waste Isolation Pilot Plant Tel: 505-887-8100
P.O. Box 2078 Fax: 887-0707
Carlsbad, NM 88221-3090 Verif: 887-8110

Manager (DOE/CAO), George E. Dials	234-7300
Dir., Nuclear Waste Mgmt Prgm, Les E. Shepard	234-0033
WIPP Sci. PM (SNL), Sr. Science Advisor, Wendell D. Weart	848-0788
General Manager (WEC), Joe Epstein	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.

Westinghouse Government and Environmental Services Waste Isolation Division manages and operates the WIPP for the U.S. Department of Energy.

YUCCA Mountain

Background and Activities:[a] In 1982, Congress established a national policy to solve the problem of nuclear waste disposal. This policy is a federal law called the Nuclear Waste Policy Act. The Nuclear Waste Policy Act made the U.S. Department of Energy responsible for finding a site, building, and operating an underground disposal facility called a geologic repository.

In 1983, the DOE selected nine locations in six states for consideration as potential repository sites. The nine sites were studied and results of these preliminary studies were reported in 1985. Based on these reports, the president approved three sites for intensive scientific study called site characterization. The three sites were Hanford, Washington; Deaf Smith County, Texas; and Yucca Mountain, Nevada.

In 1987, Congress amended the Nuclear Waste Policy Act and directed DOE to study only Yucca Mountain. The Act stressed that if, at any time, Yucca Mountain is found unsuitable, studies will be stopped immediately. If that happens, the site will be restored and DOE will seek new direction from Congress. Following successful completion of the viability assessment, a recommendation on the suitability of the Yucca Mountain site for the construction of the repository will be made to the President in Fiscal Year 2001. If the site is approved, a license application will be submitted to the Nuclear Regulatory Commission in Fiscal Year 2002 for repository construction authorization. The current program schedule projects the start of repository emplacement operations in Fiscal Year 2010.

There are many organizations participating in the Yucca Mountain Characterization Project. The managing and operating contractor for OCRWM is TRW Environmental Safety Systems Inc., (TESS).

Yucca Mountain Site Characterization Office	Tel: 702-794-5555
P.O. Box 98608	Fax: 794-1410/5561
Las Vegas, NV 89193	Verif: 794-5458
Project Manager, Wesley E. Barnes	702-794-1300
Deputy Prj Manager, J. Russell Dyer	794-1301
Scientific Programs, Susan B. Jones	794-5582
Eng./Field Operations, Richard L. Craun	794-5429
Env., Health/Safety, Wendy R. Dixon	794-5564
Suitability/Licensing, Stephan J. Brocoum	794-1359
Public Affairs, Allen B. Benson	794-1322
Administration, Jerri J. Adams	794-1483
Quality Assurance, Donald G. Horton	794-5568
International Programs, Robert A. Levich	794-5449
TRW President/Gen. Mgr, Robert Strickler	703-204-8610
Asst. General Manager YMP, L. Dale Foust	702-295-1804

Other U.S. Organizations

Environmental Protection Agency (EPA)

Environmental Protection Agency	Tel: 202-260-4057
401 M Street S.W.	Fax: 260-4474
Washington, DC 20460	Verif: 260-4057
International Activities	
Assistant Administrator, William A. Nitze	260-4870
Ofc. Western Hemisphere/Bilateral Affairs, Pat Koshel	260-4888
Radiation Programs	
Director, E. Ramona, Trovato	233-9320
Rad. Protection, Lawrence Weinstock	233-9290
Waste Management, Albert Colli	233-9300
Solid Waste	
Director, Michael Shapiro	703-308-8895
Dir., Permits/State Programs, Matthew Hale, Jr.	308-8404

Function: Establish and enforce standards for protection related to radioactive and hazardous waste.

Electric Power Research Institute (EPRI)

Electric Power Research Institute
3412 Hillview Avenue
P.O. Box 10412
Palo Alto, CA 94303

Tel: 415-855-2000
Fax: 855-2800
Verif: 855-2674

President, Kurt Yeager	855-2141
VP/Director, Nuc. Power, Robin Jones	855-2790
Fuel Performance Storage/Disposal, Rosa Yang	855-2481
Low-Level Waste, Christopher J. Wood	855-2379
Fuel Cycle, Rosa Yang	855-2481
HLW Repository Performance Assessment, John Kessler	855-2069

Fuel Cycle and Waste Management Activities: Spent fuel rod consolidation study; cooperative on-site demonstration of spent fuel storage in metal casks/ concrete silos; conceptual designs for LLW disposal sites; demonstration of transportable spent fuel metal storage casks; spent fuel storage and transportation studies; fuel failures, fuel cladding corrosion, high-temperature operation and extended burnup; fuel performance computer models; HLW repository performance assessment.

