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**International
Nuclear Fuel
Fact Book**

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INTERNATIONAL NUCLEAR
FUEL CYCLE FACT BOOK

I. W. Leigh
L. T. Lakey
K. J. Schneider
D. J. Silveira

January 1987

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

Pacific Northwest Laboratory
Richland, Washington 99352

PREFACE

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

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

The organizations and agencies listed in this publication generally have a much wider range than the activities, facilities or staff described herein. Lack of space as well as the intent and purpose of the Fact Book limit the given information to that pertaining to the Nuclear Fuel Cycle and to data considered of primary interest or most helpful to the majority of users.

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

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Waste Technology Center
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P.O. Box 999
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Telex: 15-2874

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IAEA (International Atomic Energy Agency)	INTL-3
ICRP (International Commission on Radiological Protection)	INTL-4
OECD Nuclear Energy Agency (NEA)	INTL-4
Reactors (white bindings only)	RCTR-1

ORGANIZATIONS AND FACILITIES

		Page
AEB	Atomic Energy Bureau	KS-3
AEC	Atomic Energy Commission	IN-3
AEC	Atomic Energy Commission	JA-7
AEC	Atomic Energy Commission	KS-3
AEC	Atomic Energy Council	TW-2
AEC	Atomic Energy Corporation	SF-1
AECB	Atomic Energy Control Board	CA-4
AECL	Atomic Energy of Canada Limited	CA-5
AERB	Atomic Energy Regulation Board	IN-4
AL KEM	German (FRG) Company	GE-6
ANDRA	Agence Nationale pour la Gestion des Dechets Radioactifs (France)	FR-7
ANSTO	Australian Nuclear Science and Energy Organization	AS-1
AWRE	Atomic Weapons Research Establishment (UK)	UK-6
BAM	Federal Institute for Materials Testing	GE-6
BARC	Bhabha Atomic Energy Centre	IN-3
BGR	Bundesanstalt fuer Geowissenschaften und Rohstoffe (FRG)	GE-6
BGS	British Geological Survey	UK-6
BMFT	Bundesministerium fuer Forschung und Technologie (FRG)	GE-7
BMU	Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit	GE-7
BNFL	British Nuclear Fuels Limited	UK-6
BRE	Building Research Establishment	UK-8
BRGM	Bureau de Recherches Geologiques et Minieres	FR-7
CANMET	EMR-Canada Centre for Metals and Energy Technology	CA-7
CDTN	Centro de Desenvolvimento de Tecnologia Nuclear de Nuclebras	BR-2
CEA	Commissariat a l'Energie Atomique	FR-8
CEC	Commission of the European Communities	INTL-1
CEDRA	Societe Cooperative Nationale pour l'Entreposage de Dechets Radioactifs	SZ-4
CEGB	Central Electricity Generating Board	UK-9
CEN/SCK	Centre d'Etudes de l'Energie Nucleaire/ Studiecentrum voor Kernenergie	BE-3
CEN-CA	Centre d'Etudes Nucleaires de Cadarache	FR-9
CEN-FaR	Centre d'Etudes Nucleaires de Fontenay-aux-Roses	FR-10
CEN-G	Centre d'Etudes Nucleaires de Grenoble	FR-10
CEN-M	Centre d'Etudes Nucleaires de la Vallee du Rhone	FR-10
CEN-S	Centre d'Etudes Nucleaires de Saclay	FR-11
CHALMERS	Chalmers Technical University	SW-3

CIEMAT	Centro de Investigaciones Energeticas, Medio Ambientales y Tecnologicas	SP-2
CMEA	Council for Mutual Economic Assistance . .	INTL-1
CNEA	Comision Nacional de Energia Atomica . . .	AR-2
CNEIC	China Nuclear Energy Industry Corporation .	CH-
CNEN	Comissao Nacional de Energia Nuclear . . .	BR-3
CNSNS	Comision Nacional de Seguridad Nuclear y Salvaguardias	MX-2
COGEMA	Compagnie Generale des Matieres Nucleaires	FR-11
CRESP	Coordinated Research and Environmental Surveillance Program (NEA).	INTL-6
CRIEPI	Central Research Institute of Electric Power Industry	JA-7
CRNL	AECL-Chalk River National Laboratory . . .	CA-5
CRPPH	Committee on Radiation Protection and Public Health (NEA)	INTL-6
CSN	Consejo de Seguridad Nuclear	SP-2
DAE	Department of Atomic Energy	IN-3
DAM	Direction Des Applications Militaires . . .	FR-14
DBE	Deutsche Gesellschaft zum Bau und Betrieb von Endlagern fuer Abfallstoffe mbH	GE-7
DHI	Deutsches Hydrographisches Institut	GE-8
DOE	Department of the Environment	UK-9
DWK	Deutsche Gesellschaft fuer Wiederaufar- beitung von Kernbrennstoffen mbH	GE-8
EC	European Communities	INTL-1
ECN	Netherlands Energy Research Foundation . .	NL-2
EdF	Electricite de France	FR-3
EIR	Eidgenoessisches Institut fuer Reaktor Forschung	SZ-3
EMR	Energy, Mines and Resources	CA-7
ENEA	Energia Nucleare e Delle Energie Alternative	IT-2
ENEL	Ente Nazionale per l'Energia Elettrica . .	IT-5
ENI	Ente Nazionale Idrocarburi	IT-5
ENRESA	Empresa Nacional de Residuos Radioactivos .	SP-3
ENUSA	Empresa Nacional del Uranio S.A.	SP-3
EPB	Electric Power Bureau	KS-3
ESCOM	Electricity Supply Commission	SF-2
FBFC	Societe Franco-Belge de Fabrication de Combustibles (Belgium and France)	BE-5/ FR-14
FEPC	Federation of Electric Power Companies . .	JA-2
GIRIO	Government Industrial Research Institute .	JA-7
GSF/IfT	Gesellschaft fuer Strahlen- und Umweltfor- schung mbH/Institut fuer Tieflagerung . .	GE-9
HITACHI	Hitachi, Ltd.	JA-8
HMI	Hahn-Meitner Institut	GE-10
IAEA	International Atomic Energy Agency . . .	INTL-3
ICRP	International Commission on Radiological Protection	INTL-4
IHI	Ishikawajima-Harima Heavy Industries Co..	JA-8

		Page
INER	Institute of Nuclear Energy Research . . .	TW-2
ININ	Instituto Nacional de Investigaciones Nucleares	MX-2
IOS	Institute of Oceanographic Sciences	UK-10
IPEN	Instituto de Pesquisas Energeticas e Nucleares	BR-3
IPSN	Institut de Protection et de Surete Nucleaire	FR-8
IRDI	Institut de Recherche Technologie et de Developpement Industriel	FR-8
ISIRS	International Sorption Information Retrieval System (NEA)	INTL-6
IVO	Imatra Power Company	FI-3
JAERI	Japan Atomic Energy Research Institute . .	JA-9
JGC	JGC Corporation	JA-10
JNFI	Japan Nuclear Fuel Industries Co., Inc. . .	JA-10
JNFS	Japan Nuclear Fuel Service Co., Ltd. . . .	JA-11
JRC	Joint Research Center (CEC)	INTL-2
KAERI	Korea Advanced Energy Research Institute .	KS-3
KAIST	Korea Advanced Institute of Science/Tech. .	KS-2
KIER	Korea Institute of Energy and Resources . .	KS-2
KEMA	N.V. Tot Keuring van Electrotechnische Materialen Arnhem	NL-3
KEMAKTA	Kemakta Konsult AB	SW-3
KEPCO	Korea Electric Power Corporation	KS-4
KFA	Kernforschungsanlage Julich GmbH	GE-10
KfK	Kernforschungszentrum Karlsruhe GmbH . .	GE-11
KNFC	Korea Nuclear Fuel Co., Ltd.	KS-4
KOBE	Kobe Steel	JA-11
KOPEC	Korea Power Engineering Company	KS-4
KTH	Royal Institute of Technology	SW-3
LA HAGUE	COGEMA, Centre de la Hague	FR-12
MAFF	Ministry of Agriculture, Fisheries/Food . .	UK-10
MARCOULE	COGEMA, Centre de Marcoule	FR-13
MITI	Ministry of International Trade/Industry .	JA-11
MMC	Mitsubishi Metal Coporation	JA-12
MOFA	Ministry of Foreign Affairs	JA-12
MOST	Ministry of Science and Technology	KS-2
NAGRA	Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle	SZ-4
NEA	Nuclear Energy Agency (OECD)	INTL-4
NII	Nuclear Installations Inspectorate	UK-10
NIREX	UK Nirex Ltd.	UK-10
NIRS	National Institute of Radiological Sciences	JA-12
NRPB	National Radiological Protection Board . .	UK-11
NSC	Nuclear Safety Commission	JA-12
NUCLEBRAS	Brazilian Organization	BR-3
NUCLECO	Italian Agency	IT-5
NUKEM	German (FRG) Company	GE-12
OARAI	PNC-Oarai Engineering Center	JA-13

OECD	Organisation for Economic Cooperation and Development	INTL-4
OEZS	Oesterreichisches Forschungszentrum Seibersdorf GmbH	AU-1
OH	Ontario Hydro	CA-8
ONDRAF	Organisme National de Dechets Radioactifs et des Matieres Fissiles	BE-5
PAEC	Pakistan Atomic Energy Commission	PK-1
Petten	ECN-Petten Research Center	NL-2
PNC	Power Reactor and Nuclear Fuel Development Corporation	JA-13
PTB	Physikalisch-Technische Bundesanstalt	GE-13
RMC	Radioactive Waste Management Center	JA-16
RWMC	Rad. Waste Management Committee (NEA)	INTL-5
SEMIP	Subsecretaria de Energia	MX-2
SGAB	Swedish Geological Company	SW-4
SGN	Societe Generale pour des Techniques Nouvelles	FR-15
SKB	Swedish Nuclear Fuel/Waste Management Co.	SW-4
SKI	Statens Kaernkraftinspektion	SW-5
SKN	National Board for Spent Nuclear Fuel	SW-6
SRD	Safety and Reliability Directorate	UK-10
SSI	National Institute of Radiation	SW-6
STA	Science and Technology Agency	JA-16
SYNATOM	Belgian Company	BE-6
TAIPOWER	Taiwan Power Company	TW-2
TN	Transnucleaire	FR-15
TOKAI	PNC-Tokai Works	JA-13
TVO	Industrial Power Company, Ltd.	FI-3
TUM	Technical University Munich	GE-14
UKAEA	United Kingdom Atomic Energy Authority	UK-11
VTT	Technical Research Center of Finland	FI-3
WAK	Wiederaufarbeitungsanlage Karlsruhe Betriebsgesellschaft mbH	GE-14
WNRE	AECL-Whiteshell National Research Establishment	CA-5

TECHNICAL ACRONYMS

AFR	Away-from-reactor spent fuel storage facility
AGR	Advanced gas-cooled reactor, UO ₂ fuel (UK)
ALONA	FRG acid digestion plant at Mol, Belgium
ATR	Advanced thermal reactor
AVH	AVM-type waste vitrification plant (La Hague, FR)
AVM	Atelier de vitrification de Marcoule (France)
BWR	Boiling water reactor
CANDU	Canada deuterium uranium reactor
D&D	Decontamination and decommissioning
ESTER	Multistage pot calcination-vitrification process for HLW (Italy)
FBR	Fast breeder reactor
FBTR	Fast breeder test reactor
FIPS	Fission product solidification process (FRG/KFA)
FRP	Fuel reprocessing plant
GCHWR	Gas-cooled, heavy water moderated reactor
GCR	Gas-cooled, graphite moderated reactor
GWd	Gigawatt days
GWe	10 ⁹ watts of electricity (1000 MWe)
HAO	Oxide head-end
HARVEST	British waste vitrification process
HLLW	High-level liquid waste
HLW	High-level waste
HTGR	High-temperature, gas-cooled reactor
HTR	High-temperature reactor
HWLWR	Heavy water moderated, light water cooled (same as LWCHW)
HWR	Heavy water reactor
IFTF	Immobilized Fuel Test Facility (Canada)
ILW	Intermediate-level waste
KgHM	Kilograms heavy metal
KgU	Kilograms uranium
LGR	Light water cooled, graphite moderated reactor
LHGW	Low heat generating waste
LLW	Low-level waste
LLLW	Low-level liquid waste
LMFBR	Liquid metal fast breeder reactor
LWCHW	Light water cooled, heavy water moderated (same as HWLWR)
LWR	Light water reactor
MLW	Medium-level waste (same as intermediate-level)
MOX	Mixed (plutonium/uranium) oxide
Mtce	Million metric tons of coal equivalent
Mtoe	Million metric tons of oil equivalent
MTR	Materials test reactor
MW	Megawatts
MWd/t	Megawatt days per tonne
MWe	Megawatts electric
MWt	Megawatts thermal
NPT	Non-Proliferation Treaty

PAMELA	FRG vitrification pilot plant (Mol, Belgium)
PFR	Prototype Fast Reactor (UK)
PHWR	Pressurized heavy water reactor
PLWR	Pressurized light water reactor
PURR	Prototype d'usine de retraitement des rapides (FR)
PWR	Pressurized water reactor
QUAD	10 ¹⁵ Btu
t/a	Metric tons per annum
tHM	Metric tons heavy metal
tSWU/a	Metric tons of separative work (U enrichment) per annum
tU	Metric tons uranium
TEKO	Nonradioactive semi-works facility (FRG)
THORP	Thermal Oxide Reprocessing Plant (UK)
THTR	Thorium high-temperature reactor
Th/U	Thorium/Uranium
TRU	Transuranic
TWh	Terawatt hour (million megawatt hours)
URL	Underground Research Laboratory
WIP	Waste Immobilization Plant (India)

INTRODUCTION

The International Nuclear Fuel Cycle Fact Book has been compiled in an effort to provide current data concerning fuel cycle and waste management facilities, R&D programs and key personnel. Additional information on each country is available in the International Source Book: Nuclear Fuel Cycle Research and Development, PNL-2478, Rev. 2.

The Fact Book is organized as follows:

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

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

Holidays

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

Time

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

Passports/Visa

Requirements listed are those applicable to United States citizens.

Direct Dialing

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

NATIONAL SUMMARIES

ARGENTINA

ARGENTINA

MAJOR PUBLIC HOLIDAYS (1987)

Jan. 1	New Year	July 9	Independence Day
Jan. 6	Epiphany	Aug. 15	Assumption
March 1-3	Carnival	Aug. 17	General San Martin
April 16	Holy Thursday	Oct. 12	Columbus Day
April 17	Good Friday	Nov. 1	All Saints
May 1	Labor Day	Nov. 6	Bank Holiday
May 25	Revolution Anniv.	Dec. 8	Immac. Conception
June 20	Flag Day	Dec. 25	Christmas
June 21	Corpus Christi		

TIME

Standard Time Washington D.C.: + 2 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 Argentina. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 US\$ = 1,293 Austral
per Wall Street Journal, 01/30/87. This is the new recommended currency though the peso is still in use. 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.

US EMBASSY - BUENOS AIRES

American Embassy	
4300 Colombia	
1425 Buenos Aires	Tel: 54-1-774-7611
Argentina	TIx: 18156 USICA AR
Science Attache	William S. Tilney

ARGENTINA

ENERGY

Population	1984	30 million
Electric Power Plant Capacity	1980	12 GWe
Electric Power Production	1982	27.1 TWh-- 50% oil/coal 40% hydro/geoth 10% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity	1987	0.9 GWe
	1995	1.6 GWe
	2000	1.6 GWe
Reactor Mix	1986	HWR: 2 (1974/83) 1 (1988)

INDUSTRIAL FUEL CYCLE

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

Waste Management Strategy: Reprocess spent fuel; vitrify HLW in pot process; dispose of HLW glass canisters in granite host-rock repository (Sierra del Medio, Chubut Province, Patagonia).

Cumulative Spent Fuel	1980	416 tU
Arising (HWR)	1985	940 tU
	1990	1,900 tU
	2000	5,800 tU

Demonstration/Production Activities

- * D₂O production: 1984--200 t/a D₂O enrichment plant, supplied by a Swiss firm; develop domestic technology.
- * Uranium mining and milling (t/a):
1983--170; 1985--680.
Uranium enrichment (kg/a): 1985--500 (20% enr.U).

ARGENTINA

- * Conversion of yellowcake to UO_2 ;
 UO_2 fuel fabrication.

Major Milestone

- * HLW geologic repository 2005
(Patagonia, area of Gastre, Chubut province)

ORGANIZATION

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

CNEA (National Atomic Energy Commission)

Comision Nacional de Energia Atomica (CNEA)

Avenida del Libertador 8250

1429 Buenos Aires

Argentina

Tel: 54-1-70-7711

Tlx: 121 388

President

Alberto Constantini

EZEIZA ATOMIC CENTRE

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

Facilities

- * Conversion of yellowcake to UO_2 (150 tU/a).
- * Fuel production: the first of three planned
fabrication lines started up in 1982; capacity, 1-
1/2 PWR assembly per day; MOX fuel R&D.
- * Fuel reprocessing: Ezeiza pilot plant, planned
capacity of 20 kgU/day feed, 10-15 kgPu/a product;
non-radioactive runs--1987. Potential--expansion
of pilot plant to commercial facility with 160
kg/d capacity (1990s).

AUSTRALIA

AUSTRALIA

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year
January 26	Australia Day
April 17	Good Friday
April 19-20	Easter
April 25	ANZAC Day
December 25-26	Christmas

TIME

Standard Time Washington D.C.: (New S. Wales) + 15 hours
Standard Time period: 03/15 - 10/24/87

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 1.51 Australian Dollar
per Wall Street Journal, 01/30/87. 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.

US EMBASSY - CANBERRA

American Embassy	
Moonah Place, Yarralumla	
Canberra	Tel: 61-62-70-5000
Australian Capital Territory (A.C.T.) 2600	TLX: 62-104
Science Counselor	Russel A. La Mantia

Australia

ENERGY

Population	1984	15.5 million
Electric Power Production	1984	112.9 TWh-- 72% coal 12% hydro/geoth 10% gas 6% oil

NUCLEAR POWER

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

ORGANIZATION

- * Ministry of State for Resources and Energy.
- * ANSTO--Australian Nuclear Science and Technology Organization (7-member Executive, up to 11-member Advisory Council; expected to be confirmed April 1987 as the replacement of the AAEC).
- * Lucas Heights Research Laboratory.

INTERNATIONAL RELATIONSHIPS

Member of IAEA and OECD/NEA. Cooperative agreements with Japan, Italy and the UK for development of the SYNROC process. Bilateral safeguards agreements (control use of Australian-derived uranium) with Japan, Republic of Korea, Philippines, USA, Canada, United Kingdom, France, Switzerland, Sweden, Finland, and Euratom (EC).

ANSTO

Australian Nuclear Science and Technology Organization	Tel: 61-2-543-3111
New Illawarra Rd, Lucas Heights	TLX: 24-562
Private Mail Bag 7	Fax: 61-2-543-5097
Sutherland N.S.W. 2232	
Australia	

Principal function: R&D in nuclear science and technology.

Australia

ANSTO LUCAS HEIGHTS

ANSTO Lucas Heights Research Laboratory
New Illawarra Road, Lucas Heights
Private Mail Bag 7 Tel: 61-2-543-3111
Sutherland N.S.W. 2232 Tlx: 24-562
Australia Fax: 61-2-543-5097

Director/Chief Executive Officer	Dr. D. G. Walker
Deputy Director, Research	Dr. P. M. Kelly
Deputy Director, Operations	Dr. R. Smith
Materials Division	Dr. K. U. Snowden
Environmental Science	Dr. D. R. Davy
Nuclear Technology	D. R. Ebeling

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 Production Plant**
Mission: Engineering-scale tests of SYNROC process.
Design Basis: 10 kg/hr SYNROC (40 cm); all operations compatible with remote handling; highly instrumented and partly automated.
History: Startup, 1986.
 - * **SYNROC Glove Box Line**
Mission: Produce SYNROC containing actinides/⁹⁹Tc.
Process Scale: Hundreds of grams.
History: Startup, 1984.
- Hot-Cell Processing Line for SYNROC**
History: Startup, 1984.