Nuclear Regulatory Commission (NRC)

U.S. Nuclear Regulatory Commission
Washington, DC 20555

Tel: 301-415-7000
Fax: 415-7010

Chairman, Shirley A. Jackson	301-415-1759
Commissioner, Kenneth C. Rogers	415-1855
Commissioner, Greta J. Dicus	415-1820
Commissioner, Nils J. Diaz	415-8420
Commissioner, Edward McGaffigan Jr.	415-1800

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. TenEyck	415-7212
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	415-1270
Reactor Projects I/II, Steven A. Varga	415-1403
Reactor Projects III/IV, Jack W. Roe	415-1354
Reactor Program Mgr, Brian K. Grimes (Acting)	415-1199
Systems Safety/Analysis, Gary M. Holahan	415-2884
Inspection and Support Programs, Frank P. Gillespie	415-1275
Reactor Controls/Human Factors, Bruce A. Boger	415-1004
Engineering, Brian W. Sheron	415-2722

Office of Nuclear Regulatory Research (RES)

Director, David L. Morrison	415-6641
Engineering Technology, Lawrence C. Shao	415-5678
Systems Technology, M. Wayne Hodges	415-5728
Regulatory Applications, Bill M. Morris	415-6207

Regional Offices

Philadelphia-Region I, Hubert J. Miller	610-337-5299
Atlanta-Region II, Stewart D. Ebneter	404-331-5500
Chicago-Region III, A. B. Beach	630-829-9657
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.

U.S. Nuclear Waste Technical Review Board (NWTRB)

U.S. Nuclear Waste Technical Review Board
1100 Wilson Boulevard, Suite 910
Arlington, VA 22209

Tel: 703-235-4473
Fax: 235-4495
Verif: 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 the disposal of commercial spent nuclear fuel and defense HLW. At full complement, eleven members serve on the Board; all are appointed by the President.

U.S. Geological Survey (USGS)

U.S. Geological Survey
106 National Center
12201 Sunrise Valley Drive
Reston, VA 22092
Director, Gordon P. Eaton
Senior Advisor for Science, James F. Devine
Applications
Toxic Waste, Herbert T. Buxton

Tel: 703-648-4000
Fax: 648-5295
Verif: 648-5235
648-7411
648-4423
609-771-3900

YMP TPO (Las Vegas), Robert W. Craig 702-794-7142

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

EC

European Commission
200 Rue de la Loi
1049 Brussels, Belgium

Tel: 32-2-299-1111
Fax: 32-2-295-0138/-0139/-0140

Commissioner for Science, Research and Development, Joint Research Centre, Human Resources, Education, and Formation	Edith Cresson
Director-General, Science/R&D	Jorma Routti
Director-General, JRC	Jean-Pierre Contzen
Director-General, Science/R&D, Deputy	Hendrik Tent
Director, Energy R&TD	Ezio Andreta, 32-2-295-1660
Unit, Fuel Cycle & Safety	Werner Balz (A), 32-2-295-4164
R&D Program RWM	Rainer Simon
Migration & Safety Studies	Henning von Maravic
Innovative Fuel Cycle Concepts, Waste Pkgs. QA/QC	Michel Hugon
Waste Form R&D	Thomas Mac Merramin
URLs	Bertus Haijtink
R&D Program D&D Nuc. Installations	Rainer Simon, 32-2-295-6623
Unit, Radiological Protection	Jaak Sinnaeve
Director-General, Environment, Nuclear Safety & Civil Protection	Marius Enthoven
Unit, Envir. Monitoring	George Fraser
Director, Euratom Safeguards	Wilhelm Gmelin, 32-72-32-211
Dir. Gen., Euratom Supply Agency	Michael Goppel, 32-2-298-7894

Member States - Europpean Union (EU)

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 EC (through tax on Member States): conducted by Joint Research Centre establishments at Ispra (Italy) and Karlsruhe (FRG).

- **Shared-cost action** — coordinated and party (maximum 50%) funded by EC HQ under cost-sharing contracts; conducted by research centers, universities, and industries in the Member States. The Nuclear Fission Safety research programme (1994-1996) covers these research activities:
  - 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/EC 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.

EC-JRC: ISPRA

EC Joint Research Center
Ispra Establishment
21020 Ispra (Varese)
Tel: 39-332-78-9111
Italy
Fax: 39-332-78-9045

Location: Northern Italy; may be reached by air travel to Milan, ground transport to Ispra, about 50 km.

Institute for System Information
and Safety, Director — David Wilkinson
Nuclear Safeguards — Marc Cuypers

Waste Management R&D: R&D in treatment and storage of radioactive waste; volume reduction and conditioning TRU wastes; nuclide assay in wastes.

EC-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 — Dr. Jacques van Geel

Location: On the site of the German Nuclear Research Center FZK 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; minor actinide targets.

Waste Management R&D: Characterization of vitreous HLW forms and SF when considered as waste.

Safeguards R&D: Fissile material solution analyses.

IAEA

International Atomic Energy Agency
Wagramer Strasse 5 — Tel: 43-1-2060-0
P.O. Box 100 — Tel: 43-1-2360-ext.
1400 Vienna, Austria — Fax: 43-1-2060-7
Internet: http://www.iaea.or.at/worldatom

Director-General	Hans Blix	2-1111
Dep. Dir.-Gen. Nuc. Energy/Safety	Boris Semenov	2-2600
Dir. Radiation & Waste Safety	Abel Gonzalez	2-2654
Head, Waste Safety	Gordon Linsley	2-2666
Waste Mgmt./U.S. Staff	Candace Y. Chan	2-2607
John R. Wiley	2-6097	
RADWASS Program	Ernst Warnecke	2-2676
Head, Nuc. Mtls./Fuel Cycle Tech.	Norubu Oi	2-2766
Dep. Dir.-Gen. Safeguards	Bruno Pellaud	2-1800
Dep. Dir.-Gen. Tech. Cooperation	Jijui Quian	2-2300
Dep. Dir.-Gen. Research/Isotopes	Sueo Machi	2-1600
Dep. Dir.-Gen. Administration	David B. Waller	2-1020

Member States

124 nations (U.N. members plus Holy See, Switzerland, including the U.S.)

Function

Autonomous intergornmental 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 technicalinformation; 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. Verification agency for international treaties as Nuclear Non-Proliferation Treaty and Treaties on Nuclear Weapon Free Zones in Latin America, Africa, Asian countries, and South Pacific.

Waste Management Activities

Collect, prepare, review, and disseminate technical and scientific information on:

- planning of 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 Programs: 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 multi-national 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.

U.S. Mission ot IAEA (UNVIE)
Obersteinergasse 11 — Tel: 43-1-31-339
1190 Vienna, Austria — Fax: 43-1-369-8392

Nuclear Policy	Leroy C. Simpkins
Nuclear Technology	Chuck Serpan
Safeguards	Marvin Peterson
Science Attache	Lisa Hilliard

OECD

Organization for Economic
Co-Operation and Development
2, Rue Andre-Pascal — Tel: 33-1-45-24-82-00
F-75775 Paris Cedex 16, France — Fax: 33-1-45-24-85-00

Secretary General	Donald Johnston
Dep. Secretary General	Joanna Shelton

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: 33-1-45-24-82-00
Fax: 33-1-45-24-11-10

Director-General	Vacant	33-1-45-24-10-00
Deputy Director-General	Samuel Thompson (A)	33-1-45-24-10-02
Legal Affairs	Patrick Reyners	33-1-45-24-10-30
Central Secretariat	Jacques de la Ferte	33-1-45-24-10-10
Deputy Director		
Science, Computer & Development	Philippe Savelli	33-1-45-24-10-06
Safety and Regulation	Makoto Takahashi	33-1-45-24-10-04
Nuclear Safety	Gianni Frescura	33-1-45-24-10-50
Radiation Protection/ Waste Mgmt.	Jean-Pierre Olivier	33-1-45-24-10-40
Nuclear Development	Geoffrey Stevens	33-1-45-24-10-60
Data Bank	Nigel Tubbs	33-1-45-24-10-70
Nuclear Science	Clacs Nordborg	33-1-45-24-10-90

Member States

Australia	Austria	Belgium	Canada	Czech Republic
Denmark	Finland	France	Germany	Greece
Hungary	Iceland	Ireland	Italy	Japan
Luxembourg	Mexico	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, regulatory, technical and scientific issue; participation of EC 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 discussion of site characterization issues and promotion of specific studies in this area.