AUSTRALIAN NATIONAL UNIVERSITY

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

Director, Research School of Earth Sciences Prof. A. E. Ringwood

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

Australia

GRIFFITH UNIVERSITY

Griffith University
Nathan, Queensland 4111
Australia

Tel: 61-7-275-7111
Tlx: AA40362

Chancellor

Sir Theodore Bray

Fuel Cycle/Waste Management Activities: Contract R&D.

AUSTRIA

AUSTRIA

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year	June 21	Corpus Christi
January 6	Epiphany	August 15	Assumption
April 17	Good Friday	October 26	National Day
April 19-20	Easter	November 1	All Saints
May 1	Labor Day	December 8	Im. Conception
May 28	Ascension	Dec. 25-26	Christmas
June 7-8	Pentecost		

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time period: 03/29 - 09/26/87

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 12.90 Schilling
per Wall Street Journal, 01/30/87. 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 Austria are complete as listed, after dialing international access code: 011. Country code is 43; listed local numbers include city code.

US EMBASSY - VIENNA

American Embassy	
Boltzmanngasse 16	
A-1091 Vienna	Tel: 43-222-31-5511
Austria	Tlx: 11-4634

AUSTRIA

ENERGY

Population	1984	7.7 million
Electric Power Plant Capacity	1984	14.9 GWe
Electric Power Production	1984	42.4 TWh-- 70% hydro/geoth. 12% gas 11% gas 7% oil

NUCLEAR POWER

Policy: Government sponsors R&D on reactor safety, waste treatment and waste isolation. 0.7 GWe nuclear plant at Zwentendorf completed but never approved for operation; final disposition pending.

INDUSTRIAL FUEL CYCLE

No industrial activity.

ORGANIZATION

- * OEFZS--Austrian Research Center Seibersdorf - responsible for waste treatment and disposal R&D. Headquartered in Vienna with a laboratory at Seibersdorf.

GEOLOGICAL SURVEY

Geological Survey of Austria
Rasumofskygasse 23
A-1031 Wien
Austria

OEFZS (Austrian Research Center Seibersdorf)

Oesterreichisches Forschungszentrum Seibersdorf GmbH	
Lenaugasse 10	
A-1082 Vienna	Tel: 43-222-42-7511
Austria	Tlx: 7-5400

AUSTRIA

OEZ (contd)

A-2444 Seibersdorf	Tel: 43-2254-80-0
Austria	Tlx: 14-353
Waste Management	Dr. Peter Krejsa
	43-2254-80-2541
Incineration Material	Dr. Peter Patek
Test, Cementation	43-2254-80-2568
Bituminization	Dr. Karl Knotik
	43-2254-80-2405

Owners: Government, industry, and utilities.

Waste Management R&D: HLW immobilization, LLW and ILW treatment, waste isolation in granite formations (geology, hydrology, heat transfer, corrosion, barrier materials, and risk analysis).

BELGIUM

BELGIUM

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year	July 21	National Day
April 19-20	Easter	August 15	Assumption
May 1	Labor Day	November 1	All Saints
May 28	Ascension	November 11	Armistice Day
June 7-8	Pentecost	December 25	Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time period: 03/29 - 09/26/87

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 37.88 Franc
per Wall Street Journal, 01/30/87. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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

US EMBASSY - BRUSSELS

American Embassy 27 Boulevard du Regent B-1000 Brussels Belgium	Tel: 32-2-513-3830 Tlx: 846-21336
USDOE Representative, Energy and Resources Office	Dana M. Marshall

BELGIUM

ENERGY

Population	1984	9.9 million
Electric Power Plant Capacity	1984	12.3 GWe 29% nuclear
	1985	13.6 GWe 40% nuclear
	1990	14.9 GWe 36% nuclear
Electric Power Production	1984	54.7 TWh-- 51% nuclear 34% coal 8% oil 5% gas 2% hydro/geoth.
	1985	60% nuclear
	1990	56% nuclear

NUCLEAR POWER

Policy: Produce base load electricity by nuclear and coal power plants. Evaluate addition of an eighth (1300 MWe) nuclear unit.

Nuclear Power Plant Capacity	1987	5.5 GWe
	1995	5.5 GWe
	2000	6.8 GWe
Reactor Mix	1986	PWR: 7 (1975-85)

INDUSTRIAL FUEL CYCLE

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

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

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

INTERNATIONAL RELATIONSHIPS

DOE/SCK Umbrella Agreement for Waste Management Exchange

- Term: 1-19-81 to 1-18-89.
- Scope: Terminal storage in geologic formations; technology of retrievable storage; waste processing technology; environmental effects.
- Emphasis: General information exchange.

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

ORGANIZATION

BELGONUCLEAIRE

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

Tel: 32-2-513-9700
 Tlx: 22187 nucbru b

General Manager J. Van Dievoet

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

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

Facilities

- * **MOX Plant** (at Dessel, near Mol)
Mission: Produce MOX fuels for FBRs and LWRs.
Design Capacity: 36 t/a LWR or 7 t/a FBR fuel.
History: Startup, 1973.

BELGOPROCESS

Belgoprocess
B-2400 Mol
Belgium

Tel: 32-14-312-861
Tlx: 31-924

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

Managing Director
Plant Operations

H. Meyers
J. Claes

Activities: Maintenance/dismantling of ex-Eurochemic facilities; medium-level waste conditioning; technical support to FRG PAMELA pilot plant (Mol).

Facilities

- * **Eurowetcomb** (hot pilot plant-acid digestion)
Mission: Wet combustion of combustible TRU wastes and Pu recovery.
Design Basis: Acid digestion with $H_2SO_4-HNO_3$.
History: Startup, 1980.
- * **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-stream time, 87% through June 1983. Plant now operated batchwise.
- * **PAMELA HLW Vitrification Pilot Plant** (FRG facility, see DWK, GE-8).

CEN/SCK (Nuclear Energy Research Center)

Centre d'Etude de l'Energie Nucleaire/
Studiecentrum voor Kernenergie
Laboratory of the CEN/SCK
Boeretang 200
B-2400 Mol
Belgium

Tel: 32-14-31-1801
Tlx: 31-922 Atomol

General Manager
Fuel Cycle
Chemistry
Waste
Geological Disposal

S. Amelinckx
P. Dejonghe
L. H. Baetsle
N. L. C. Van de Voorde
A. A. Bonne

Owner: Government--Ministry of Economic Affairs.

CEN/SCX (contd)

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

Facilities

- * **HERMES Pilot Plant** (Head-End Research facility on Mockup Engineering Scale)
Mission: Develop head-end treatment technology for LWR fuels.
Design Basis: Chop-leach; silver zeolite and cryogenic treatment of offgas.
Process Components: Double-pin chopper, critically safe dissolver, centrifugal filtration for solution clarification, fuel residue dissolver, "super dissolver" for cleanup of hulls, off-gas scrubbers, treatment of hulls by high-pressure compaction, encapsulation of compacted hulls.
Throughput: 10 kg irradiated fuel (20-30% PuO₂ in UO₂) per batch.
History: Not operation, depending on authorization and budget allocation.
- * **FLK Slagging Incinerator** (radioactive)
Mission: Volume reduction of combustible, and of selected noncombustible, low-activity TRU wastes.
Design Basis: High-temperature combustion (1200-1500°C); capacity, 50-100 kg/hr; product, unsoluble granular slag.
History: First tests with Pu-bearing wastes (tens of grams Pu in several tons of waste), 1983.
- * **CEN/SCX Bituminization Plant**
Mission: Immobilize Belgian LLW.
Design Basis: Stirred evaporator, batch process; capacity, 60-80 l/hr liquid LLW or 15-20 l/hr dried sludge.
History: Startup, 1964.
- * **Underground Research Laboratory**
Mission: In-situ investigation in a deep clay formation to develop technology for disposal of ILW, TRU waste, and HLW.
Description: Access shaft to -230 m level, 2.65 m useful dia; laboratory gallery, 3.5 m useful dia by 30 m length; cast iron liner.

CEN/SCK (contd)

Test Program: Geomechanical behavior of clay around underground structures, water-flow measurements, in-situ heater tests, clay stability studies, liner stresses, borehole atmospheres, corrosion; test emplacement of HLW and TRU incinerator residues.

History: Laboratory operational, late 1984.

FBFC (French-Belgian Fuel Fabrication Company)

Societe Franco-Belge de Fabrication de Combustibles

FBFC (Plant)

Europalaan 12

B-2480 Dessel

Belgium

Tel: 32-14-31-5851

Tlx: 32357 Sofaco B

Plant Manager

M. Huberlant

Function: Fabrication of fuel assemblies for LWR (capacity: 400 t/a). 50% French/50% Belgian.

FBFC Tour Manhattan-La Defense (Administrative)

6 Place de l'Iris

F-92400 Courbevoie, France

MINISTRY OF ECONOMIC AFFAIRS

Ministry of Economic Affairs

Administration of Energy

Rue de Mot, 30

B-1040 Brussels

Belgium

Tel: 32-2-233-6636

Tlx: 23509 ENERGI B

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

Organisme National des Dechets Radioactifs

et des Matieres Fissiles (ONDRAF/NIRAS)

Boulevard du Regent 54

B-1000 Brussels

Belgium

Tel: 32-2-513-7460

Tlx: 65784 Nirond

Chairman, Board of Directors

M. Frerotte

Chairman, Perm. Tech. Committee

F. Deconinck

General Manager

E. Detilleux

Tech. Manager/Deputy General

F. Decamps

Owner: Government.

BELGIUM

ONDRAF/NIRAS (contd)

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

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

SYNATOM

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

Tel: 32-2-518-6666
Tlx: 24-152 SYNAT B

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

R. De Cort
R. Cayron
Pierre A. Erkes
Jean Danguy

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

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

BRAZIL

BRAZIL

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year	Sept. 7	Independence
March 1-3	Carnival	Oct. 12	N. S. Aparecida
April 17	Good Friday	Nov. 2	All Souls
April 21	Tiradentes Day	Nov. 15	Proclamation of the Republic
May 1	Labor Day		
June 21	Corpus Christi	Dec. 25	Christmas

TIME

Standard Time Washington D.C.: (East/all coast) + 2 hours
Standard Time Period: 03/14 - 10/31/87

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 16.45 Crusado
per Wall Street Journal, 01/30/87. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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

US EMBASSY - BRASILIA

American Embassy
Avenida das Nacoes, Lote 3
Brasilia
Brazil

Tel: 55-61-223-0120
Tlx: 61-1091

Science Counselor

James Chamberlin

ENERGY

Population	1985	135 million
Electric Power Plant Capacity	1984	42 GWe
Electric Power Production	1984	161.9 TWh-- 93.5% hydro 6.5% thermal

NUCLEAR POWER

Policy: Ambitious program to develop complete government-owned nuclear industry, based upon technology transfer from FRG and other countries.

Nuclear Power Plant Capacity	1987	0.6 GWe
	1995	1.9 GWe
	2000	3.1 GWe
Reactor Mix	1986	PWR: 1 (1984) 2 (1990/91)
Reactor Development		FBR

INDUSTRIAL FUEL CYCLE

Policy: Full commercial capability through a government-owned corporation--conversion of U_3O_8 to UF_6 ; enrichment; UO_2 fuel fabrication; fuel reprocessing.

Waste Management Strategy: Not yet defined.

Cumulative Spent Fuel	1985	32 tU
Arisings (LWR)	1990	180 tU
	1995	510 tU
	2000	1,000 tU

Demonstration/Production Activities

- * Uranium mining and milling: 500 tU/a--in operation.
- * UF_6 production: (1984) 90 tU/a--currently delayed indefinitely.
- * Uranium enrichment (gas centrifuge): small experimental demonstration (1986).

BRAZIL

- * Uranium enrichment (Becker nozzle process), at Resende (Nuclebras):
 - First Cascade, 24 stages; to 1% U-235 at first stage (1988)
 - 200-300 tSWU/a demo plant (1990).
- * Fuel fabrication: 80 tU/a (1982); design capacity--400 tU/a.
- * Spent fuel reprocessing: 10 kg/d pilot plant (1986 startup originally scheduled, but as yet completion date unknown).

INTERNATIONAL RELATIONSHIPS

Joint Natural Analog Studies (Migration of Radionuclides from Ore Deposits in Brazil).

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

ORGANIZATION

- * Federal Ministry of Mines and Energy--planning, execution and control of nuclear power program.
- * CNEN (Nuclear Energy Commission)--regulatory and R&D.
- * Nuclebras--plant engineering, construction and operation; operates through partly-owned subsidiaries--Nucon (construction), Nuclen (design), Nuclep (heavy components), Nuclam (mining), Nuclei and Nustep (enrichment), Nuclemon (thorium production), and federal and state utilities, such as FURNAS.

CDTN (Center for the Development of Nuclear Technology)

Centro de Desenvolvimento de
Tecnologia Nuclear de Nuclebras (CDTN)
Rua Gonçalves Dias No. 1054
Belo Horizonte, MG
Brazil

Tel: 55-31-441-5422
Tlx:

Director

V. Mattos Andrade Silva

Function: Applied research and industrial development of uses for atomic energy.

CNEN (Nuclear Energy Commission)

Comissao Nacional de Energia Nuclear (CNEN)
 Rua General Severiano 90
 Botafogo ZC-82
 22290 Rio de Janeiro, RJ
 Brazil

Tel: 55-21-295-2232
 Tlx: 21-21280

President

Rex Nazare Alves

Fuel Cycle and Waste Management R&D: Uranium enrichment; migration of radionuclides from thorium deposits, (joint Brazil-US study); spent fuel reprocessing, 10 kg HM/day pilot reprocessing facility being built (by the government) in the Rio de Janeiro area (completion date unknown).

IPEN (Energy and Nuclear Research Institute)

Instituto de Pesquisas Energeticas e Nucleares
 Cidade Universitaria
 Caixa Postal 11.049
 Pinheiros - CEP 01000
 Sao Paulo, Brazil

Tel: 55-11-211-6011
 Tlx: 11-23592 IPEN

Superintendent

Claudio Rodrigues

Areas of Activity: Physics; nuclear physics; high energy physics. Life Sciences; nuclear medicine; radiobiology; radiation health and safety. Engineering and reactor technology; instrumentation. Chemistry; materials in the nuclear industry. Isotope and radiation applications and production. Nuclear waste disposal. Nuclear metallurgy. Radiochemistry.

NUCLEBRAS

Nuclebras
 Avenida Presidente Wilson 231
 CEP 20030, Rio de Janeiro
 Brazil

Tel: 55-21-292-1144
 Tlx: 23128, 23830

President

Licio Seabra

Director-Superintendent

General Jose Pinto de
Araujo Rabello

Director, Mineral Production

Paulo Lima

Director, Nuclear Fuel

David Neiva Simon

Director, Nuclear Plants

Ronaldo A. Cruz Fabricio

Function: Establish a nuclear fuel cycle industry, promote nuclear technology, transfer to private industry, design and build nuclear power plants, pursue R&D programs.

Owner: Government.

CANADA

CANADA

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year
April 17	Good Friday
April 19-20	Easter
May 18	Victoria Day
July 1	Dominion Day
October 12	Thanksgiving
November 11	Remembrance Day
December 25-26	Christmas

TIME

Time zones correspond to those in the United States.
Daylight Saving Time period: 04/05 - 10/25/87

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 US\$ = 1.3380 Canadian Dollar
per Wall Street Journal, 01/30/87. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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

US EMBASSY - OTTAWA

American Embassy
100 Wellington Street
Ottawa K1P 5T1
Canada

Tel: 613-238-5335
Tlx: 053-3582

Science Attache

Francis M. Kinnelly

ENERGY

Population	1985	25.4 million
Electric Power Plant Capacity	1984	95.8 GWe 10% nuclear
	1985	96.4 GWe 10% nuclear
	1990	102.2 GWe 14% nuclear
Electric Power Production	1984	437.1 TWh-- 65% hydro/geoth 20% coal 12% nuclear 2% oil 1% gas
	1985	13% nuclear
	1990	19% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity	1987	10.6 GWe
	1990	13.4 GWe
	1995	15.8 GWe
	2000	15.8 GWe
Reactor Mix	1986	HWR: 17 (1968-86) 5 (1987-92)

INDUSTRIAL FUEL CYCLE

Policy: Retrievable storage of spent fuel for decades, pending decision between reprocessing and disposal of spent fuel.

Waste Management Strategy: Geologic disposal of "nuclear fuel waste," either spent CANDU fuel or immobilized HLW, in a crystalline rock repository; disposal of other reactor wastes in engineered surface facilities.

Cumulative Spent Fuel Arisings (HWR)	1980	3,650 tU
	1985	9,000 tU
	1990	17,700 tU
	2000	33,900 tU

Major Milestones

*	URL completion	1989
*	Complete concept assessment/geo.repository	1990

INTERNATIONAL RELATIONSHIPS

DOE/AECL Umbrella Agreement for Waste Management Exchange

- Term: 9-8-76 to 8-25-87.
- Scope: Waste treatment; storage; geologic disposal; transportation requirements; operational considerations; environment and safety; public acceptance issues.
- Emphasis: Collaboration in AECL URL project near Whiteshell; intercomparison of performance assessment computer models and codes; information exchange in waste form characterization and in waste/spent fuel storage.

DOE/AECL Implementing Agreement for a Technical Cooperative Program

- Term: 2-28-86 to 9-30-89
- Scope: Cooperative experimental program at Canada's URL; performance assessment studies; field testing investigations; URL shaft deepening and characterization. (DOE to pay for cost of shaft extension to 450 m.)

Member of IAEA and OECD/NEA. Exchange agreements with CEC, BMFT/Germany, SKB/Sweden, UKAEA/United Kingdom, PNC/Japan and Euratom.

ORGANIZATION

- * AECB (Atomic Energy Control Board)--regulatory.
- * AECL (Atomic Energy of Canada Limited)--a Crown Corporation owned by the federal government. Nuclear R&D; design, engineering and sale of CANDU reactors; Waste management R&D at Whiteshell and Chalk River.
- * Ontario Hydro--provincial public utility, owns and operates most of Canada's nuclear power plants--those located in Ontario Province. Waste management R&D.
- * Hydro Quebec--provincial public utility, owns and operates Gentilly 2 (600 MWe CANDU station).
- * NB Power (New Brunswick Electric Power Commission)--provincial utility, owns and operates Point Lepreau Nuclear Generating Station (600 MWe CANDU).

FEDERAL GOVERNMENT RESPONSIBILITIES— FUEL CYCLE/WASTE

Ministry of Energy, Mines and Resources (EMR)

|--- Atomic Energy of Canada, Limited (AECL)

| |--- Canada Operations

| | * CANDU Reactor Design, Engineering, Export

| |--- AECL Radiochemical Company

| | * Radioisotopes/Medical Applications

| |--- AECL Research (see CA-4)

|--- Department of Energy Mines and Resources (EMR)

| |--- Atomic Control Board (AECB)

| | * Regulations, Licensing

| |--- Geological Survey of Canada

| | * Field Geology

| | * Regional Geological Assessments

| | * Alternative Rock Types

| | * Seismicity

| |--- Canadian Centre for Mineral and Energy Technology (CANMET)

| | |--- Mining Research Laboratories

| | | |--- Elliot Lake Laboratory

| | | | * Mill Tailings

| | | |--- Rock Mechanics Laboratory

| | | | * Rock Properties

| | |--- Mineral Sciences Laboratories

| | | * Radionuclide Recovery from Thorium Mill
Tailings

ATOMIC ENERGY OF CANADA LIMITED - PARTIAL ORGANIZATION

AECL RESEARCH

- |--- Whiteshell Nuclear Research Establishment (WNRE)
 - |
 - * Reactor Safety
 - * Physics and Health Sciences
 - * Material Sciences
 - * Radiation Applications and Isotopes
 - |--- Waste Management Program
 - * Geological/Environmental Science
 - * Geochemistry/Waste Immobilization
- |--- Chalk River Nuclear Research Establishment (CRNL)
 - |
 - * Reactor Waste Treatment and Immobilization
 - * Reactor D&D
 - * Material Sciences
 - |--- Reactor Development
 - |--- Physics and Health Sciences
 - |--- Radiation Application and Isotopes

AECL

Atomic Energy Control Board

P.O. Box 1046

270 Albert Street

Ottawa, Ontario K1P 5S9

Canada

Tel: 613-995-5894

Tlx: 53-3771

Fax:

President

J. H. Jennekens

Fuel Cycle/Materials Regulations

W. D. Smythe

Waste Management

G. C. Jack

-3181

Fuel and Heavy Water Plant

J. P. Didyk

Regulatory Research

J. W. Beare

Safety/Safeguards

J. R. Coady

AECL

Atomic Energy of Canada Limited
275 Slater Street
Ottawa, Ontario K1A 0S4
Canada

Tel: 613-237-3270
Tlx: 053-3126
Fax:

President
President, AECL Research
Vice President, R&D

James Donnelly
Dr. Stanley R. Hatcher
Dr. A. J. Mooradian

AECL-CRNL

AECL-Chalk River Nuclear
Laboratories
Chalk River, Ontario K0J 1J0
Canada

Tel: 613-687-5581
Tlx: 053-34555
Fax:

General Manager
V. P., Reactor Development
V. P., Physics/Health Sciences
V. P., Radiation Appl./Isotopes

Dr. P. J. Harvey
Dr. R. E. Green
Dr. J. D. Milton
Dr. H. K. Rae

Facility**Waste Treatment Center (WTC)**

Mission: Develop reactor waste treatment processes.

AECL-WNRE

AECL-Whiteshell Nuclear Research
Establishment
Pinawa, Manitoba R0E 1L0
Canada

Tel: 204-753-2311
Tlx: 075-7553
Fax:

General Manager
V. P., Waste Management
Geological/Environmental
Geochem./Waste Immobilization
Low-Level Waste
Waste Management Technology

M. G. Wright
Dr. W. T. Hancox
Dr. K. W. Dormuth
Dr. K. Nuttal
Dr. D. J. Cameron
Dr. D. H. Charlesworth

Facilities

- * **WIPE** (cold pilot plant-vitrification)
Mission: Develop HLW conditioning process for the CANDU-Thorium fuel cycle.
Design Basis: 10 kg/hr glass--rotospray calciner/ceramic melter.
History: Startup, 1983.

AECL-WNRE (contd)

- * **Hot Pilot Plant-Reprocessing**
Mission: Develop CANDU-Thorium fuel cycle technology; provide HLW for waste studies.
Design Basis: Thorex process, mixer-settlers; capacity, 0.3 kg/day.
History: Hot operation, 1980; Shut down 1985.

- * **URL (Underground Research Laboratory)**
Mission: Provide a research facility in a virgin granite pluton characteristic of the Canadian granite formations which may be selected for waste repository construction. (USDOE participating in experimental programs)
Design Basis: Location about 20 km from WNRE, on the Lac du Bonnet Batholith; horizontal tunnel with adjoining rooms located 240 m below the surface, with vertical shaft. Start of shaft extension to the 440 m level, January 1987. Licensed radioactive sources and selected tracers may be used in the facility, but no radioactive wastes are to be emplaced there.
Milestones: Underground operation startup, 1986; completion of shaft expansion, 1989.

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

- * **EBTF (Engineered Barrier Test Facility, formerly - IFTF/Immobilized Fuel Test Facility)**
Mission: Test the effects of water, heat and pressure on waste forms, containers, buffer and rock in the presence of a radiation field. Waste forms include spent fuel and fuel recycle glass or glass/ceramics.
Design Basis: A high-level radiation source used in concrete canisters to measure corrosion of metals; warm cells for experiments involving moderate levels of radiation. **Three Laboratories:** Analytical, Low-Activity Examination, and Alpha.
History: First canister loaded, August 1984.

EMR

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

Tel: 613-995-3065
 Tlx: 053-3117
 Fax:

Director, Nuc.Fuel Waste Disposal Dr. J. S. Scott

EMR-CANMET

EMR-Canada Centre for Mineral
 and Energy Technology
 555 Booth Street
 Ottawa, Ontario K1A 0G1
 Canada

Tel: 613-995-4029
 Tlx:
 Fax:

Director General

Dr. W. G. Jeffery
 -4179

Deputy Director General
 Rock Mechanics
 Waste Management (Elliot Lake)

J. T. Gubb
 G. E. Larocque
 R. Tervo

Laboratories

- # Mineral Sciences # Rock Mechanics
- # Mining Research Laboratories
 Elliot Lake, Ontario P5A 2K2
 Canada

EMR-GSC

EMR-Geological Survey of Canada
 601 Booth Street
 Ottawa, Ontario K1A 0E8
 Canada

Tel: 613-592-493
 Tlx: 053-3117
 Fax:

Director

Dr. R. A. Price

OH

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

Tel: 416-592-5111
 Tlx: 06-217662
 Fax:

OH (contd)

Director, Nuc. Design/Developmt.	H. S. Irvine	-5210
Nuclear Materials Management	H. N. Isaac	-5539
Radioactive Materials Mgmt.	T. J. Carter	-6024
Radiation/Decom. Waste Disposal	P. J. Armstrong	-5830
Fuel Disposal	R. A. McEachran	-4066

Function: Design, construction, and operation of CANDU power stations.

Facilities

- * **RWVRF** (Radioactive Waste Volume Reduction Facility)
Location: Bruce Nuclear Complex, Tiverton, Ontario.
Components: Pyrolysis incinerator (2-chamber), solid waste compactor.
History: Startup, 1977.
- * **Intermediate-Level Waste Storage**
Location: Bruce Nuclear Power Development Waste Management Site, Tiverton, Ontario.
Components: In-ground concrete tile holes or trenches, above-ground concrete "Quadricell."

CHINA
(People's Republic of China)

CHINA

MAJOR PUBLIC HOLIDAYS

January/	Lunar New Year
February	
May 1	Labor Day
Aug 1	Army Day
October 1	National Liberation

TIME

Standard Time Washington D.C.: + 13 hours
Daylight Saving Time period: 05/03 - 09/12/87

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 3.722 Yuan
per Wall Street Journal, 01/30/87. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

US EMBASSY - BEIJING

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

Science Counselor Dr. Pierre M. Perrolle

ENERGY

Population	1986	1.05 billion
Electric Power Plant Capacity	1985	86 GWe
Electric Power Production	1985	406 TWh-- ~70% coal ~24% oil hydro/geoth. gas

NUCLEAR POWER

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

Nuclear Power Plant Capacity	1990	2 GWe
	2000	10 GWe
Reactor Mix	1986	PWR: 3 (1988-90)
Reactor Development		BWR, HTR, FBR

INDUSTRIAL FUEL CYCLE

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

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

INTERNATIONAL RELATIONSHIPS

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

ORGANIZATION

- * MNI (Ministry of Nuclear Industry)--fuel cycle development
 - IAE (Institute of Atomic Energy)
 - INET (Institute of Nuclear Energy Technology)
- * NNSA (National Nuclear Safety Administration)--responsible for standards/regulations, construction permits/operating licenses, monitoring plant operations; conducts joint safety research with other nations.
- * Atomic and Nuclear Energy Research Institute of the Academy of Sciences (Beijing Area and Southwest China)--nuclear R&D.
- * CNEIC (China Nuclear Energy Industry Corporation)--handles import and export.
- * China Zhongyuan Engineering Corporation--provides technical services and engineering work.

IAE

Institute of Atomic Energy
 Academia Sinica
 PO Box 275 (4)
 Beijing
 People's Republic of China

Director	Sun Zuxun
Honorary Director	Dai Cuanzheng

INET

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

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

MNI

Ministry of Nuclear Industry
Beijing
People's Republic of China

Minister	Jiang Xingxiang
Science/Tech.Com., V.Chairman	Lu Rong'Guang

MNSA

National Nuclear Safety Administration
Beijing
People's Republic of China

Director General	Jiang Sheng-Jie
Chief Engineer	Lin Chengge
Dep. Chief Engineer	Dong Bonian
Dep. Div. Chief	Xu Wanjin
Dep. Div. Chief	Li Zhiyu

FINLAND

FINLAND

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year
April 17	Good Friday
April 19-20	Easter
May 1	May Day
June 19	Midsummer Eve
December 24-26	Christmas

TIME

Standard Time Washington D.C.: + 7 hours
Daylight Saving Time period: 03/29 ~ 09/26/87

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 4.600 Markka (FIM)
per Wall Street Journal, 01/30/87. 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.

US EMBASSY - HELSINKI

American Embassy	
Itäainen Puistotie 14A	
Helsinki 14	Tel: 358-0-17-1931
Finland	Tlx: 12-1644 USEMB SF

ENERGY

Population	1985	4.9 million
Electric Power Plant Capacity	1984	11.3 GWe
		20% nuclear
	1985	11.4 GWe
		20% nuclear
Electric Power Production	1990	11.7 GWe
		20% nuclear
	1984	45.4 TWh--
		42% nuclear
		29% hydro/geoth.
		25% coal
		2% oil
		2% gas
	1985	38% nuclear
	1990	31% nuclear

NUCLEAR POWER

Nuclear Power Plant Capacity	1987	2.3 GWe
	1995	2.3 GWe
	2000	3.3 GWe
Reactor Mix	1986	PWR: 2 (1977/81)
		BWR: 2 (1979/82)

INDUSTRIAL FUEL CYCLE

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

Waste Management Strategy: Not fully defined; spent fuel or HLW from non-Soviet fuels will be stored for 40 years, then placed in a granite repository; reactor wastes are bituminized and will be stored underground.

Cumulative Spent Fuel		<u>TVQ</u>	<u>IVQ</u>
Arising (LWR), tU	1980	22	46
	1985	228	183
	1990	450	330
	2000	900	620

Major Milestones

* Complete updated final disposal concept for spent fuel	1992
* Complete site selection	2000
* Complete repository	2020

INTERNATIONAL RELATIONSHIPS

Member of IAEA and OECD/NEA. Collaboration with Sweden, Denmark and Norway in waste management studies. Purchases fuel cycle services, including disposal of spent fuel, from USSR for USSR-purchased PWR power stations.

ORGANIZATION

- * **IVO** (state-owned power company) and **TVO** (power company, jointly owned by IVO and several industrial companies): IVO operates two Soviet-built PWR reactors, while TVO operates two Swedish-built BWR plants.
- * **Nuclear Waste Commission of Finnish Power Companies**--established by IVO and TVO to do joint analysis and planning for managing their nuclear wastes.
- * **VTT** (Technical Research Center)--nuclear research, including waste management R&D.
- * **Geological Survey of Finland**--bedrock-related research.
- * **University of Helsinki**--basic research on radio-chemistry.

ATOMIC ENERGY COMMISSION

Atomic Energy Commission
Ministry of Trade and Industry
Pohjoinen Makasiinikatu 6
SF-00130 Helsinki
Finland

Tel: 358-0-160-5256
Tlx: 125-452 EDEPT SF

Chairman

Prof. Pekka Jauho
358-0-456-4100
Tlx: 12-2972 VTTHA SF

Secretary-General

Lasse Mattila

GEOLOGICAL SURVEY OF FINLAND

Geological Survey of Finland
Kivimiehentie 1
SF-02150 Espoo
Finland

Tel: 358-0-46931
Tlx: 12-3185 geolo SF

Director
Research Director
Nuclear Waste Disposal

Prof. L. K. Kauranne
Prof. K. Korpela
Dr. M. Salmi
358-0-803-7988

FINNISH CENTRE FOR RADIATION AND NUCLEAR SAFETY

Finnish Centre for Radiation
and Nuclear Safety

P.O. Box 268
SF-00101 Helsinki
Finland

Tel: 358-0-61671
Tlx: 12-2691 STL-SF

Chief Inspector, Reactor Safety
Inspectors

S. Vaisanen
E. Ruokola - I. Aro

IVO

Imatra Power Company (IVO)

Malminkatu 16
P.O. Box 138
SF-00101 Helsinki
Finland

Tel: 358-0-694-4811
Tlx: 12-4608

IVO

Industrial Power Company Ltd. (IVO)

Fredrikinkatu 51-53
SF-00100 Helsinki
Finland

Tel: 358-0-60-5022
Tlx: 12-2065

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

P.O. Box 169
SF-00181 Helsinki
Finland

Tel: 358-0-4561
Tlx: 12-2972 VTTHA SF

Director, Nuclear Waste
Nuclear Waste Management

Prof. Pekka Silvennoinen
Dr. Seppo Vuori

VTT Reactor Laboratory

Otakaari 3A
SF-02150 Espoo
Finland

Tel: 358-0-4561
Tlx: 12-2972 VTTHA SF

Director
Nuclear Waste Management

Dr. Pekka Hiismaki
Arto Muurinennonen

VTT Metals Laboratory

Metallimiehenuja 6
SF-02150 Espoo
Finland

Tel: 358-0-4561
Tlx: 12-2972 VTTHA SF

Director
Nuc. Fuel Material Research

Dr. Jarl Forsten
Esa Vitikainen

FINLAND

VTT (contd)

VTT Geotechnical Laboratory

Betonimiehenkuja 1
SF-02150 Espoo
Finland

Tel:
Tlx: 12-27972 VTTHA SF

Director
Rock Mechanics

Dr. Markku Tamminen
Dr. Kari Saari

UNIVERSITY OF HELSINKI

University of Helsinki
Department of Radiochemistry
Unioninkatu 35
SF-00170 Helsinki
Finland

Tel: 358-0-192-4392
Tlx: 12-4690 unh SF

Director

Prof. T. Jaakkola

FRANCE

FRANCE

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year
April 19-20	Easter
May 1	Labor Day
May 28	Ascension
June 7-8	Pentecost
July 14	Bastille Day
August 15	Assumption
November 1	All Saints
November 11	Remembrance Day
December 25	Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time period: 03/29 - 09/26/87

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 France. However, it is recommended to consult a travel agency for up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 US\$ = 6.1015 Franc
per Wall Street Journal, 01/30/87. 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.

US EMBASSY - PARIS

American Embassy	
2 Avenue Gabriel	Tel: 33-14-296-1202
75382 Paris	33-14-261-8075
France	Telex: 650-221
Science Counselor	Dr. Alan L. Sessoms

ENERGY

Population	1984	54.61 million
Electric Power Plant Capacity	1984	84.7 GWe 39% nuclear
	1985	88.5 GWe 44% nuclear
	1990	107.6 GWe 51% nuclear
Electric Power Production	1984	324.6 TWh-- 59% nuclear 21% hydro/geoth. 16% coal 3% oil 1% gas
	1985	65% nuclear
	1990	73% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity	1987	44.6 GWe
	1990	52.6 GWe
	1995	60.4 GWe
	2000	64.6 GWe
Reactor Mix	1986	GCR: 4 (1967-72)
		PWR: 41 (1970-86)
		16 (1987-93)
		LMFBR: 2 (1974/86)
Reactor Development	LMFBR commercialization;	
	SuperPhenix--1985; industrial follow-on work still under debate.	

INDUSTRIAL FUEL CYCLE

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

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

FRANCE

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

Industrial-Scale Activities

- * Uranium mining and milling (tU):
1984--3,168; 1985--3,200.
- * Uranium enrichment (tSWU/a)
 - Pierrelatte, gaseous diffusion: 400-600
 - Eurodif, gaseous diffusion: 1982--10,800.
- * Fuel fabrication (tHM/a)
 - UO₂: 1986--1,100
 - MOX: for FBR fuels--5; for LWR fuels--15.
- * Spent fuel reprocessing
 - Marcoule: 800 t/a, U metal fuels,
 - La Hague: 800 t/a, U metal fuels;
400 t/a, UO₂ (to be expanded to
1,750 t/a).

Major Milestones

- * TOR demonstration reprocessing plant 1986
for FBR fuels (Marcoule)
- * UP3 reprocessing plant (La Hague) 1989
including T7 vitrification plant
- * UP2-800 reprocessing plant (La Hague) 1992
including R7 vitrification plant
- * New LLW disposal site 1987
- * Underground Research Laboratory 1989

INTERNATIONAL RELATIONSHIPS

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

- Term: 7-26-83 to 7-26-88.
- Scope: Preparation/packaging; D&D; waste/spent fuel storage; geologic disposal; transportation requirements.
- Emphasis: Technical workshops in the areas of ILW and TRU waste management; exchange of waste repository site characterization technology and data for granite and salt host rocks.

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

ORGANIZATION

- * **EdF** (Electricite de France, 100% government)--public power generation; owns and operates all nuclear plants except Phenix (50% EdF, 50% CEA) and SuperPhenix (NERSA: 51% EdF, 33% ENEL, 16% RWE)
- * **CEA** (Atomic Energy Commission)--controls all nuclear R&D and industrial fuel cycle activities:
R&D: Nuclear research centers at Cadarache, Fontenay-aux-Roses, Grenoble, Marcoule, Saclay; Institute for Nuclear Protection and Safety
Commercial fuel cycle: COGEMA (mining, uranium conversion, enrichment, reprocessing); SGN, a COGEMA subsidiary (design, construction and marketing of fuel cycle facilities)
Commercial waste disposal: ANDRA.

NUCLEAR FUEL CYCLE RESPONSIBILITIES

Minister of Industry, Telecommunication and Tourism

DERDCA RESPONSIBILITIES

RESEARCH CENTERS

COGEMA

- |— Pierrelatte and Tricastin
 - * U Enrichment
- |— La Hague Center
 - * Reprocessing
- |— Marcoule Center
 - * Reprocessing
 - * AVM
- |— Transnucleaire
 - * Transport
- |— SGN (Architect-Engineer)
 - * Fuel Cycle Plants

CEA

- |— Cadarache
 - * MOX Fuel Fabrication
 - * TRU Waste and LL/ILW Treatment
- |— Fontenay-aux-Roses
 - * Disposal R&D
 - * MOX Fuel Fabrication
 - * TRU Waste and LL/ILW Treatment
- |— Grenoble
- |— Saclay
 - * MOX Fuel Fabrication
 - * TRU Waste and LL/ILW Treatment
- |— Marcoule
 - * FBR Development
 - * Reprocessing
 - * HLW Treatment R&D

ANDRA (National Agency for Radioactive Waste Management)

Agence Nationale pour la Gestion
des Dechets Radioactifs
Commissariat a l'Energie Atomique
31, Rue de la Federation
F-75752 Paris CEDEX 15
France

Tel: 33-1-40-56-1000
Tlx: 20-5433 ANDRAGE F

Director	Jean Chatoux
Deputy Directors	Alain Barthoux
	Armand Faussat
Operations	Emile Roussel
Projects	Yves Marque
Quality Assurance	Hubert Nougulier
Safety	Francis Van Kote
Sites	Raymonde Andre-Jehan

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

Facilities

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

Mission: Disposal of ILW and LLW; capacity:
460,000 m³ (1985: 265,000 m³ in place).

- * Two new centers planned; one site selected (1986):
Soulaines (Aube).