- **Liason Committee for Co-operative Program on Decommissioning**
  Participants: Belgium, Canada, France, Germany, Italy, Japan, Slovak Republic, Spain, Sweden, U.K., and U.S.
  Term: 1995-2000 (third 5-year mandate).
  Scope: Exchange of scientific and technical information concerning nuclear installlation decommissioning projects.

Committee on Radiation Protection and Public Health (CRPPH)

- **Coordinated Research and Environmental Surveillance Programme (CRESP)** - Related to sea disposal of radioactive waste.

  Participants: Belgium, Canada, EC, Denmark, France, FRG, Italy, Japan, Korea, Netherlands, Portugal, Slovak Republic, Spain, Sweden, Switzerland, U.K., UNIPE, U.S., IAEA; IMO is an associate member.
  Term: 1996-2000 (Phase 3)
  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, EC.
  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.

Glossary

Organizations, Facilities, Technical and Other Terms

Organizations and Facilities

C

EdF	Electricité de France	FR-3
EdF	Engineering Demonstration Facility	JA-17
EH	Office of Environment, Safety and Health	US-4
EKR	High security building for nuclear fuel	GE-21
EM	DOE Environmental Management	US-4/5/7/8
ENEA	Ente per le Nuove Technologie, l'Energia l'Ambiente	IT-2
ENEL	Ente Nazionale per l'Energia Elettrica	IT-2/3
ENI	Ente Nazionale Idrocarburi	IT-2
ENRESA	Empresa Nacional de Residuos Radioactivos	SP-3
ENSM	Ecole Nationale Supérieure des Mines de Paris	FR-14
ENUSA	Empresa Nacional del Uranio	SP-4
EPA	Environmental Protection Agency	US-5/US-26
EPB	Electric Power Bureau	KS-2/4
EPRI	Electric Power Research Institute	US-27
ERAM	Endlager für Radioaktive Abfälle Morsleben	GE-5
ERS	Effluent Recovery System	US-19
ESKOM	South African utility	SF-2/4
ESR	Waste treatment plant for LLW	GE-21
ETF	Engineering Test Facility	JA-17
EUREX	Fuel reprocessing pilot plant	IT-2
Eurobitum	Bituminization plant	BE-4
EURODIF	Commercial enrichment company	FR-3
EWN GmbH	Energiewerke Nord GmbH Rubenow	GE-11
Ezeiza	Argentine atomic center	AR-3

F

FBFC	Société Franco-Belge de Fabrication de Combustibles (Belgium and France)	BE-4,FR-3/14
FRAGEMA	COGEMA subsidiary	FR-3
FRG	Federal Republic of Germany	BE-4,BR-2
FURNAS	Subsidiary of Electrobrás	BR-3
FUSRAP	Remedial action program	US-12
FZJ	Julich Research Center	GE-16
FZK	Research Center Karlsruhe	GE-17
FZR	Research Center Rossendorf	GE-11/12

G

H

I

IPEP	Institute of Power Engineering Problems	BO-2/3/4/6
IPSN	CEA-Institut de Protection et de Sûreté Nucléaire	FR-4
IRD	Instituto de Radioproteção e Dosimetria	BR-3/4/5
IREP	Institute of Radio-Ecological Problems	BO-3/6
IRUS	Intrusion Resistant Underground Structure	CA-9
ISF	Interim Storage Facility	IN-7
IVO	Imatran Voima Oy	FI-2/3

J

JAERI	Japan Atomic Energy Research Institute	CA-3,JA-4/6/9
JGC	JGC Corporation	JA-10/11
JNFL	Japan Nuclear Fuel Ltd.	JA-4/11
JPDR	Japan Power Demonstration Reactor	JA-6
JRC	Joint Research Center (CEC)	Intl-1

K

KAERI	Korea Atomic Energy Research Institute	CA-3,KS-3/4
KAIST	Korea Advanced Institute of Science/Technology	KS-3/5
KALPAKKAM	Fuel reprocessing laboratory	IN-6
KANUPP	Karachi Nuclear Power Plant	PK-2
KAPS	Kakrapar Atomic Power Station	IN-6
KEMA	N.V. Tot Keuring van Electrotechnische Materialen Arnhem	NL-4
KEMAKTA	Kemakta Konsult	SW-3
KEPCO	Korea Electric Power Corporation	KS-2/5
KEPOS	Korea Electric Power Operating Service Company, Ltd.	KS-2
KFA	Kernforschungszentrum Jülich	GE-16
KHIC	Korea Heavy Industries/Construction Co.	KS-2
Khlopin	Khlopin Radium Institute	RS-5
KIER	Korea Institute of Energy and Resources	KS-3/5
KIGAM	Korea Institute of Geology, Mining and Materials	KS-6
KINS	Korea Institute of Nuclear Safety Technology	KS-3/6
KNFC	Korea Nuclear Fuel Co.	KS-2/6
KOBE	Kobe Steel, Ltd.	JA-12
KOLAR	Waste disposal research station	IN-6

PEV	Prototype vitrification facility	FR-10
Phenix	French FBR	FR-3
PINSTECH	Pakistan Institute of Science/Technology	PK-2/3
PIVER	Hot pilot plant - vitrification	FR-10
PIVER II	HLW vitrification facility	FR-10
PKA	Pilot fuel conditioning plant	GE-14
PKS	Quality assurance project	GE-16
PNC	Power Reactor and Nuclear Fuel Development Corporation	CA-9,JA-4/15/16
PNNL	Pacific Northwest National Laboratory	US-21
PREFRE	Fuel reprocessing plant	IN-8
PSI	Paul Scherrer Institute	SZ-2/4
PWSF	Pu-contaminated Waste Storage Facility	JA-18
PWTF	Pu-contaminated Waste Treatment Facility	JA-18

R

RADWASS	Radioactive Waste Safety Standards	Intl-5
RAPS	Rajasthan Atomic Power Station	IN-7
RES	NRC Office of Nuclear Regulatory Research	US-28
RF	Russian Federation	RS-3
RIVM	Rijksinstituut voor Volksgezondheid en Milieuhygiene	NL-5
RLWTF	Radioactive Liquid Waste Treatment Facility	US-13
RPA	Research Production Association	RS-3
RSK	Reaktor Sicherheitskommission	GE-5
RW	DOE-Office of Civilian Radioactive Waste Management	US-8
RWMC	Radioactive Waste Management Center	JA-19
RWMC	Rad. Waste Management Committee (NEA)	Intl-7
RWMC	Radioactive Waste Management Complex	US-16
RWOS	Radioactive Waste Operations Site	CA-11

S

SAE	Strategic Business Secretariat	BR-2
Saluggia	ENEA nuclear research center	IT-2
SCK/CEN	Studiecentrum voor Kernenergie/ Centre d'Études de l'Énergie Nucléaire	BE-2/6
SEDE	Site Evaluation and Design of Experiments for Radioactive Waste Disposal (NEA)	Intl-7
SFMP	Surplus Facilities Management Program	US-12

SFR	Swedish Final Repository	SW-5
SGN	Société Générale pour les Techniques Nouvelles	FR-3/15
SICN	COGEMA subsidiary	FR-3
SKB	Svensk Kärnbränslehantering	CA-3,SW-2/4
SKI	Statens Kärnkraftinspektion	SW-2/6
SNL	Sandia National Laboratories	US-22
SRS	Savannah River Site	US-23
SSI	Statens Straalskyddsinstitut	SW-2/5
SSK	Strahlenschutzkommission	GE-5
SSSF	Solid Storage Surveillance Facility	IN-8
STA	Science and Technology Agency	JA-4/6/14/19
STACY	Static Experimental Critical Facility	JA-10
STE3	Liquid waste treatment facility	FR-12
STEM	Simulation Test Facility for Environmental Radionuclide Migration	JA-10
STMI	Nuclear services company	FR-3
STUDSVIK	Studsvik Energiteknik	SW-6
STUK	Finnish Center for Radiation and Nuclear Safety	FI-2/4
SuperPhenix	European FBR	FR-1/3
SWA	Waste water treatment plant	GE-21
SWEPP	Stored Waste Examination Pilot Plant	US-16
SYNATOM	Belgian company	BE-2/7