BRGM (Bureau of Geological and Mineral Research)

Bureau de Recherches Geologiques
et Minieres
B.P. 6009
F-45060 Orleans CEDEX 2
France

Tel: 33-1-38-64-3634
Tlx: 78-0258 F

Director	Gerard Renon
Managing Director, Geology	H. Astie
Waste Storage	P. F. R. Peaudecerf
Hydrogeology	J. J. Collin
Geotechnology	Ph. Masure

CEA (Atomic Energy Commission)

Commissariat à l'Energie Atomique (CEA)
 Centre d'Etudes Nucleaires (CEN)
 29-33, Rue de la Federation
 F-75752 Paris
 France

Tel: 33-1-40-56-1000
 Tlx: 200671 Energat

Administrator General	Jean-Pierre Capron
High Commissioner	Jean Teillac
Director, Nuc. Safety (FaR)	Francois Cogne
Director, Nuc. Waste Mgmt. (FaR)	Jean Lefevre
	33-14-654-7471
Asst.Dir., International (DED)	Pierre Jourde
Asst.Dir., R&D (DED)	Annie Sugier
Director, Safety	Jacques Bellot
Director, Applied R&D	Michel Rapin

CEA-IPSN (Institute of Protection and Nuclear Safety)

Institut de Protection et de Surete
 Nucleaires (IPSN)
 B.P. 6
 F-92260 Fontenay-aux-Roses
 France

Tel: 33-14-654-7080
 Tlx: 204841 Energat
 Fnayr

Safety Analysis	D. Quenart
Waste Safety	J. Lewi
Technical Protection	J. Pradel
Waste Protection Research	A. M. Chapuis
Safety Studies/Research (CEN-C)	M. Bailly
Instrumentation/Methodology	
Undergrd. Disp. (Fanay-Augerres)	J. Lewi

CEA-IRDI (Institute for Applied Research and Development)

Institut de Recherche Technologique
 et de Developpement Industriel (IRDI)

Director	Michel Rapin
Division, Reprocessing Waste/ Applied Chemistry	J. Megy
Department, Technology Transfer/ Process Industrialization	M. Courouble
Department, Reprocessing/ R&D Pilot Plants	J. Sauteron
Department, Analysis-Corrosion/ Applied Chemistry	M. Leveque
Department, R&D Waste (FaR)	Guy Baudin
	33-1-46-54-8222

CEA-IRDI (contd)

Characterization (Cadarache)	A. Saas
LL/ILW (Cadarache)	D. Alexandre
HLW (Marcoule)	M. Bonniaud
Engineered Barriers,	M. Jorda
Modeling (FaR)	33-14-654-8129

CEN-CA (Cadarache Nuclear Research Center)

Centre d'Etudes Nucleaires de Cadarache
 B.P. 1
 F-13115 Saint-Paul-lez Durance Tel: 33-42-25-7000
 France Tlx: CEACA 440678 F

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

Bureau for Evaluation and Control	A. Saas
of Waste Confinement (BECC/CIDN)	33-42-25-7364
Information Center for	Mrs. Rocca-Serra
Waste	33-42-25-7882
Studies of LLW/ILW	D. Alexandre
	33-42-25-7123

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

Facilities

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

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

Centre d'Etudes Nucleaires
de Fontenay-aux-Roses
B.P. 6
F-92265 Fontenay-aux-Roses
France

Tel: 33-14-654-8000
Tlx: FaR 20481

(See CEA-IRDI, Institute for Applied R&D)

Waste Management R&D: Safety-related research; airborne waste treatment; solvent extraction processes for waste partitioning; OKLO studies; engineered barriers, modeling.

CEN-G (Grenoble Nuclear Research Center)

Centre d'Etudes Nucleaires
de Grenoble
Avenue des Martyrs 85X
F-38041 Grenoble
France

Tel: 33-76-97-4111
Tlx: 320323 Energat
Greno

Director

Michel Suscillon

* **Waste Resin Embedding Facility**

CEN-M (Marcoule Nuclear Research Center)

Centre d'Etudes Nucleaires
de la Vallee du Rhone
B.P. 171
F-30205 Bagnols-sur-CEze
Marcoule, France

Tel: 33-16-679-6000
Tlx: 480-816 F
Fax: 33-16-679-6030

Manager, High-Level Waste
Deputy Manager

M. Bonniaud
Claude G. Sombret
33-16-679-6362

Laboratory Studies
Confinement Processing

N. Jacquet-Francillon
Antoine F. Jouan
33-16-679-6376

Hot Technology

F. Laude

Facilities

* **TOR** (Reprocessing Head-End Pilot Plant)
Mission: Develop technology for LWR, FBR and MOX fuels.
Design Basis: PUREX flowsheet, mixer-settlers and pulsed columns; 5 tHM/a.

CEN-M (contd)

- * **PIVER (Hot Pilot Plant-Vitrification)**
Mission: Test batch vitrification processes (1969-1973); produce samples for characterization and advanced (high-temperature) waste forms.
Design Basis: Pot calciner/melter; capacity, 90 kg glass/batch or 25-30 m³ HLW/a; product, borosilicate glass blocks, 25 cm dia by 2.5 m high.
- * **Hull Fusion Non-Radioactive Prototype** (84 startup)
- * **PEV Prototype** (full-scale, non-radioactive R7/T7 vitrification process). Startup, 1984

CEN-S (Saclay Nuclear Research Center)

Centre d'Etudes Nucleaires
de Saclay

F-91191 Gif-sur-Yvette
France

Tel: 33-16-908-6000
Tlx: 690641 F Energat
Saclay

Director
Nuclear Wastes

Paul Mirat
Henri Vialettes

Facilities

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

COGEMA (Compagnie Generale des Matieres Nucleaires)

COGEMA, Inc.
Direction Generale
B.P. 4

F-78141 Velizy Villacoublay Cedex
France

Tel: 33-13-946-9641
Tlx: 69-7833 COGEM

Vice President, Reprocessing
Ind. Director, Reprocessing
La Hague Expansion Proj./Reproc.
Marcoule Expansion Proj./Reproc.

Claude Aycoberry
Maurice Delange
Francois Chenevier
Andre Bekiarian

COGEMA-LA HAGUE CENTER

COGEMA, Centre de La Hague

B.P. 270

F-50107 Cherbourg

France

Tel: 33-13-303-6000

Tlx: 170030 Energat

Director

Jean Parmentier

Reprocessing

Jean-Louis Ricaud

Waste Management

Jean-Pierre Laurent

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. Current plans are to transfer all reprocessing of gas/graphite fuels to Marcoule UP1 and devote La Hague to treating LWR fuels with occasional FBR fuel campaigns through UP2.

Facilities

- * **UP2 (Fuel Reprocessing Plant)**
Mission: Reprocess magnesium-clad, natural uranium metal fuels from gas/graphite reactors and oxide fuels from LWRs and Phenix FBR (Phenix fuel has been reprocessed from 1979 to 1984, diluted with natural uranium fuel for criticality control).
Design Basis: Metal fuels: chemical decladding; PUREX flowsheet; capacity, 800 t/a and 1.6 tPu/a; contact maintenance. Oxide fuels: shear-leach HAO head-end; remote maintenance; capacity, 400 t/a of LWR fuels.
History: Startup: UP2, 1967; HAO, 1976. From startup (6/76) through 11/85 total HAO throughput was 1,337 t fuel from LWRs and 10 t from Phenix.
- * **UP2-800 (Fuel Reprocessing Plant)**
Mission: Reprocess U oxide and MOX fuels from French LWRs.
Design Basis: Progressive expansion of UP2 plant from 400 to 800 t/a of LWR fuel started in 1984, to be completed in early 1990s. Chop leach head-end, PUREX flowsheet, AVM vitrification process [R7 vitrification plant; rotary calciner, metallic or ceramic melter; capacity, 600 m³/a HLLW feed three lines - 50 l/hr HLLW, 25 kg/hr glass; canister dimensions: 42 cm dia x 1.3 m high (400 kg glass)].
Capacity: 800 t/a.
Milestone: Startup, 1991.

COGEMA-LA HAGUE CENTER (contd)

- * **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).
Milestones: Startup, UP2-800--1992.

COGEMA-MARCOULE CENTER

COGEMA, Centre de Marcoule

B.P. 170

F-30200 Bagnols-sur-Cèze

Marcoule, France

Tel: 33-16-689-5390

Tlx: 480232F MARCOGEMA

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

Director

Maurice Alles

Reprocessing Plant

Maurice Chotin

AVM Manager

Pierre Hugony

Facilities

- * **UP1 (Reprocessing Plant)**
Mission: Reprocess magnesium-clad natural uranium metal fuels from military or gas/graphite power reactors.
Design Basis: Mechanical declad; PUREX flowsheet; contact maintenance; capacity 400-450 tU/a of gas/graphite reactor fuel, in addition to military fuel load.
History: Startup, 1958; total gas/graphite power reactor fuels processed up to 11/85: 2,000 t.
- * **AVM (Ateliers de Vitrification de Marcoule)**
Mission: Demonstrate AVM process: vitrify Marcoule UP1 wastes.
Design Basis: Rotary calciner feeding an induction-heated metallic melter; capacity, 30 t/hr HLLW feed and 360 kg/day (1 canister) borosilicate glass product; waste form, glass blocks 0.5 m dia x 1.0 m high.
History: Hot startup, 6/78; as of 7/15/85, 956 m³ of HLLW had been vitrified (1,233 canisters).
- * **Incinerator** * **Bituminization Facility**

DAM (Directorate of Military Applications)

Direction des Applications Militaires
 Commissariat a l'Energie Atomique
 31-33 Rue de la Federation
 F-75752 Paris, Cedex 15
 France

FBFC (Franco-Belge Company for Fuel Fabrication)

Societe Franco-Belge de Fabrication de
 Combustibles
 Avenue Bertie Albrecht
 F-75008 Paris
 France

Tel: 33-14-766-5200
 Tlx: 290503

Facilities

- * **Fuel Fabrication Plant** (Romans, France)
Mission: Fabricate UO_2 fuels for power reactors.
Design Capacity: 400 t/a (to be increased to 600 t/a).
- * **Fuel Fabrication Plant** (Dessel, Belgium)
Mission: Fabricate UO_2 fuels.
Design Capacity: 400 t/a.

PARIS SCHOOL OF MINES

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

Tel: 33-16-422-4821
 Tlx: 600736 MINEFON

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

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

SGN

Societe Generale pour les
Techniques Nouvelles
1 Rue des Herons,
Montigny la Bretonneux
F-78184 St.-Quentin-en-Yvelines
Cedex, France

Tel: 33-13-058-6000
Tlx: 698316 F

President Louis Pradere
Managing Director Pierre B. de la Combe
Technical Director Claude Bernard

SGN US Operations
2550 M Street NW, Suite 400
Washington, DC
USA

Tel: 202-857-0713
Tlx: 89-2605
Fax: 202-822-9438

IN

Transnucleaire
11 Rue Christophe-Colomb
F-75008 Paris
France

Tel: 33-14-723-7850
Tlx: 280992

General Manager Bernard Savornin
Technical Manager Paul Blum

GERMANY
(Federal Republic of Germany)

GERMANY (FRG)

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year
April 17	Good Friday
April 19-20	Easter
May 1	May Day
May 28	Ascension
June 7-8	Pentecost
June 17	Day of Unity
December 25-26	Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time period: 03/29 - 09/26/87

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 1.8295 Mark (DM)
per Wall Street Journal, 01/30/87. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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

US EMBASSY - BONN

American Embassy	
Deichmannsaue	
D-5300 Bonn 2	Tel: 49-228-3391
Federal Republic of Germany	Tlx: 885-452
Science Counselor	Edward M. Malloy

ENERGY

Population	1984	59 million
Electric Power Plant Capacity	1984	89.9 GWe 16% nuclear
	1985	93.3 GWe 17% nuclear
	1990	92.9 GWe 24% nuclear
Electric Power Production	1984	394.9 TWh-- 61% coal 24% nuclear 8% gas 5% hydro/geoth. 2% oil
	1985	31% nuclear
	1990	34% nuclear

NUCLEAR POWER

Policy: Strong federal support for LMFBR and HTGR demonstration projects. Emphasis on LWR.

Nuclear Power Plant Capacity	1987	18.9 GWe
	1990	18.9 GWe
	1995	23.0 GWe
	2000	26.0 GWe
Reactor Mix	1986	PWR: 12 (1972-86)
		3 (1988-89)
		BWR: 7 (1972-85)
		FBR: 1 (1987)
		HTR: 1 (1986)

INDUSTRIAL FUEL CYCLE

Policy: Full commercial capability --enrichment; fuel fabrication; domestic reprocessing of standard LWR fuels; plutonium recycle to FBRs and LWRs. Immediate reprocessing load is to be handled by foreign plants.

Waste Management Strategy: Vitrification of HLW and interim storage of HLW glass for at least 10 years; disposal of reprocessing wastes in salt-dome repository; disposal of reactor and decommissioning wastes in salt repository or abandoned iron mine.

Germany (FRG)

Cumulative Spent Fuel	1980	960 tU
Arisings (LWR)	1985	2,250 tU
	1990	4,550 tU
	2000	11,000 tU
Cumulative Waste Arisings	2000	LLW 250-500,000 drums
		ILW 70-100,000 drums
		HLW 4,600 blocks glass

Industrial-Scale Activities

- * Uranium mining and milling (tU/a): 100.
Uranium enrichment (tSWU/a): 1985--100, 1986--400.
- * Fuel fabrication
 - UO₂ fuel: 950 tU/a
 - MOX fuel: either 40 tHM/a for LWR fuels or 10 tHM/a for FBR fuel elements (ALKEM).
- * AFR spent fuel storage
 - 1,500 t, dry storage (Gorleben), startup 1987.
 - 1,500 t, dry storage (Ahaus), stopped by court order.
- * Fuel reprocessing plant (350 to 500 t/a)--to be constructed near Wackersdorf, Bavaria. Approval process started 1985.

Major Milestones

- * Spent fuel AFR at Gorleben 1987
- * Fuel reprocessing plant/Wackersdorf 1996
- * Konrad iron mine repository 1992
- * Gorleben repository, HLW 1995/2003
- * Acceptance of HLW from Cogema/La Hague 1990

INTERNATIONAL RELATIONSHIPS

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

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

Germany (FRG)

DOE/BMFT Implementing Agreement for Asse Mine Studies

- Term: 10-1-81 to 10-1-86.
- Scope: In-situ studies of brine migration, test equipment, performance of materials, thermal effects.

DOE/BMFT Implementing Agreement for HLW Immobilization Studies

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

SNL/BAM Implementing Agreement for Transportation Research

- Term: 1-1-85 to 12-1-87.
- Scope: Cask development and design; transportation packaging; risk analysis.

Member of EC, IAEA and OECD/NEA. Partnership with the Netherlands and the UK in URENCO uranium enrichment consortium, with France and the UK in United Reprocessors GmbH (DWK) and Nuclear Transport, Ltd. (Transnuklear), with Belgium and The Netherlands in FRG SNR-300 LMFBF demonstration project. Small interest in SuperPhenix project (France).

ORGANIZATION

- * Federal Government
 - Coordinates FRG nuclear program
 - Sponsors R&D
 - Builds and operates radioactive waste disposal facilities (through PTB)
 - Sets licensing rules
- * States (Laender)
 - License nuclear plants
 - Provide LLW interim storage area
- * Utilities
 - Provide spent fuel storage, reprocessing and waste treatment
 - Pay for waste disposal

GOVERNMENT RESPONSIBILITIES—NUCLEAR FUEL CYCLE/W MANAGEMENT

BMFT (Federal Ministry for Research and Technology)

- | * Government Fuel Cycle/Waste Management Program Administration
- |
- |— GSF/IfT
 - | * FRG Lead Geologic Waste Disposal R&D
 - | * Supporting Lab Work - Salt Properties
 - | * Asse II Studies
 - | * Konrad R&D
- |
- |— KfK
 - | * LWR/FBR Spent Fuel Reprocessing R&D
 - | * LWR Fuel Cycle Waste Treatment/Packaging R&D
 - | * LWR Spent Fuel Management Alternatives R&D
 - | * HLW Vitrification R&D - PAMELA Support
- |
- |— KFA
 - | * HTGR Fuel Cycle
 - | * Waste Treatment
- |
- |— HMI
 - | * Waste Form Characterization Techniques/Properties

BM (Federal Ministry for Economics)

- |
- |— BGR
 - | * Geologic Survey
 - | * Salt Dome Repository R&D (Salt Properties, Rock Mechanics)
- |
- |— PTB
 - | * Fuel Storage/Disposal Licensing
- |
- |— DBE
 - | * Construction/Operation (Repositories)

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

- | * State Licensing Procedures
- | * Nuclear Safety/Radiation Protection
- |
- |— RSK (Reactor Safety Commission)
- |
- |— SSK (Radiation Protection Commission)

LAENDER (State Governments)

- | * Licensing

INDUSTRIAL/UNIVERSITY RESPONSIBILITIES

EWK (Utility Consortium)

DMK (Owned by FRG Nuclear Utilities)

- | * Fuel Reprocessing/Waste Conditioning Services
- | * Funding of Waste Disposal Services Provided by Federal Government
- | * Construction/Operation of PAMELA Pilot Plant
- | — WAK (DMK Subsidiary)
- | * Reprocessing Pilot Plant
- | * DMK R&D Program Management
- | — BLG (DMK Subsidiary)
- | * Gorleben Spent Fuel/LLW Storage Facilities Operation

NUKEM (Owned by Degussa, 45%; RWE, 25%, RTZ, 18%; MG, 12%)

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

ALKEM (Owned by NUKEM, 40%; KWU, 60%)

- * MOX Fuel Fabrication R&D/Production
- * TRU Waste Treatment

TRANSNUCLEAR (Owned by NUKEM, 67%; Transnucleaire SA, 33%)

- * Shipping Cask Development/Production
- * Portable LLW Solidification
- * Transportation of Radioactive Materials

TUM (Technical University Munich)

- * Actinide Chemistry R&D

ALKEM

ALKEM GmbH
Postfach 110069
D-6450 Hanau 11 (Wolfgang)
Federal Republic of Germany

Tel: 49-6181-58-0
Tlx: 418-4124 rbu d

Directors Horst Roepenack
49-6181-58-4600
Dr. Wolfgang Stoll
49-6181-58-4666

Waste Management Dr. Volker Schneider
49-6181-58-4590
Dr. F.-W. Ledebrock
49-6181-58-4155

Facilities

- * MOX Fuel Fabrication Plant
Capacity: 40 t/a, LWR fuel; 10 t/a, FBR fuel.

BAM (Federal Materials Research/Testing Institute)

Bundesanstalt fuer Materialforschung
und -pruefung (BAM)
Unter den Eichen 87
D-1000 Berlin 45
Federal Republic of Germany

Tel: 49-30-8104-1
Tlx: 18-3261 BAMB D

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

Bundesanstalt fuer Geowissenschaften
und Rohstoffe
Stilleweg 2
D-3000 Hannover 51
Federal Republic of Germany

Tel: 49-511-6468-1
Tlx: 92-3730 bfb

Director, Division 2, General/Technical Geology Prof. Helmut Venzlaff
Director, Subdivision, Engineering Geology Prof. Michael Langer

Rock Mechanics Prof. A. Pahl
Soil Mechanics Dr. R. Luedeling
Salt Mechanics Dr. H. Albrecht
Rock Mech. in Mining/Tech. Res. Dr. D. Meister
Rad. Waste Disposal Dr. W. Jaritz
Underground Storage Dr. H. Reum
Hydrogeology Dr. H. Vierhuff
Groundwater Geophysics Dr. W. Giesel

BMFT (Federal Ministry for Science and Technology)

Bundesministerium fuer Forschung
und Technologie

Heinemannstrasse 2

Postfach 200706

D-5300 Bonn 2

Federal Republic of Germany

Tel: 49-228-591

Tlx: 88-5674 BMFT

Fax: 49-228-593-105

Minister, Science/Technology

Dr. Heinz Riesenhuber

Director General, Energy/

Dr. Guenter Lehr

Environment/Raw Materials

Director, Energy Sci. Tech.

Dr. Manfred Popp

Reprocessing/Recycling

Dr. Rolf-Peter Randl

49-228-59-3275

Waste Disposal

Dr. Hamacher

49-228-59-3282

Repository Programs

Helmut H. Geipel

Waste Treatment

Dr. Karlheinz Huebenthal

BMU (Federal Ministry for Environmental
Protection and Reactor Safety)

Bundesministerium fuer Umwelt,

Naturschutz und Reaktorsicherheit

Husarenstrasse 30

D-5300 Bonn 1

Federal Republic of Germany

Tel: 49-228-6811

Tlx: 88-6664

Minister

Dr. Walter Wallmann

Chairman, Reactor Safety

Prof. Dr. Adolf Birkhofer

Commission (RSK)

Chairman, Radiation Protection

Prof. Oberhausen

Commission (SSK)

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

Deutsche Gesellschaft zum Bau und Betrieb

von Endlagern fuer Abfallstoffe mbH (DBE)

Woltorfer Strasse 74

D-3150 Peine 1

Federal Republic of Germany

Tel: 49-5171-43-100

Tlx: 92-646 dbe d

Project Gorleben

Gernot Gruebler

Project Konrad

G. Holtz

Project-Related R&D

Hans Engelmann

DHI (German Hydrographic Institute)

Deutsches Hydrographisches Institut
Isotopenlaboratorium
Bernhard-Nacht-Str. 78
P.O. Box 220
D-2000 Hamburg 4
Federal Republic of Germany

Tel: 49-40-3190-1
Tlx: 21-1138 bmvhh d

President Prof. Gerhard Zickwolff

DNK (German Fuel Reprocessing Company)

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

Tel: 49-511-3390-0
Tlx: 9-220-202 dwk
Fax: 49-511-339-0699

Brd.Memb.-Eng./Tech. Director Joachim Mischke
Board Member/Plant Operations Dr. Walter Weinlaender
Waste Management Dr. Klaus Einfeld
Project Direction Dr. Klaus W. Storck
Project PAMELA Dr. Knut Scheffler
PAMELA Manager *Horst Wiese
* DNK-PAMELA Tel: 32-14-240-400
c/o Belgoprocess
Gravenstraat
B-24800 Dessel, Belgium

Facilities

- * **AFR Spent Fuel Storage Facilities** (Gorleben and Ahaus sites)
Design Basis: Dry storage in CASTOR casks - 400 casks in a building which has dimensions of 600 ft x 125 ft x 62 ft high; capacity, 1500 t.
Milestone: Startup of Gorleben AFR, 1987.
- * **Fuel Reprocessing Plant** (Wackersdorf, Bavaria)
Mission: Demonstrate operability and safety of small commercial plant; reprocess spent LWR fuels commercially.
Design Basis: Shear-leach head-end; PUREX process; capacity, 350 t/a.
Milestone: Startup, 1996.
- * **Lahde R&D Development Facility** (90 km west of Hannover)
Mockup of remote handling equipment for the Wackersdorf reprocessing plant.

DMK (contd)

- * **PAMELA Pilot Plant** (Mol, Belgium)
Mission: Demonstrate ceramic melter and VITROMET production with stored Eurochemic LEWC.
Design Basis: liquid-fed ceramic melter, 0.72 m² surface area; capacity, 36 l/hr feed, 25 kg/hr glass (3 canisters/day @ 150 kg glass/canister); product, either borosilicate glass blocks or VITROMET, 0.3 m dia by 1.2 m high.
History: Hot operation, startup 1985. (KfK development)

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

Gesellschaft fuer Strahlen- und
Umweltforschung mbH Muenchen,
Institut fuer Tief Lagerung
Theodor-Heuss-Strasse 4 Tel: 49-531-8012-1
D-3300 Braunschweig Tlx: 2627-531-8228 IFT
Federal Republic of Germany Fax: 49-531-8012-200

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

Director, and	Dr. Klaus Kuehn
Director, Disposal Technology	49-531-8012-231
Engineering Development	Alfred Beinlich
Geotechnology	Manfred W. Schmidt
Test Fields	Tilman Rothfuchs
	49-5336-89232
Geophysics	Dr. D. Flach
Director, Safety Technology	Dr. Werner Hild
Safety Analysis	Dr. Richard Storck
Geology	Dr. T. Brasser
Geochemics	Dr. Hermann J. Gies
Director, Project Management	Dr. Werner Brewitz
ILW/HLW Project	Dr. Rolf Stippler
Gorleben	Juergen Kunze
Asse	Dr. Helmut Fleck
Konrad	Wolfgang Busch

Schachtanlage Asse Tel: 49-533-6891
D-3345 Remlingen
Kreis Wolfenbuettel
Federal Republic of Germany

Director, Mine Operations	Klaus Duerr
Mine Manager	Oswald Opp
Tech. Planning	Helmut Kolditz
Radiation Protection	Dr. Mueller-Lyda

GSF/IfT (contd)

Facilities

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

HMI

Hahn-Meitner Institut fuer Kernforschung, GmbH
Postfach 390128
Glienicker Strasse 100
D-1000 Berlin 39
Federal Republic of Germany

Tel: 49-30-8009-1
Tlx: 18-5763

Scientific Technical Director Prof. Dr. H. Lindenberger
Managing Director Dr. M. Nettesheim
Reactor Chemistry Section Dr. Werner Lutze
(HMI Waste Program)

KFA (Juelich Nuclear Research Center)

Kernforschungsanlage Juelich GmbH
Postfach 1913
D-5170 Juelich
Federal Republic of Germany

Tel: 49-2461-610
Tlx: 83-3556

Director, Institute of Prof. Dr. Erich Merz
Chemical Technology 49-2461-61-5299
Reproc./Final Storage Dr. Erich Zimmer
HTGR Fuel Cycle Project Dr. G. Kaiser
Director, Decon. Inst. Dr. Manfred Laser
Director, Reactor Mtls. Inst. Prof. Dr. H. Nickel

Facilities

- * **FIPS II** (radioactive)
Mission: Develop HLW vitrification technology.
Design Basis: Denitration to form sludge, drum dryer, in-can melter. Capacity, 1 kg/hr glass; product, phosphate or borosilicate glass.
History: Hot operation, 1986 (FBR work and ILW vitrification projects by KfK) expected to be closed down early 1988.

KfK (Karlsruhe Nuclear Research Center)

Kernforschungszentrum Karlsruhe GmbH
 Postfach 3640 Tel: 49-7247-821
 D-7500 Karlsruhe 1 Tlx: 78-26484
 Federal Republic of Germany Fax: 49-7247-82-5503

(Convenient route from US is by plane to Frankfurt and by train or car to Karlsruhe.)

Director, Waste Treatmt. (HDB)	Wolfgang Pfeiffer
Manager, Fuel Reproc./Waste	Dr. Reinhard Kroebe
Mgmt. Project (PWA)	49-7247-82-2032
Director, Inst. for Hot Chem.	Prof. Klaus Ebert
Deputy Director	Dr. Gunter Koch
Director, Institute for Nuc.	Dr. Helmut Krause
Waste Tech. (INE)	49-7247-82-2230
Final Disposal	Dr. R. Koester
	49-7247-82-2302
Chemistry (WMRD)	Dr. Horst Penttinghaus
Process Engineering	Dr. S. Weisenburger
Director, Institute for	Prof. Ache
Radiochemistry (IRCh)	
Director, Ctrl. Eng. Dept. (IT)	Dr. Hermann Rininsland
Remote Handling	G. Boehme
Director, Lab. for Aerosol	J. Wilhelm
Phys./Filter Tech. (LAF II)	

Facilities

- * **MILLI Hot Cell Facility** (fuel reprocessing)
Mission: LWR and FBR fuel reprocessing R&D.
- * **MINKA Hot Glove Boxes** (U and Pu)
Mission: Extraction code verification for pulsed columns and maloperation experiments.
Design: Small scale pulse columns first extraction cycle.
History: Startup: U - 1985, Pu - 1986.
- * **PUTE Hot Facility** (fuel reprocessing)
Mission: U/Pu Separation.
Design Basis: Pulsed Columns, Electr. Chem. Reduction.
History: Startup 1982.
- * **PUSTA Facility** (fuel reprocessing)
Mission: Development of Pulsed Plate Columns Design Data, Correlation Equations.
Design Basis: Columns of 100 mm, 210 mm, and 350 mm diameter.
History: Startup, 1984.

KfK (contd)

- * **KRETA**
Mission: Develop ⁸⁵Kr recovery technology.
(Project completed August/1985).
Design Basis: Cryogenic distillation; capacity, 50 m³/hr.
- * **PASSAT Facility**
Mission: Development and testing of DOG filters.
Design Basis: Packed fiber mist eliminators, HEPA-filter, iodine-filter.
History: Startup, 1978 (prog. completion, 1987).
- * **BEATE Facility**
Mission: Aerosol source term destination and VOG-behavior.
Design Basis: Stirring and transport of liquids by air and steam.
History: Startup, 1983 (prog. completion 1987).
- * **Ceramic Melter (nonradioactive)**
Mission: HLW vitrification process development with ceramic melter for the PAMELA pilot plant and for the WA-350.
Design Basis: Liquid-fed joule heated melter; PAMELA capacity: 30 l/hr HLLW or 30 kg/hr glass; WA-350 capacity: 80 l/hr HAWC evaporation.
History: Startup, 1981; WA-350 melter, 1985/86.
- * **ALONA (radioactive acid digestion pilot plant built and operated by KfK at Mol, Belgium)**
Mission: Demonstrate acid digestion of combustible TRU wastes.
Design Basis: Treatment with H₂SO₄-HNO₃ in thermal loop system. Capacity, 1,000 m³/a.
History: Startup, 1982; terminated 1985.
- * **Waste Concreting Plant (radioactive)**
Mission: Immobilize KfK ILW.
Design Capacity: 2.5 t/day waste.
History: Startup, 1977.

NUKEM

NUKEM GmbH
Rotenbacher Chaussee
Postfach 110080
D-6450 Hanau
Federal Republic of Germany

Tel: 49-6181-58-0
Tlx: 41-84113 nuk d

Germany (FRG)

Managing Directors	Manfred Stephany P. Jellinek-Fink Dr. K. G. Hackstein H. Pirk Dr. Hubertus Brunner
Process Engineering	
Research and Development	

PTB (Federal Science/Engineering Institute)

Physikalisch-Technische Bundesanstalt
Bundesallee 100
D-3300 Braunschweig
Federal Republic of Germany

Tel: 49-531-5921
Tlx: 95-2822 ptb d

Director	Prof. Dr. H. Roethemeyer
Director, Division Storage/ Radwaste Disposal	Prof. Dr. Horst Schneider 49-531-592-7620
Waste Product	Dr. Ernst Warnecke
Radiation Safety	Dr. Ehrlich
R&D, Accident Analysis	Dr. Illi
Explorations/Mine Construction	G. Wosnick
Director, Subd. Fuel Matls.	Dr. W. Collin
Transport Licensing	M. Blechschmidt (acting)
Interim Stor. Fac. Licensing	M. Blechschmidt

Facilities

- * **Gorleben Disposal Site** (20 km NE of Braunschweig)
Mission: Dispose of high-level and TRU wastes.
Repository Concept: 65 m deep boreholes in tunnel floors at depths of 800-1000 m in the Gorleben salt dome.
Milestone: Startup, 1995.
 - * **Konrad Iron Mine** (10 km SW of Braunschweig)
Mission: Disposal of low-level and decommissioning wastes. Hard-rock disposal R&D.
Milestone: Startup as disposal site, 1992
- Mine Manager M. Kubetzy
49-534-127-3588

TRANSNUKLEAR

Transnuklear GmbH
Postfach 110030
D-6450 Hanau 11
Federal Republic of Germany

Tel: 49-6181-580
Tlx: 41-84123 tnf d

Executive Dr. Peter Vygen

TUM (Technical University Munich)

Technische Universität München
Walther-Meißner-Strasse
D-8046 Garching (München) Tel: 49-89-21051
Federal Republic of Germany Tlx: 52-2854 tumue d
Director, Radiochem. Institute Prof. Franz Baumgaertner

WAK (Fuel Reprocessing Company)

Wiederaufarbeitungsanlage Karlsruhe
Betriebsgesellschaft mbH
Postfach 220
D-7514 Eggenstein-Leopoldshafen 2 Tel: 49-7247-881
Federal Republic of Germany Tlx: 78-26893 wak d

(WAK and the WAK plant are located next to Karlsruhe Nuclear Research Center. WAK is a subsidiary of DWK.)

Chief Executive	Dr. Walter Schueller 49-7247-88-204
R&D Division	Dr. Karl-Dieter Kuhn 49-7247-88-506
Reprocessing Plant Manager	Dr. Hans-Otto Willax 49-7247-88-434

Facilities

- * **WAK Reprocessing Plant** (owned by KfK)
Mission: Reprocess UO_2 fuels; recover plutonium for recycle; test advanced technology.
Design Basis: Chop-leach head-end; PUREX process; capacity, 175 kg HM/day.
History: On-line from 9/71 to early 1980, when it was shut down for dissolver replacement. Total throughput to 1980, 115 tHM (43 tHM from LWR fuel). Operation resumed, October 1982.
- * **TEKO Hall** (cold semi-works, owned by KfK)
Mission: Test fuel cycle components and unit operations; currently being equipped for fuel reprocessing studies.
Design Basis: Shear, dissolver, centrifuge, solvent extraction battery; head-end capacity, 4 tHM/day.

Manager Dr. Klaus Eiben
49-7247-88450

INDIA

INDIA

HOLIDAYS

Jan.1	New Year	Aug. 15	Independence
January	Id-ul-Fitr	August	Janmashtami
Jan. 26	Republic Day	Sept.	Anant Choudas
February	Vasanta	October	Dussehra
February	Maha Sivarati	October	Diwali
March	Holi	Oct. 2	Gandhi's Birth
March	Dulhendi	October	Bhaiya Dooj
April	Durga Ashtmi	November	Guru Nanak's
April	Muharram		Birthday
April	Mahavir Jayanti	December	Singh's Birth
Apr. 13	Baisakhi	Dec. 13	Bank Holiday
August	Raksha Bandhan		

TIME

Standard Time Washington D.C.: + 10.5 hours

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 13.01 Rupee
per Wall Street Journal, 01/30/87. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

US EMBASSY - NEW DELHI

American Embassy	
Shanti Path, Chanakyapuri 110021	
New Delhi	Tel: 11-91-60-0651
India	TLx: 031-65269 WEF
Science Counselor	S. Ahmed Meer

INDIA

ENERGY

Population	1984	173 million
Electric Power Plant Capacity	1982	35 GWe
	1985	50 GWe
Electric Power Production	1982	107 TWh--
		50% coal
		42% hydro
		6% oil
		2.7% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity	1987	1.3 GWe
	1990	1.7 GWe
	1995	3.0 GWe
	2000	5.9 GWe
Reactor Mix	1986	BWR: 2 (1969)
		HWR: 4 (1973-85)
		2 (1988/89)
Reactor Development	1985	FBR 12-15 MWe test unit
	1990	FBR 500 MWe commercial

INDUSTRIAL FUEL CYCLE

Policy: Achieve self-sufficiency in CANDU-type fuel cycle--uranium milling, conversion to UO_2 , fuel fabrication, reprocessing (in small plants adjacent to power stations); if enriched UF_6 supply for India's BWRs is cut off, they may fuel with UO_2 -Pu O_2 .

Waste Management Strategy: Vitrification of HLW, interim storage for at least 20 years and disposal in a granite or gneiss formation.

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

INDIA

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 production (t/a): 1981--300; additional capacity is planned, sufficient to yield a 13,000 t inventory by the year 2000.
- * Uranium mining and milling (t/a): 200.
- * UO₂ fuel fabrication (t/a): 1981--100; 1984--210.
- * Fuel reprocessing:
 - Trombay pilot plant, 30 t/a (1962--)
 - Tarapur plant, 100 t/a (1982--)
 - Kalpakkam plant, 100 t/a.
- * HLW vitrification: Tarapur (1985--)

Major Milestones

- * Interim Storage/Waste Immobilization Plants
 - Trombay 1990
 - Tarapur 1990
 - Kalpakkam 1993

ORGANIZATION

```

Prime Minister
|
|-- Department of Atomic Energy
|   |
|   |-- Atomic Energy Commission
|       |
|       |-- Atomic Minerals
|       |
|       |-- Nuclear Fuels
|       |
|       |-- Power Project Engineering
|       |
|       |-- Research and Development
|           |
|           |-- Reactor Research Center (Kalpakkam)
|               |
|               * Fuel Cycle R&D
|               * Waste Management
|           |-- Bhabha Atomic Research Center
|               |
|               * Fuel cycle R&D
|               * Waste management
  
```

BARC

Bhabha Atomic Research Centre
Trombay, Bombay 400 085
India

Director, Nuclear Safety Group	V. N. Meckoni
Waste Management Division	N. S. Sunder Rajan
Central. WM Facil., Kalpakkam	R. V. Amalraj
Radiol. Protection Division	K. G. Vohra
Director, Chem. Engineering Group	B. K. Garg
Fuel Reproc. Div. PreFre	A. N. Prasad

Activities: BARC has five test reactors; radiochemistry and isotope laboratories; an isotope production and processing unit; pilot plants for production of heavy water, zirconium, titanium, etc.; a thorium plant; a uranium metal plant; a 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/day.
History: On-line, 1965-1974; modified and being readied to operate again.
- * **HLW Vitrification Plant**
Construction start, 1981 - Commissioning, 1990.

DAE

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

Atomic Energy Commission (AEC)
Chairman Dr. Raja Ramanna

DAE (contd)

Atomic Energy Regulation Board (AERB)

Chairman A. K. De (Inst. of Tech.)
Function: Regulation and licensing of nuclear facilities.

Nuclear Power Board

Chairman Dr. M. R. Srinivasan
Function: Design, construction, and operation/maintenance of nuclear power stations.

KOLAR WASTE DISPOSAL RESEARCH STATION

Located in the Kolar gold mine area of the Karnataka State.

Mission: Assess the suitability of peninsular gneisses for location of a repository (in situ studies).

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

History: Startup, late 1979.

MADRAS ATOMIC POWER PROJECT

Madras Atomic Power Project
 Kalpakkam, India

Mission: Nuclear power production, FBR development, fuel reprocessing and waste treatment, plutonium fuel fabrication for FBRs.

Fuel Cycle R&D: FBR technology, reprocessing of FBR fuels.

Facilities

- * **Kalpakkam Fuel Reprocessing Plant**
Mission: Reprocess spent fuel from the Kalpakkam reactors and from the 15-MW FBTR commissioned 1985.
Design Basis: PUREX process, with a separate line for FBTR mixed-carbide fuels; capacity, 0.5 tHM/day for PHWR fuels.
- * **Kalpakkam Fuel Reprocessing Laboratory**
Mission: Develop and test equipment and unit operations for FBR fuel reprocessing.
- * **Kalpakkam HLW Vitrification Plant**
 Construction start, 1983 - Commissioning, 1993.

TARAPUR ATOMIC POWER STATION

Tarapur Atomic Power Station
Tarapur, Maharashtra
India

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

Facilities

- * **Tarapur Fuel Reprocessing Plant (PreFre)**
Mission: Reprocess natural and low-enriched UO₂ fuels.
Design Basis: Chop-leach head-end; PUREX flow-sheet; contact maintenance; capacity, 0.5 tHM/day.
History: Construction completed, 1975; hot operation, 12/82.
- * **WIP (Waste Immobilization Plant)**
Mission: Vitrify Tarapur HLW.
Design Basis: Two-step calcination and melting in drainable pot; capacity, 25 l/hr HLLW, 125 kg glass/canister, 1 canister/day; product, borosilicate glass blocks.
History: Construction completed 1981. Hot startup 1985.
- * **Solid Storage Surveillance Facility**
Mission: Provide air-cooled storage for WIP products.
Design Basis: Stack-induced natural-draft air cooling; capacity for 20 years' storage of Tarapur and Trombay waste.
- * **ILW Bituminization Plant**
- * **Polymerization Facility**

ITALY

ITALY

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year
April 17	Good Friday
April 19-20	Easter
April 25	Liberation Day
May 1	Labor Day
June 7-8	Pentecost
August 15	Assumption
November 1	All Saints
December 8	Immaculate Conception
December 25-26	Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time period: 03/29 - 09/26/87

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 1655.00 Lira
per Wall Street Journal, 01/30/87. 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.

US EMBASSY - ROME

American Embassy	
Via Veneto 119/A	
I-00187 Rome	Tel: 39-6-46-742
Italy	Tlx: 61-0450 AMBRMA
Science Counselor	Gerald J. Whitman

ITALY

ENERGY

Population	1984	58 million
Electric Power Plant Capacity	1984	54.0 GWe 2% nuclear
	1985	56.0 GWe 2% nuclear
	1990	64.4 GWe 3% nuclear
Electric Power Production	1984	182.7 TWh-- 41% oil 26% hydro/geoth. 15% coal 14% gas 4% nuclear
	1985	4% nuclear
	1990	8% nuclear

NUCLEAR POWER

Policy: National government supports nuclear power growth, but is hampered by financial/siting problems and public resistance.

Nuclear Power Plant Capacity	1987	1.3 GWe
	1995	3.1 GWe
	2000	5.7 GWe
Reactor Mix	1985	GCR: 1 (1964)
		PWR: 1 (1965)
		BWR: 1 (1981)
		2 (1990)
		HWR: 1 (1987)
Reactor Development		HWR, FBR

INDUSTRIAL FUEL CYCLE

Policy: Reprocess spent fuel and recycle Pu to breeders; develop indigenous fuel cycle and waste treatment capability.