T

TAIPOWER	Taiwan Power Company	TW-2/3
TAN	Test Area North	US-17
TAPS	Tarapur Atomic Power Station	IN-8
TAWRS	Tritium Aqueous Waste Recovery System	US-19
TECHNICATOME	Nuclear fuel cycle services company	FR-3
TN	Transnucléaire	FR-15
TRA	Test Reactor Area	US-17
TRACY	Transient Experimental Critical Facility	JA-10
TREAT	Transient Reactor Test Facility	US-13
Trisaia	ENEA nuclear fuel services company	IT-2
Trombay	Fuel reprocessing plant	IN-4
TRUEX	TRU waste technology	US-12
TRW	TRW Environmental Safety Systems	US-25
TUM	Technische Universität München	GE-6/20

TVF	Tokai Vitrification Facility	JA-18
TVO	Teollisuuden Voima Oy	FI-2/3/4

U

UNVIE	U.S. Mission to IAEA	Intl-5
UP1	Fuel reprocessing plant	FR-13
UP2	Fuel reprocessing plant	FR-11
UP2-800	Fuel reprocessing plant	FR-12
UP3	Fuel reprocessing plant	FR-12
URENCO	Uranium enrichment consortium	NL-1
URL	Underground Research Laboratory	Intl-1
USGS	U.S. Geological Survey	US-29

V

Vaalputs	LLW disposal facility	SF-3
Valindaba	U enrichment and conversion plants	SF-3
VATTENFALL		SW-7
VEK	Pilot Vitrification Plant Karlsruhe	GE-22
VKTA	Verein für Kernferfahrenstechnik and Analytik Rossendorf	GE-21
VLJ	LLW/ILW repository	FI-5
VNIPIET	All Russian Design/Research Association	RS-4/9
VTT	Technical Research Centre of Finland	FI-3/5/6

W

WAK	Wiederaufarbeitungsanlage Karlsruhe	BE-3/4,GE-22
WAMAP	Waste Management Advisory Program	Intl-5
WASTEF	Glove box and hot cell facilities	JA-10
WATRP	International peer review program	Intl-5
WDF	Waste Dismantling Facility	JA-16
WEAF	Waste Examination Assay Facility	US-20
WEC	Westinghouse Electric Company	US-24
WIP	Waste Immobilization Plant	IN-4/6/8
WIPP	Waste Isolation Pilot Plant	US-22/24
WL	Whitshell Laboratories	CA-6/7
WSRC	Westinghouse Savannah River Co.	US-23/24
WTC	Waste Treatment Center	CA-9
WVRF	Waste Volume Reduction Facility	CA-11

Y

YMP	Yucca Mountain Project	US-29

Z

ZFK-DE	Waste treatment project	GE-16
ZPPR	Zero Power Plutonium Reactor	US-12
ZWILAG	Zwischenlager Würenlingen AG	SZ-4

Technical and Other Terms

(A)	Acting
/a	per annum
Acad	Academian
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)
/h	per hour
HAO	Head-end oxide
HAWC	High acid waste content

HEPA	High-efficiency particulate absolute
HLLW	High-level liquid waste
HLW	High-level waste
HIP	Hot isostatic pressing
HTGR	High-temperature, gas-cooled reactor
HTR	High-temperature reactor
HWLWR	Heavy water moderated, light water cooled reactor (same as LWCHW)
HWR	Heavy-water reactor
ILW	Intermediate-level waste
kg/h	kilograms per hour
kgHM	kilograms heavy metal
kgU	kilograms uranium
kPa	kilopascal
kW	kilowatt
l/h	liters per hour
LEU	Low enriched uranium
LGR	Light-water cooled, graphite moderated reactor
LHGW	Low heat generating waste
LLLW	Low-level liquid waste
LLW	Low-level waste
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
tHM	Metric tons heavy metal
THTR	Thorium high-temperature reactor
TPO	Technical program officer
TRU	Transuranic
tU	Metric tons uranium
TWh	Terawatt hour (million megawatt hours)
U	Uranium
UF_6	Uranium hexaflouride
UO_2	Uranium dioxide
VOG	Vessel off-gas