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

Cumulative Spent Fuel Arisings (LWR)	1980	160 tU
	1985	330 tU
	1990	520 tU
	2000	2,000 tU

INTERNATIONAL RELATIONSHIPS

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

ORGANIZATION

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

ENEA (National Organization for Nuclear and Alternative Energy Sources)

ENEA

Regina Margherita 125
I-00198 Rome
Italy

Tel: 39-6-85281
Tlx: 61183

President
Director General

Prof. Umberto Colombo
Dr. Fabio Pistella

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

ENEA-CASACCIA

ENEA-Casaccia Center
C.P. 2400
I-00100 Rome
Italy

Tel: 39-6-9481
Tlx: 613296

Director, Fuel Cycle
Waste Management
Reprocessing

Dr. Paolo Venditti
Dr. B. Dello Vicario
Dr. G. Rolandi

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

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

ENEA-SALUGGIA

ENEA-Impianto Eurex
I-13040 Saluggia (Vercelli)
Italy

Tel: 39-161-48415
Tlx: 38-0058 EURI

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

Director, Eurex Pilot Plant
Deputy Director, Eurex

Dr. Franco Pozzi
Dr. Arnolfo Hall

Function: Applied nuclear research

Facilities

- * **EUREX** (fuel reprocessing pilot plant-radioactive)
Mission: Reprocess MTR and low-enriched uranium (including UO_2) fuels.
Design Basis: EUREX process for MTR fuel has capacity of 30 kg U-A1/day. Plant will be modified for LWR fuel.
History: Built and operated under a CNEN-Euratom convention 1964-1983. Startup, 1970. CANDU fuels from Canada processed in 1983. A unit will be added for MOX fuel reprocessing.
- * **IVEX** (HLW vitrification plant-radioactive) - Planned
Mission: Immobilize EUREX HLW.
- * **IFEC** (fuel element fabrication)

ENEA-TRISAIA

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

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

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

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

Facilities

- * **ITREC** (fuel reprocessing pilot plant-radioactive)
Mission: Special fuel reprocessing R&D; reprocess thorium and MOX (FBR) fuels.
Design Basis: Chop-leach headend; maintenance by remote removal of modules; capacity, 15 kg HM/day (ThO₂ and UO₂).
History: Startup, 1975.
- * **IVET-1** (vitrification pilot plant-nonradioactive)
Owner: ENEA and AGIP.
Mission: Develop full-scale HLW vitrification process.
Design Basis: IVET-1 pot vitrification (rising-level process); capacity, 20 l/hr feed; product, borosilicate glass cylinders, 0.25 m dia x 1 m.
History: Startup, July 1980.
- * **IVET-2** (HLW vitrification pilot plant-radioactive)
 - Planned
Owner: ENEA.
Mission: Process development; solidify HLW from EUREX fuel reprocessing pilot plant.
Design Basis: Pot vitrification (rising-level process); capacity, 15 l/hr feed (2 canisters/wk) or 10 m³ HLW/a; product, borosilicate glass cylinders, 0.25 m dia x 1 m.
History: Startup, late 1980s.

ENEL (National Electric Energy Agency)

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

Tel: 39-6-85091
 Tlx: 610518

President: Franco Viezzoli
 Vice President: Dr. Marcello Inghilesi
 Director General: Dr. Alberto Negrone

Government agency, responsible for all electric power production.

ENI

Ente Nazionale Idrocarburi SPA
 Piazza Enrico Mattei
 I-00144 Rome
 Italy

Tel: 39-6-59001
 Tlx:

President: Dr. Franco Reviglio

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

NUCLECO

Nucleco
 Via Anguillarese 351
 I-00060 Rome
 Italy

Tel: 39-6-948-3052
 Tlx: 61-3296 ENEA CAI

President: Ing. Silvio Cao

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

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

SNIA TECHINT

Snia Techint
 Tecnologie Energetiche Avanzate SpA
 Via A. Bregoni 34
 I-00153 Rome
 Italy

Tel: 39-6-589-4041
 Tlx: 61-4354 SNITEC

General Manager: Dr. Marino Fiorelli

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

JAPAN

JAPAN

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year
January 15	Adult's Day
February 11	National Foundation
March 21	Vernal Equinox
April 29	Emperor's Birthday
May 3	Constitution
May 5	Children's Day
September 15	Respect for the Aged
September 23	Autumnal Equinox
October 10	Physical Culture Day
November 3	Culture Day
November 23	Labor Thanksgiving

TIME

Standard Time Washington D.C.: + 14 hours

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

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per Wall Street Journal, 01/30/87. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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US EMBASSY - TOKYO

American Embassy	
10-1, Akasaka 1-chome, Minato-ku	
Tokyo 107	Tel: 81-3-583-7141
Japan	Tlx: 24-22118
Science Counselor	Dr. Richard W. Getzinger
DOE Representative	Robert M. Jackson

ENERGY

Population	1985	119.5 million
Electric Power Plant Capacity	1985	154 GWe
		16% nuclear
	1995	205 GWe
		23% nuclear
Electric Power Production	1985	603.9 TWh--
		28% oil
		26% nuclear
		22% gas
		14% hydro/geoth.
		10% coal
	1990	685 TWh--
		28% nuclear

NUCLEAR POWER

Policy: Strong nuclear power program to lessen dependence on foreign energy sources--install LWRs for near-term needs; develop advanced HWR; aim for commercial FBR operation, approximately 2010. Supply domestic needs and build export business.

Nuclear Power Plant Capacity	1987	25.8 GWe
	1990	29.4 GWe
	1995	38.9 GWe
	2000	46.3 GWe
Reactor Mix	1986	GCR: 1 (1966)
		BWR: 16 (1970-85)
		5 (1987-90)
		PWR: 15 (1970-86)
		2 (1989/91)
		HWR: 1 (1979)
		FBR: 1 (1993)
Reactor Development	HWR (ATR), LMFBF, HTGR	

INDUSTRIAL FUEL CYCLE

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

JAPAN

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

Cumulative Spent Fuel	1980	1,450 tU
Arisings (LWR)	1985	3,700 tU
	1990	7,800 tU
	1995	12,400 tU

Industrial-Scale Activities (Capacity)

* Uranium mining and conversion (tUF ₆ /a):	200		
* Uranium reconversion (tU/a):	948		
* Uranium enrichment (tSWU/a):			
1981--50	1988--250	2000--3000	
* Fuel fabrication			
- UO ₂ (tU/a):	1986--2,475		
- MOX--FBR (t/a):	1972-- 1	1988-- 11	
ATR (t/a):	1972-- 10	1991-- 45	
* Reprocessing (t/day):	1981-- 0.7	2000-- 3.0	

Major Milestones

* Pu waste treatment facility	1987
* Uranium enrichment demonstration plant (PNC)	~1987
* HLW vitrification pilot plant (PNC)	1991
* Return of HLW from COGEMA and BNFL	~1990
* Selection of repository test site for in situ test with a simulated waste package	~1990
* MONJU LMFBR	1992
* Commercial uranium enrichment plant (Rokkashomura; FEPC/JNFI)	~1991
* Completion of URL	1992
* HLW glass storage facility (Honorobe-PNC)	1992
* Commercial LWR fuel reprocessing plant (Rokkasho-mura; FEPC)	~1995
* Selection of demonstration site for in situ test with actual waste package	~1995
* FBR fuel reprocessing pilot plant	~1997
* Commercial HLW vitrification plant	~1997
* Startup of disposal site	After 2000
* Experimental sea-dumping of LLW	TBD
* Commercial LLW storage facility (Rokkashomura; FEPC/JNFI)	TBD

INTERNATIONAL RELATIONSHIPS

DOE/PNC Umbrella LMFB Exchange Agreement

- Term: 3-4-69 to 1-31-89.
- Scope: Storage and disposal; treatment; D&D; transportation; public acceptance issues.
- Emphasis: Technical exchange of HLW and TRU waste conditioning technology.

DOE/PNC Implementing Agreement for Collaborative Testing of the Radioactive Liquid-Fed Ceramic Melter

- Term: 3-29-85 to 3-29-90.
- Scope: PNC participation in startup and operation of radioactive ceramic melter facility at PNL, including testing of PNC components and simulated waste streams in PNL facility; DOE participation in similar PNC activities.

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

- Term: 12-3-86 to 12-2-96
- Scope: HLW/TRU waste; waste form development, assay and characterization; treatment/packaging/transportation; storage/disposal; D&D; facility operations; environment/safety and public acceptance issues.
- Emphasis: Information exchange of HLW and TRU waste conditioning technology.

Member of IAEA and OECD/NEA. Cooperative agreements with Australia (SYNROC development), Canada, China, France, UK. Collaboration with Sweden and Switzerland in HLW glass characterization studies.

ORGANIZATION

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

NUCLEAR FUEL CYCLE/WASTE MANAGEMENT RESPONSIBILITIES

PARTIAL PNC ORGANIZATION

Board of Directors

PARTIAL JAERI ORGANIZATION

President

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

AEC

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

Tel: 81-3-581-2585
Tlx:

Chairman (Minister of State
for Science/Technology)
Deputy Chairman

Yataro Misubayashi
Takahashi Mukaibo

Function: Formulate national policy on nuclear energy
research, development and utilization.

CRIEPI

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

President Hiroshi Narita

Function: Provide R&D support for utilities.

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

Energy and Environmental
Research Laboratory
for Energy and Electric Power
2-11-1, Iwato-kita
Komae-shi, Tokyo 201
Japan

Tel: 81-3-480-2111
Tlx: 2423098 CRIEPI J

GIRIO

Government Industrial Research
Institute, Osaka
1-8-31 Midorigaoka, Ikeda-shi
Osaka 563, Japan

Tel: 81-727-51-8351

Director, 4th Department
Nuclear Waste Program

Dr. Ryoze Hayami
Dr. Ryohei Teraf

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

HITACHI

Hitachi, Ltd.
 6, Kanda-surugada, 4-chome
 Chiyoda-ku, Tokyo 101
 Japan

Tel: 81-3-258-1111
 Tlx: J26375 HITACHI

General Manager, Yoshitaki Korei
 Nuclear Power Generation
 Nuclear Power Development Hiromasa Kobayashi

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

Hitachi Engineering Co., Ltd.
 1-1 Saiwai-cho, 3-chome
 Hitachi-shi, Ibaraki-ken, 317
 Japan

Tel: 81-294-21-1111
 Tlx: 03645511

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

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

IHI

Ishikawajima-Harima
 Heavy Industries Co., Ltd.
 Tokyo-chu Bldg.
 6-2, Marunouchi 1-chome
 Chiyoda-ku, Tokyo 100
 Japan

Tel: 81-3-286-2185
 Tlx:

President Kousaku Inaba
 General Manager, Kugao Nojima
 Nuclear Power Division

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

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

JAERI

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

Tel: 81-3-503-6111
Tlx: J24596

President	Yoshinori Ihara
Vice President	Hiroshi Ishikawa
Vice President	Hiroshi Fukunaga
Exec. Director, International	Hakubi Sasaki

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

JAERI: OARAI

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

Tel: 81-292-67-4111
Tlx:

JAERI: TOKAI

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

Tel: 81-292-82-5111
Tlx: 3632340 J TOKAI J
3632339 JAERIF J

Vice President	Dr. Hiroshi Ishikawa
Executive Director	Dr. Shigeru Mori
Director, (DESR)	Dr. T. Iwamoto
Environmental Safety Research	
Deputy Director, DESR	Dr. K. Araki

Facilities

- * **WASTE** (glove box and hot cell facilities)
Mission: Safety evaluations for high level waste.
History: Startup: cold, 1981; hot, 1982.
- * **STEM** (simulation test for environmental radionuclide migration)
Mission: Safety evaluation for land disposal of radioactive LLW.
History: Startup, 1983.

JGC

JGC Corporation
Nuclear Project Division
New Ohtemachi Bldg.
2-1 Ohtemachi 2-chome
Chiyoda-ku, Tokyo 100
Japan

Tel: 81-3-279-5441
Tlx: 02223096 JGCTOK J

General Manager

Takao Nakajima

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

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

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

Facilities

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

JNEI

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

Tel:
Tlx:

President T. Ohgaki
V. President, U Enrichment Y. Yukawa
V. President, Envrnmtl. Adjmts. E. Okumura

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

JNES

Japan Nuclear Fuel Service Company, Ltd.
 2-2, 2-chome, Uchisaiwaicho
 Chiyoda-ku, Tokyo 100
 Japan

Tel: 81-3-580 6911

President Kenzaburo Kobayashi
 Exec., Mg. Dir. - Technology Yoshiro Kawashima
 Dir., Plant Design/Reprocessing Kentaro Nakajima

Facilities

- * **Commercial Fuel Reprocessing Plant** (located in Ohishita area of Rokkasho-mura).
Mission: Reprocess Japanese fuels.
Design Basis: 800 tHM/a; 3000 tU storage pool; HLW vitrification/storage. Cost: 700 billion yen.
Milestone: FRP startup, 1995; spent fuel storage, 1991.

KOBE STEEL

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

Tel: 81-78-251-1551
 Tlx: 562-2177 KOBSTL J
 Fax: 78-232-3459

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

Hiroyasu Komatsu
 Fumiaki Komatsu

Kobe Steel, Ltd.
 Tekko Building
 No. 8-2, Marunouchi 1-chome
 Chiyoda-ku, Tokyo 100
 Japan

Tel: 81-3-218-6408
 Tlx: 222-6736 KOBSTL J
 Fax: 3-287-2278

Nuc. Power R&D Planning
 General Manager, Engineering
 Technical Advisor

Tokuya Ishikawa
 Dr. Takeshi Okada
 81-3-459-4169
 Dr. Yasuji Nakamura

Waste Management R&D: Development of radioactive waste treatment technology.

MITI

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

Tel: 81-3-501-1511
 Tlx:

Director, Nuc. Energy Industry
 Deputy Director

Tashimitsu Arai
 Masaki Mishiro

JAPAN

MMC

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

Tel: 81-3-213-2111
Tlx: 2226533 MMCTOKJ

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

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

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

MOFA

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

Tel: 81-3-580-3311
Tlx:

Director, Nuclear Energy
Deputy Director

Hiroshi Yamada
Akio Shirota

NIRS

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

Tel: 81-472-51-2111
Tlx:

Director

Toshiyuki Kumatori

NSC

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

Tel: 81-3-581-5271

Chairman

Keisuke Misono

PNC

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

Tel: 81-3-586-3311
Tlx: 26-462 J
Fax: 81-3-586-7726

President
Vice Presidents
Exec. Director
Director, Nuclear Fuels Devel.
Waste Isolation

Masayoshi Hayashi
G. Nagane, T. Ishiwatari
Kunihiko Uematsu
M. Koizumi
T. Tsuboya
T. Mishima
T. Koizumi
K. Hashimoto
Tadatomo Yamaguchi

Director, Reprocessing
Director, Technology Mgmt.
International Cooperation

PNC Washington Office:

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

Tel: 202-338-3770
Tlx: 89-2777
Fax: 202-333-1097

Manager

Masami Katsuragawa

PNC: OARAI

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

Tel: 81-292-67-4141
Tlx: J26482

Director
Waste Management

S. Nomoto
E. Inada

PNC: TOKAI

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

Tel: 81-292-82-1111

PNC: TOKAI (contd)

Director	S. Omachi
Deputy Directors	I. Tanaka, T. Ueno
Director, Reprocessing Plant	T. Yamanouchi
Director, Processing	N. Suyama
Director, Waste Mgmt. Tech. Devel.	M. Yamamoto
Director, Plutonium Fuel	K. Kono
Director, Conversion Tech. Devel.	K. Otsuka
Director, Engineering Tech. Devel.	N. Tsunoda

Facilities

- * **Fuel Reprocessing Plant**
Mission: Reprocess low-enriched UO_2 .
Design Basis: Oxide fuels: chop-leach head-end. PUREX flowsheet; capacity, 0.7 tHM/day. Remote maintenance of chop-leach equipment; contact maintenance of other components.
History: Startup, 9/1977; 300 tU spent fuel processed through 12/86.
- * **Co-Conversion Facility**
Mission: Demonstrate PNC microwave process for co-conversion production of MOX.
Design Basis: 10 kg/day MOX (50% PuO_2 , 50% UO_2).
History: Start-up of hot operation, 10/83.
- * **Plutonium Fuel Development 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 to Date: 82 t MOX.
- * **Plutonium Fuel Fabrication Plant**
Mission: Fabricate MOX fuel for demonstration ATR and prototype FBR.
Design Basis: for fuels, 5 t/a; ATR fuels 40 t/a.
- * **Mockup Test Facilities**
Mission: Nonradioactive, full-scale and/or engineering mockup tests of processes and equipment for vitrification, FBR spent fuel reprocessing.
History: Startup, 4/82.
- * **Engineering Test Facility**
Mission: Develop engineering test of vitrification and ceramic melter technologies.
Design Basis: Joule-heated melter--9 kg/hr glass.
History: Facility startup, 2/80.

PNC: TOKAI (contd)

- * **Chemical Processing Facility** (reprocessing and HLW treatment)
Mission: Radioactive studies of FBR spent fuel reprocessing and HLW solidification processes.
Design Basis: Five standard hot cells for breeder-fuel reprocessing R&D, five cells for waste conditioning R&D. Reprocessing--1 kg/batch; HLW solidification--10 l/Batch HLW.
History: Hot tests, 9/82.
- * **⁸⁵Kr Recovery Pilot Plant**
Mission: Demonstrate ⁸⁵Kr recovery from Tokai-mura reprocessing plant offgas.
Design Basis: Cryogenic distillation and pressurized cylinder storage.
History: Cold test, 10/83.
- * **Bitumization Facility**
Mission: Immobilize PNC's LLW.
Design Basis: 200 l/hr.
- * **Incinerator (Tokai)**
Mission: Burn solid LLW.
Design Basis: 600 kg/day.
- * **Incinerator (Oarai)**
Mission: Burn solid LLW.
Design Basis: Three chambers--pyrolysis, combustion, after-burning.
- * **Acid Digestion Facility** (nonradioactive)
Mission: Confirm laboratory-scale results on acid digestion process for TRU wastes.
Design Basis: 200-l tantalum digester vessel and ancillary equipment, glass-lined steel where necessary; capacity, 4-8 kg/hr.
History: In operation.
- * **Plutonium-Contaminated Waste Treatment Facility**
Mission: Prepare PNC TRU wastes for disposal.
Design Basis: Acid digestion of chloride-containing wastes; incineration of other combustibles; mechanical volume reduction.
Milestone: Operation startup, 1987.

PNC: TOKAI (contd)

- * **HLW Vitrification Pilot Plant**
Mission: Vitrify and store HLW from the Tokai-mura fuel reprocessing plant; demonstrate technology.
Design Basis: Ceramic melter to produce a borosilicate glass (tentative); capacity, 0.79 m³ HLW/day or 1 canister (76 l)/day of glass.
Milestone: Startup, 1990.
- * **FBR Fuel Reprocessing Pilot Plant** (reprocessing and HLW treatment)
Mission: Demonstrate FBR fuel reprocessing and HLW solidification.
Design Basis: 120 kg MOX/day (12 t/a).
Milestone: Hot operation, 1997.

RMC

Radioactive Waste Management Center
 No. 15, Mori Building
 2-8-10, Toranomon
 Minato-ku, Tokyo, 105
 Japan

Tel: 81-3-504-1081

President Syunichi Suzuki
 Managing Director Syunichi Murakoshi

Function: Promote the study of safe and rational operation of low-level radioactive waste disposal.
Owners: Japanese industry, MITI and STA.

STA

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

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

Minister, Science/Technology	Yataro Misubayashi
Deputy Minister	Tetsuro Shimura
Administrative Vice Minister	Syozo Shimomura
Director-General, AEB	Takashi Matsui
Deputy Director-General	Misugu Ishizuka
Director, Nuclear Fuel	Hiroto Ishida
Deputy Director	Chichiro Hirano
Director-General, NSB	Toshimitsu Sasaki
Deputy Director-General	Toshihiko Hotta
Director, Nuc. Mtls. Regulations	Saichiro Yoshimura
Deputy Director	Naoki Inoue

KOREA
(Republic of Korea)

REPUBLIC OF KOREA

MAJOR PUBLIC HOLIDAYS

January 1-3	New Year
August 15	National (Independence) Day
Aug./Sept.	Chusok (Harvest Moon Fest)
October 3	National Foundation Day
October 9	Hangul (Korean Alphabet) Day

TIME

Standard Time Washington D.C.: + 14 hours

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 857.90 Won
per Wall Street Journal, 01/30/87. 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.

US EMBASSY - SEOUL

American Embassy	
82 Sejong-Ro, Chongro-Ku	
Seoul	Tel: 82-2-732-2601
Korea	TLx: 23-108 AMEMB
Science Attache	Dr. Jerome J. Bosken

ENERGY

Population	1983	40 million
Electric Power Plant Capacity	1983	13.1 GWe
Electric Power Production	1983	41.5 TWh-- 55% oil 15% nuclear 5% hydro

NUCLEAR POWER

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

Nuclear Power Plant Capacity	1986	4.5 GWe
	1990	7.4 GWe
	2000	9.3 GWe
Reactor Mix	1987	PWR: 5 (1978-86) 3 (1987-89) HWR: 1 (1983)
Reactor Development		FBR

INDUSTRIAL FUEL CYCLE

Policy: Develop long-term contracts for fuel supplies, holdings of foreign uranium resources; fabrication capability for PWR and CANDU fuels; "wait and see"--reprocessing and recycle of Pu to FBR, CANDU and LWRs.

Waste Management Strategy: Not yet defined.

Cumulative Spent Fuel	1980	17 tU
Arisings	1985	60 tU
	1990	1,450 tU
	2000	4,400 tU

Industrial-Scale Activities

- * Uranium milling--3 t ore/day pilot plant.
- * Uranium conversion, yellowcake to UO₂--100 tU/a.
- * UO₂ fuel fabrication pilot plant--10 tU/a.
- * UO₂ fuel fabrication--200 tU/a. Startup, 1989.

ORGANIZATION

Fuel Cycle/Waste Management Responsibilities

Ministry of Energy and Resources

- |
- |— Electric Power Bureau (EPB)
 - |
 - |— Korea Electric Power Corporation (KEPCO)

Ministry of Science and Technology (MOST)

- |
- |— Atomic Energy Commission (AEC)
 - |
 - |— Atomic Energy Bureau (AEB)
 - |
 - |— International Cooperation Division
 - |
 - |— Nuclear Policy Division
 - |
 - |— Nuclear Standards Division
 - |
 - |— Nuclear Energy R&D Division
 - |
 - |— Radiation Safety Division
- |
- |— Korea Advanced Institute of Science/Technology (KAIST)
- |
- |— Korea Institute of Energy and Resources (KIER)
- |
- |— Korea Advanced Energy Res. Institute (KAERI)
- |
- |— Nuclear Safety Center

KOREA

AEB

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

Tel: 82-2-591-9038
Tlx: K24230

Director-General Shiyoh1 Park
Director, R&D Division Uk Jong Yoo
Director, Nuclear Policy Jae Choon Lim
Director, Nuclear Reactor Kyong Chul Jang
Director, Internl. Cooperation Tae Sik Min

AEC

Atomic Energy Commission
Ministry of Science and Technology
Gwacheon 171-11
Republic of Korea

Tel: 82-2-591-7694
Tlx: K24230

Commissioners Dr. Yong-Kyu Lim
Byoung Whie Lee

EPB

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

Tel: 82-2-720-2369
Tlx: K23472

Director, Nuclear Power Se-Jong Kim

KAERI

Korea Advanced Energy Research Institute
Head Office (Daeduk Center)
P.O. Box 7, Daedukdanji
Choongnam 300-32
Republic of Korea

Tel: 82-42-822-6821
Tlx: K45553

President Dr. Pilsoon Han
Ext. 231

Nuclear Fuel Dr. Changsaeng Rim
Nuclear Fuel Cycle Dr. Insuk Suh
Nuclear Safety Dr. Sunggee Chai
Nuclear Policy Dr. Poong-Eil Juhn

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

KOREA

KAERI: SEOUL

Korea Advanced Energy Research Institute
Seoul Research Center
P.O. Box 7, Cheongryang
Seoul 131
Republic of Korea

Tel: 82-2-972-2081
Tlx: K24230

Vice President Dr. Donghoon Kim
Nuclear Reactor Research Dr. Changgun Lee
Nuc. Radiation Application Dr. Yongkuk Kim

KEPCO

Korea Electric Power Corporation
87, Samseong-Dong
Gangnam-Ku
Seoul
Republic of Korea

Tel: 82-2-562-9926
Tlx: Kelecco K24287,
K28350

President Jung Ki Park
Nuclear Research Eunrae Roh
Nuclear Fuel Chang Kook Yang

KNFC

Korea Nuclear Fuel Company, Ltd.
P.O. Box 7
Daedukdanji, Daejeon
Choongnam 300
Republic of Korea

Tel: 82-42-822-6821/9
Tlx: K5553

President Dr. Pilsoon Han
Director Ui-Kyum Lee

KOPEC

Korea Power Engineering Co., Inc.
P.O. Box 109
YE0EUIDO
Seoul 150
Republic of Korea

Tel: 82-2-783-7606
Tlx: KOPEN K22562

President Dr. Kun-Mo Chung

MEXICO

MEXICO

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year
January 6	Epiphany
February 5	Promulgation of Constitution
March 21	Birthday of Benito Juarez
April 16	Holy Thursday
April 17	Good Friday
May 1	Labor Day
May 5	Victory of Gen. Zaragoza
September 16	Independence Day
October 12	Columbus Day
November 2	All Souls
November 20	Anniv. of the Revolution
December 8	Immaculate Conception
December 12	Our Lady of Guadalupe Day
December 25	Christmas

TIME

Standard Time Washington D.C.: (Mexico City) - 1 hour
Daylight Saving Time period: 04/05 - 10/24/87

PASSPORT/VISA

In lieu of passport, identification such as birth certificate (driver's license not sufficient) is required, in addition to a tourist card, for a visit to Mexico. Most travel agencies can provide up-to-date information concerning requirements.

CURRENCY EXCHANGE RATE

1 US\$ = 975.00 Peso
(Floating rate) per Wall Street Journal, 01/30/87. 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 Mexico are complete as listed, after dialing international access code: 011. Country code is 52; listed local numbers include city code.

US EMBASSY - MEXICO CITY

American Embassy	
Paseo de la Reforma 305	
Mexico 5, D.F.	Tel: 52-5-211-0042
Mexico	Telex: 017-73-091
Science Counselor	Joe DeThomas

ENERGY

Population	1984	80 million
Electric Power Plant Capacity	1983	18 GWe
Electric Power Production	1983	75.0 TWh 67% oil/gas 29% hydro/geoth. 4% coal

NUCLEAR POWER

Policy: Future is unclear; ambitious plans to use extensive uranium reserves in domestic nuclear power production have been thwarted by national economic problems, cost overruns with nuclear plant construction, etc.

Nuclear Power Plant Capacity	1987	0.7 GWe
	1990	1.3 GWe
	2000	1.3 GWe
Reactor Mix	1985	BWR: 2 (1987-89)

INDUSTRIAL FUEL CYCLE

Policy: Future is unclear; plans for pilot reprocessing and waste management facilities have been dropped, but uranium mining/milling and fuel fabrication work continues. Nuclear industry is being re-organized.

Waste Management Strategy: Not announced.

Cumulative Spent Fuel	1990	100 tU
Arisings (LWR)	2000	500 tU

ORGANIZATION

Nuclear activities controlled by federal government through:

- * SEMIP (Secretariat of Energy, Mining & Industries)
- * ININ (National Nuclear Research Institute)--R&D
- * CNSNS (National Commission of Nuclear Security and Safeguards)--safety R&D and licensing of nuclear facilities.

**CNSNS (National Commission of Nuclear
Security and Safeguards)**

Comision Nacional de Seguridad
Nuclear y Salvaguardias
Av. Insurgentes Sur No. 1806
Colonia Florida
Delegacion Alvaro Obregon
01030 Mexico, D.F.
Mexico

Tel: 52-5-534-1404
Tlx:

Director General Ing. Miguel M. Vailland

ININ (National Nuclear Research Institute)

Instituto Nacional de
Investigaciones Nucleares
Agricultura No. 21
Colonia Escandon
Delegacion Miguel Hidalgo
06140 Mexico, D.F.
Mexico

Tel: 52-5-570-1289
Tlx:

Director General Ing. Ruben Bello Rivera
Manager, Rad. Safety Ing. Alfonso Hernandez de
la Torre
Manager, Interntl. Affairs David Sarquis

* **Salazar Plant**
(Located 36.5 km from Mexico City). Mail should
be addressed to the Mexico City headquarters:
Carretera Mexico - Toluca km 35.6
Salazar, Edo. de Mexico
Mexico

Tel: 52-5-518-2360

SENIP

Subsecretaria de Energia
Av. Constituyentes 94779
Edificio C Planta Baja
01110 Mexico, D.F.
Mexico

Tel: 905-553-9119
Tlx:

Director General, R&D Dr. Edmundo de Alba

NETHERLANDS

NETHERLANDS

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year
April 17	Good Friday
April 19-20	Easter
April 30	Queen's Birthday
May 28	Ascension
June 7-8	Pentecost
December 25-26	Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time period: 03/29 - 09/26/87

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 2.0575 Guilder (Fl.)
per Wall Street Journal, 01/30/87. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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

US EMBASSY - THE HAGUE

American Embassy	
Lange Voorhout 102	
2514 The Hague	Tel: 31-70-62-4911
The Netherlands	Tlx: 044-31016

NETHERLANDS

ENERGY

Population	1984	14.6 million
Electric Power Plant Capacity	1984	16.6 GWe
		3% nuclear
	1990	16.6 GWe
		3% nuclear
	1984	62.8 TWh--
		62% gas
Electric Power Production		27% coal
		6% nuclear
		5% oil
	1990	6% nuclear

NUCLEAR POWER

Policy: 1985 Parliamentary support to expand nuclear capacity by at least two 1000 MWe plants (contingent on satisfactory answers to waste disposal questions), has since been shaded by events at Chernobyl. 1986 election results are not favorable toward expansion and long delays are expected.

Nuclear Power Plant Capacity	1986	0.5 GWe
	2000	1.7 GWe
Reactor Mix	1986	BWR: 1 (1969)
		PWR: 1 (1973)
Reactor Development	Participation in SNR-300 FBR	

INDUSTRIAL FUEL CYCLE

Policy: Use foreign services (fuel fabrication, reprocessing). Participation with FRG and UK in URENCO (Uranium Enrichment Consortium).

Waste Management Strategy: Designate single centralized waste collection service; extend interim storage of all wastes, followed by disposal into geological formations within or (preferably) outside the Netherlands. Ocean-dumping of LLW and ILW has been halted.

Cumulative Spent Fuel	1980	103 tU
Arisings (LWR)	1985	190 tU
	1990	270 tU
	2000	420 tU

ORGANIZATION

- * Government--Ministries of Economic Affairs, Public Housing and Environment, and Social Affairs exercise overall control of nuclear matters with parliamentary approval of their decisions.
- * ILONA (Integrated National Research Program Nuclear Waste Policy Committee)--supervises and coordinates waste disposal research.
- * ECN (Netherlands Energy Research Foundation)--government organization, provides nuclear-related services, including waste treatment and disposal research.
- * COVRA (Centrale Organisatie Voor Radioactief Afval)--stores and collects all radioactive wastes. Responsible for treatment of all waste. (Multi-funded: utilities, government, ECN).

Director	Dr. Jan Vrijen
Radiation Protection	Dr. H.D.K. Codee
Waste Storage/Transp.	U. Bakema

- Interim Storage Center	1994
--------------------------	------

ECN (Netherlands Energy Research Foundation)

Stichting Energieonderzoek Centrum Nederland
Scheveningse Weg 112
P.O. Box 80404

2508 GK The Hague	Tel: 31-70-51-4581
The Netherlands	Tlx: 31459

Chairman, Governing Board	J. H. Bakker
Chairman,	Prof. J. J. van Loef
Scientific Advisory Center	
Chairman, Program Committee	Prof. P. de Wolff
of the Energy Study Center	

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

ECN: PETTEN

Research Center
Netherlands Energy Research Foundation

P.O. Box 1	Tel: 31-2246-4744
1755 ZG Petten	Tlx: 57211 Reacp NL
The Netherlands	Fax: 31-2246-4480

NETHERLANDS

ECN: PETTEN (contd)

Managing Director, Research	Dr. J. F. Van de Vate
Nuclear Energy	Dr. A. M. Veersteegh
Nuc. Waste/Geol. Disposal	Dr. L. H. Vons
Exp. Underground Disp. Program	Dr. Teun C. de Boer
Rad. Migration	Dr. A. van Dalen

Function: Scientific and technical center: applied energy research; waste treatment.
Waste Management R&D: Geologic waste isolation--salt dome repositories (conceptual design, thermal studies, and radio-nuclide migration), seabed disposal, study of large components - decontamination.

GEOLOGICAL SURVEY OF THE NETHERLANDS

Geological Survey of the Netherlands
Nieuwe Gracht 13
Postbus 157
2000 AD Haarlem
The Netherlands

Tel: 31-23-31-9362
Tlx: 71105 geold

Dr. H. M. van Montfrans

KEMA (Research and Testing Electrochemical
Materials Company)

N.V. Tot Keuring van Elektrotechnische
Materialen Arnhem
Utrechtseweg 310
P.O. Box 9035
6800 ET Arnhem
The Netherlands

Tel: 31-85-45-7057
Tlx: 45016 Kema nl

Deputy Director, Research Dr. M. E. A. Hermans
Research Technology Dr. J. Kuypers
Nuclear Waste Research Dr. H. Boekschoten
Acid Digestion/Incineration Dr. J. Matteman

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

NETHERLANDS

MINISTRY OF PUBLIC HOUSING AND ENVIRONMENT

Ministry of Public Housing and Environment
P.O. Box 5811

Koopmansstraat 1

2280 HV Rijswijk

The Netherlands

Tel: 31-70-94-9505

Tlx: 32691

Deputy Chief

Director, Rad. Protection

Dr. J. Ch. Cornelis

Dr. J. L. Baas

PAKISTAN

PAKISTAN

MAJOR PUBLIC HOLIDAYS

January	Mawlid An-Nabi (Birth of the Prophet)
March 23	Pakistan Day
March 28	Good Friday
May 1	May Day
August	Id ul Sitr (End of Ramadan)
August 14	Independence Day
September 6	Defense of Pakistan
September 11	Death of Quaid-i-Azam
October	Id ul Azba (Feast of the Sacrifice)
November	Muhurran (Ashura)
December 25	Birthday of Quaid-i-Azam; Christmas

TIME

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

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 17.258 Rupee
per Wall Street Journal, 01/30/87. 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.

US EMBASSY - ISLAMABAD

American Embassy	
P.O. Box 1048	
Islamabad	Tel: 92-51-8261
Pakistan	Tlx: 82-5-864

PAKISTAN

ENERGY

Population	1984	86.4 million
Electric Power Plant Capacity	1981	4.0 GWe
Electric Power Production	1981	14.2 TWh-- 50% thermal 46% hydro 4% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity	1987	0.1 GWe
	1995	0.1 GWe
	2000	1.1 GWe
Reactor Mix	1986	HWR: 1 (1972)

INDUSTRIAL FUEL CYCLE

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

Cumulative Spent Fuel Arisings	1980	49 tU
	1985	110 tU
	1990	170 tU
	2000	440 tU

ORGANIZATION

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

PAEC

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

Chairman Dr. Munir Ahmad Khan

SOUTH AFRICA

SOUTH AFRICA

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year
April 17	Good Friday
March 31	Family Day
April 6	Founder's Day
May 28	Ascension
May 31	Republic Day
October 10	Kruger Day
December 16	Day of the Vow
December 25	Christmas
December 26	Day of Goodwill

TIME

Standard Time Washington D.C.: + 7 hours

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 2.0408 Rand
per Wall Street Journal, 01/30/87. 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.

US EMBASSY - PRETORIA

American Embassy	
Thibault House	
225 Pretorius St.	
Pretoria	Tel: 27-12-28-4266
South Africa	Tlx: 3-751
Science Attache	Dr. Gilbert Melese

SOUTH AFRICA

ENERGY

Population	1985	32 million
Electric Power Plant Capacity	1985	25.7 GWe 7.5% nuclear
Electric Power Production	1985	126 TWh--

NUCLEAR POWER

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

Nuclear Power Plant Capacity	1987	1.8 GWe
	2000	1.8 GWe
Reactor Mix	1986	PWR: 2 (1984/85)

INDUSTRIAL FUEL CYCLE

Policy: Produce and export uranium (1984:5,732 tU; 1985: 4,880 tU); develop enrichment capability (300-350 tSWU/a) by late 1987. No current plans for fuel fabrication or reprocessing. UF₆ conversion plant of 400 tU/a (1986).

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

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

Major Milestone

- * Dry spent fuel storage facility (Vaalputs) 1994

ATOMIC ENERGY CORPORATION

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

Tel: 27-12-324-2811
Tlx: 3-21047 SA

SOUTH AFRICA

ATOMIC ENERGY CORPORATION (contd)

Executive Chairman	Dr. J. W. L. de Villiers
Exec.Gen.Mgr., Nuc.Energy Devel.	Dr. W. L. Grant
Exec.Gen.Mgr., Nuc.Fuel Cycle	Dr. J. P. Hugo
Exec.Gen.Mgr., Corporate Services	Dr. R. S. Loubser

Function: Overall responsibility for nuclear activities funded by the Government, including uranium conversion and enrichment, R&D, radioisotope production, licensing, rad-waste disposal and repository.

ESCOM (Electricity Supply Commission)

ESCOM

P.O. Box 1091

Johannesburg 2000

South Africa

Tel: 27-11-800-8111

Tlx: 4-24481 SA

Chairman, Electricity Council

Sr.Gen.Mgr./Chief Executive

John Maree

I. C. McRae

SPAIN

SPAIN

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year
January 6	Epiphany
March 19	St. Joseph
April 16	Holy Thursday
April 17	Good Friday
May 1	Labor Day
June 21	Corpus Christi
July 25	St. James
August 15	Assumption
November 1	All Saints
December 8	Immaculate Conception
December 25	Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time period: 03/29 - 09/26/87

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 129.50 Peseta
per Wall Street Journal, 01/30/87. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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

US EMBASSY - MADRID

American Embassy
Serrano 75
Madrid
Spain

Tel: 34-1-276-3600
Tlx: 27-763

Science Attache

Roy C. Simpkins

ENERGY

Population	1984	38.7 million
Electric Power Plant Capacity	1984	38.8 GWe 12% nuclear
	1985	41.4 GWe 14% nuclear
	1990	41.8 GWe 18% nuclear
Electric Power Production	1984	120.1 TWh-- 42% coal 28% hydro/geoth. 19% nuclear
		9% oil 2% gas
	1985	22% nuclear
	1990	33% 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--no changes expected in near future.

Nuclear Power Plant Capacity	1987	5.5 GWe
	1990	7.5 GWe
	2000	10.3 GWe
Reactor Mix	1986	GCR: 1 (1972)
		PWR: 5 (1969-85)
		2 (1987)
		BWR: 2 (1971-85)

INDUSTRIAL FUEL CYCLE

Policy: Once-through fuel cycle; no domestic reprocessing and no further contracts for foreign reprocessing.

Waste Management Strategy: Store spent fuels at the reactor sites for 10 years, then transfer to AFR engineered (dry) storage facility until geologic repository is ready to receive "high-level wastes" (spent fuels); locate AFR and fuel encapsulation facility at repository site (salt dome or granite formation). Shallow-land burial of LLW in trenches. Institutional radioactive wastes are currently placed in a worked-out uranium mine.

SPAIN

Cumulative Spent Fuel	1980	176 tU
Arisings (LWR)	1985	490 tU
	1990	1,300 tU
	2000	3,400 tU

Industrial-Scale Activities

- * Uranium mining and milling: 200 tU/a.
- * Uranium enrichment: 11.1% interest in Eurodif.
- * Fuel fabrication: 200 tU/a.
- * AFR spent fuel storage: 1500 tU.

INTERNATIONAL RELATIONSHIPS

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

- Term: 6-6-86 to 6-5-91.
- Scope: Includes nuclear safety technology and radioactive waste management.
- Emphasis: General information exchange.

CIEMAT (ENERGY RESEARCH CENTER)

Centro de Investigaciones Energeticas,
Medio Ambientales y Tecnologicas
Avenida Complutense 22
Ciudad Universitaria
E-28040 Madrid, Spain

Tel: 34-1-449-4400
Tlx: 23555 JUVIG E

President	Fernando Maravall Herrero
General Director	Jose Angel Azuara Solis
Director, Nuclear Technology	V. Gonzalez
Spent Fuel Storage	A. Uriarte

Function: R&D--nuclear fuel cycle, nuclear reactor technology, waste treatment, and terminal storage.

CSN (Council of Nuclear Safety)

Consejo de Seguridad Nuclear	Tel: 34-1-456-1812
Sor Angela de Cruz, 3	Tlx 45-869 CSNM E
E-28020 Madrid, Spain	Fax: 34-1-455-1280

President	Francisco Pascual
Commissioner	Dr. Luis Gutierrez-Jodra

Function: Assess the safety of nuclear technology and environmental protection; perform plant inspections and issue licenses.

SPAIN

ENRESA (National Waste Management Company)

Empresa Nacional de Residuos
Radiactivos S.A. (ENRESA)
Paseo Castellana, 135
E-28046 Madrid, Spain

Tel: 34-1-279-2667
Tlx: 41-429 ENRES E

President Juan Manuel Kindelan
Director General Alberto Lopez
Director, Engineering Aurelio Ulibarri

Function: Supply waste management services and disposal facilities to all Spanish nuclear companies.

ENUSA (National Fuel Cycle Company)

Empresa Nacional del Uranio S.A.
Santiago Rusinol 12
E-28040 Madrid, Spain

Tel: 34-1-233-6207
Tlx: 43042 URAN E

President Jose Manuel Jimenez Arana

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

Facility

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

MINISTRY OF INDUSTRY AND ENERGY

Minister Luis Carlos Croissier
Batista
Director General of Energy Victor Perez Pita

SWEDEN

SWEDEN

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year
January 6	Epiphany
April 17	Good Friday
April 19-20	Easter
May 1	Labor Day
May 28	Ascension Day
June 7-8	Pentecost
June 21	Midsummer Day
November 1	All Saints
December 25-26	Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time period: 03/29 - 09/26/87

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 6.53 Krona (SEK)
per Wall Street Journal, 01/30/87. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Sweden are complete as listed, after dialing international access code: 011.
Country code is 46; listed local numbers include city code.

US EMBASSY - STOCKHOLM

American Embassy	
Strandvagen 101	
S-10000 Stockholm	Tel: 46-8-783-5300
Sweden	Tlx: 12060 AMEMB S

ENERGY

Population	1985	8.3 million
Electric Power Plant Capacity	1984	30.8 GWe 24% nuclear
	1985	33.1 GWe 29% nuclear
	1990	33.5 GWe 24% nuclear
Electric Power Production	1984	124.1 TWh-- 55% hydro/geoth. 41% nuclear 2% oil 2% coal
	1985	42% nuclear
	1990	47% nuclear

NUCLEAR POWER

Policy: Phase out all nuclear plants at the latest by the year 2010. Change of this policy would require a new decision by Parliament.

Nuclear Power Plant Capacity	1987	9.6 GWe
	2000	9.6 GWe
Reactor Mix	1987	BWR: 9 (1972-85)
		PWR: 3 (1975-83)

INDUSTRIAL FUEL CYCLE

Policy: Direct disposal of spent fuel. No Pu recycle is planned. Costs for waste management and for future decommissioning of nuclear power plants are paid by fees collected from the nuclear utilities.

Waste Management Strategy: Store spent fuel for 30-40 years in an underground pool storage facility; encapsulate spent fuel in a highly corrosion-resistant canister; emplace in a deep geologic (crystalline rock) repository.
New facilities: 3000 t AFR (completed 1985); interim storage plants for conditioned reprocessing wastes; spent fuel encapsulation plant; repositories for spent fuel, reactor and other long-lived wastes.

SWEDEN

Cumulative Spent Fuel	1985	1,330 tU
Arising (LWR)	1990	2,360 tU
	2010	7,800 tU

Cumulative Waste Arisings	2020	
(conditioned and	Spent fuel	5,100 canisters
encapsulated--	HLW glass	550 canisters
ready for disposal)	TRU waste	4,500 m ³
	Reactor waste	95,000 m ³
	" core comp.	19,000 m ³
	D&D waste	113,000 m ³

Industrial-Scale Activities:

- * LWR fuel fabrication: 400 tU/a.

Major Milestones

* Repository for reactor wastes, SFR	1988
* HLW repository site selection	2000
* HLW repository operational	2020
* Interim HLW dry storage facility	1990
* Encapsulated spent fuel repository	2020-50

INTERNATIONAL RELATIONSHIPS

DOE/SKB Umbrella Agreement for Waste Management Exchange

- Term: 7-1-77 to 12-31-90
- Scope: Preparation and packaging of waste forms; storage; field and laboratory testing; geologic disposal; operations; safety and environment; institutional and public relations issues.
- Emphasis: Collaboration in Stripa Mine test program (NEA coordination); US participation in performance assessment computer model and code intercomparison sponsored by SKB.

Member of IAEA and OECD/NEA. Waste management cooperative agreements with Canada, France, Switzerland. Host country for NEA Stripa Project.

ORGANIZATION

- * Waste Management
 - SKB (Swedish Nuclear Fuel and Waste Management Company)--executes spent fuel and waste management program for the utilities; manages waste disposal R&D programs.

SWEDEN

- SKN (National Board for Spent Fuel)--administers waste management fund collected from the nuclear utilities; oversees back-end-of-the-fuel-cycle activities.
- * Licensing Responsibilities
 - SKI (Swedish Nuclear Power Inspectorate)--construction/operation of nuclear facilities
 - SSI (Swedish National Institute of Radiation Protection)
 - National Swedish Franchise Board for Environment Protection
 - Municipality where the facility is to be located (right of veto).

CHALMERS (TECHNICAL UNIVERSITY)

Chalmers Tekniska Högskola
S-41296 Göteborg
Sweden

Tel: 46-31-81-0100
Tlx: 2369

Nuclear Chemistry

Jan Rydberg
Bert Allard
Jan Liljenzin

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

KEMAKTA

Kemakta Konsult AB
Luntnakargatan 94
S-11351 Stockholm
Sweden

Tel: 46-8-15-0380
Tlx: 15660

Bertil Grundfelt

Computer calculations on hydrology and nuclide migration.

KTH (Royal Institute of Technology)

KTH
S-10044 Stockholm
Sweden

Tel: 46-8-787-7000
Tlx: 10389

Chemical Engineering
Inorganic Chemistry

Ivars Neretnieks
I. Grenthe
P. Wickberg

KTH (contd)

Waste Management R&D: Near- and far-field migration modeling, rock-matrix diffusion experiments. Actinide-chemistry, solubility calculations, groundwater sampling and characterization.

NUCLEAR SAFETY BOARD (OF THE SWEDISH UTILITIES)

Raadet foer Kaernkraeftsaekerhet
Box 5864
S-10248 Stockholm
Sweden

Tel: 46-8-65-2800
Tlx: 13108

Director Thomas Eckerod

Function: Promote coordination and cooperation among the Swedish utilities in their nuclear power plant safety work.

SGAB (Swedish Geological Company)

Sveriges Geologiska AB (SGAB)
Vretgraend 18
Box 670
S-75128 Uppsala
Sweden

Tel: 46-18-15-5280
Tlx: 76154 GEOSWED S

Geology, Site Investigations Kaj Ahlbom
Hydrogeology Leif Carlsson
Geologic Waste Disposal Otto Brotzen

Waste Management R&D: Evaluation of rock formations for use as waste disposal sites (permeability; groundwater behavior, age and chemistry).

SKB (Nuclear Fuel and Waste Management Company)

Svensk Kaernbraensle-Hantering
Box 5864
S-10248 Stockholm
Sweden

Tel: 46-8-65-2800
Tlx: 13108 SKB

President	Sten Bjurstroem
Research and Development	Per-Eric Ahlstrom
Geology and Hydrology	Hans Carlsson
Material Sciences	Lars Werme
Nuclear Waste Services	Lars Bertil Nilsson
Planning/Systems Analysis	Hans Forstroem
Material Sciences	Lars Werme
International	Torsten Eng

Facilities

- * **CLAB** (Central Storage for Spent Fuel, located at Simpevarp adjacent to Oscarshamn Power Station)
Mission: AFR storage facility.
Design Capacity: Initially, 3000 t.
History: Start of construction, 5/80; start of operation 1985.

* Stripa Mine

Stripa Mine Service AB
S-717 00 Stora Tel: 46-581-41420
Sweden Tlx:

Stripa Project Manager Hans Carlsson
Mine Operations Gunnar Ramquist

(Near Kopparberg, 15 km north of Lindesberg and about 250 km west of Stockholm. Site of the NEA Stripa Project)

Function: Research in realistic environment of matters connected to disposal in crystalline rock. Development of investigation methods and instruments; measurement of radionuclide migration/supporting studies.

Description: Granite body, about 350-400 m below surface, at the Stripa iron mine.

SKI (Nuclear Power Inspectorate)

Statens Kærnkraftinspektion

Box 27106

S-102 52 Stockholm

Sweden

Tel: 46-8-63-5560

Telex: 11961 Sweatom S

Director

Waste Management

01 of Hoermander

Alf Larsson

Søren Norrby

Function: Responsible for licensing of nuclear facilities.

SKN (National Board for Spent Nuclear Fuel)

Statens Kaernbraenslenaemnd
Box 2045
S-10311 Stockholm
Sweden

Tel: 46-8-23-4774
Tlx:

Director
Chief Engineer

Olof Soederberg
Nils Rydell

Function: Serve as the government's control agency to oversee back-end fuel cycle technology, financing/information.

SSI

National Institute
of Radiation Protection
Box 60204
S-10401 Stockholm
Sweden

Tel: 46-8-729-7100
Tlx: 11-771 SAFE RAD

Director
Radwaste Group

Gunnar Bengtsson
Ragnar Boge

Function: Responsible for enforcing radiation protection regulations.

STUDSVIK

Studsvik Energiteknik AB
S-61182 Nykoeping
Sweden

Tel: 46-155-2-1000
Tlx: 64013 studs s

Director, Nuclear Division
Waste Technology

Stig Bergstroem
Aake Hultgren

Function: Nuclear energy R&D and service to support Swedish power programs (contract research).

Owner: Government (Ministry of Industry)

Waste Management R&D: HLW waste form characterization, LLW and ILW treatment, D&D techniques, leaching of UO₂ from spent fuel, biosphere migration, dose-calculations. AMOS project: Waste treatment plant (1986), interim waste storage in a rock cavity (1985).

SWEDISH STATE POWER BOARD

Statens Vattensfallswerk	
S-162 87 Vaellingby	Tel: 46-8-739-5000
Sweden	Tlx: 19653 Svtelvx S

President	Carl-Eric Nykvist
Vice President, Nuc. Power	Lars Gustafsson
Nuclear Safety	Hans Bartsch
Low- and Medium-Level Wastes	Stig Pettersson

Function: Operate the power distribution grid in Sweden, produce power. (Owner of Ringhals Power Plants).

Owner: Government (Ministry of Industry).

SWITZERLAND

SWITZERLAND

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year
April 17	Good Friday
April 19-20	Easter
May 28	Ascension
June 7-8	Pentecost
August 1	Independence Day
December 25-26	Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time period: 03/29 - 09/26/87

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 1.5430 Franc
per Wall Street Journal, 01/30/87. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to Switzerland are complete as listed, after dialing international access code: 011. Country code is 41; listed local numbers include city code.

US EMBASSY - BERN

American Embassy	
Jubiläumstrasse 93	
CH-3005 Bern	Tel: 41-31-43-7011
Switzerland	Tlx: 845-32128

SWITZERLAND

ENERGY

Population	1984	6.5 million
Electric Power Plant Capacity	1984	15.1 GWe
		19% nuclear
	1990	15.1 GWe
Electric Power Production		19% nuclear
	1984	50.6 TWh--
		62% hydro/geoth.
		36% nuclear
		1% coal
		1% oil/gas
	1985	40% nuclear
	1990	39% nuclear

NUCLEAR POWER

Policy: Government is pro-nuclear. Strong public opposition has weakened somewhat and installation of additional nuclear power plants appears possible.

Nuclear Power Plant Capacity	1987	2.9 GWe
	1995	2.9
	2000	3.8 GWe
Reactor Mix	1986	BWR: 2 (1972-84)
		PWR: 3 (1969-79)

INDUSTRIAL FUEL CYCLE

Policy: Foreign reprocessing of spent fuels and Pu recycle to either LWRs or FBRs.

Waste Management Strategy: Develop two waste repositories: a horizontally accessed rock cavern in a geologic host rock with considerable overburden for LLW/ILW, and a deep repository (crystalline rock) for HLW glass or unprocessed spent fuel elements. Sea-dumping of LLW discontinued 1982.

Cumulative Spent Fuel Arisings (LWR)	1980	380 tU
	1985	650 tU
	1990	1,090 tU
	2000	2,000 tU

Cumulative Waste Arisings		
[After 40 years' operation of the nuclear power system (total 6,000 GWe)]	LLW/D&D Waste	100,000 m ³
	LLW/ILW	70,000 m ³
	HLW glass	1,000 m ³
	Spent fuel	or 15,000 m ³

SWITZERLAND

Major Milestones

- * Initial receipt of HLW glass from COGEMA (France) 1992
- * Intermediate-depth storage facility for ultimate repository for reactor wastes 1995
- * Geologic repository for HLW or spent fuels After 2020

INTERNATIONAL FUEL CYCLE RELATIONSHIPS

DOE/NAGRA Umbrella Agreement for Cooperation in Radioactive Waste Management

- Term: 4-19-85 to 4-19-90.
- Scope: Preparation and packaging of wastes; field and laboratory testing; storage; geologic disposal; environment and safety; design and operational issues; transportation requirements; public acceptance issues.
- Emphasis: Information exchange concerning Grimsel Pass URL activities.

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

- Term: 9-26-86 to 9-25-91
- Scope: Experimental/analytical studies relating to safety research.
- Emphasis: General information exchange.

Member of IAEA and OECD/NEA.

ORGANIZATION

- * NAGRA--National Cooperative for the Disposal of Radioactive Waste--formed by utilities/government to handle fuel cycle/waste management activities.
- * EIR--Federal Institute for Reactor Research--nuclear R&D
- * Federal Energy Office--sets criteria for waste management practices, including geologic disposal.

EIR (Federal Institute for Reactor Research)

Eidgenoessisches Institut fuer
Reaktorforschung (EIR)
CH-5303 Wuerenlingen
Switzerland

Tel: 41-56-99-2111
Tlx: 53714 eir ch

Director	Prof.-Dr. H. Graenicher
Deputy Director	M. Breu
Staff Assistant, Research	Dr. U. Flueckiger
Materials Technology	D. H. P. Alder
Hot Laboratory	Dr. W. Hausmann
Metallurgy	G. Ullrich
Chemistry	Dr. P. Baertschi
Fuel Division	H. Flury
Radioactive Waste Project	Dr. G. Bart
Fuel Program	R. W. Stratton

Owner: Federal government--Department of Interior.

Waste Management R&D: Incineration of TRU wastes, modeling of radionuclide migration through heterogeneous geologic media, chemical behavior of radionuclides during migration, transport of radionuclides through the biosphere, hydrological studies, sorption constants on different rocks, immobilization of LLW and ILW in cements, leaching rates on LLW and ILW waste forms, and long-term corrosion tests on waste package materials.

Facilities

- * **ADA** (Acid Digestion Plant for TRU Wastes)
Design Basis: Carbonization/digestion in H_2SO_4/HNO_3 at 250°C; capacity, 1 kg/hr solid wastes.
History: Non-Pu runs, late 1981; Pu runs, 1982.

FEDERAL OFFICE OF ENERGY

Federal Office of Energy
Nuclear Safety Inspectorate
CH-5303 Wuerenlingen
Switzerland

Tel: 41-56-98-2853
Tlx: 59058

Waste Management Dr. U. Niederer

Function: Licensing and inspection of nuclear installations.

**NAGRA/CEDRA (NATIONAL COOPERATIVE
FOR THE DISPOSAL OF RADIOACTIVE WASTE)**

Nationale Genossenschaft fuer die Lagerung
Radioaktiver Abfælle (NAGRA)

or

Societe Cooperative Nationale pour l'Entreposage de
Dechets Radioactifs (CEDRA)

Parkstrasse 23

CH-5401 Baden

Switzerland

Tel: 41-56-20-5511

Tlx: 57333

President

Dr. Rudolph Rometsch

Managing Director

Dr. Hans Issler

Science/Technology Division

Dr. Charles McCombie

Geology

Dr. Marc F. Thury

Field Operations/Testing

Ch. Sprecher

Engineering

Andreas L. Nold

Nuclear Technology

Dr. Charles McCombie

Repository Projects

E. Kowalski

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

Sponsors: Utilities and government.

Facility

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

TAIWAN

TAIWAN

MAJOR PUBLIC HOLIDAYS (1987)

January 1-2	Founding Day
March 29	Youth Day
April 5	Tomb Sweeping Day
September 28	Teacher's Day
October 10	National Day
October 25	Retrocession Day
October 31	Chiang Kai-Shek's Birthday
November 12	Sun Yat-Sen's Birthday
December 25	Constitution Day

TIME

Standard Time Washington D.C.: + 12 hours

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 35.14 Taiwan Dollar
per Wall Street Journal, 01/30/87. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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

AII - TAIPEI

American Institute in Taiwan	
7 Lane 134	
Hsin Yi Road, Sec. 3	
Taipei	Tel: 86-709-2000
Republic of China	Tlx: 23890 USTRAD

ENERGY

Population	1985	19 million
Electric Power Plant Capacity	1985	15.97 GWe-- 31.1% nuclear
Electric Power Production	1985	52.56 TWh-- 52% nuclear 25% coal 13% hydro 10% oil

NUCLEAR POWER

Policy: Look to nuclear power to meet rapidly growing demand for electric energy.

Nuclear Power Plant Capacity	1987	5.1 GWe
	1995	4.9 GWe
	2000	8.7 GWe
Reactor Mix	1986	BWR: 4 (1978-83) PWR: 2 (1984/85)

INDUSTRIAL FUEL CYCLE

Policy: Develop indigenous fuel production capability: UF₆ conversion; UO₂ pellets; fuel hardware; fuel assembly.

Waste Management Strategy: Evaluating spent fuel/HLW interim storage options; may reprocess (in other countries); LLW to go to new National Waste Storage Facility on nearby Orchid Island.

Cumulative Spent Fuel	1980	70 tU
Arisings (LWR)	1985	430 tU
	1990	1,140 tU
	2000	2,600 tU

ORGANIZATION

- * TAIPOWER (Taiwan Power Company)--operation of nuclear power plants (owned by the government).
- * AEC (Atomic Energy Council)--regulatory functions.
 - RWA (Radwaste Administration)--radwaste disposal.
- * INER (Institute of Nuclear Energy Research)--nuclear R&D

TAIWAN

AEC

Atomic Energy Council 65, Lane 144 Keelung Road, Section 4 Taipei 107, Taiwan Republic of China	Tel: 86-2-392-4180 Tlx: 26554 SINOATOM Fax: 86-2-341-5377 86-2-321-5448
Secretary General Director, Radwaste Admin.	Prof. Yu-Hao Lee Dr. Chao-Ming Tsai 86-2-396-4324
Director, Planning Division Director, Rad. Protection Div. Director, Nuc. Regulatory Div.	Chao-Chin Tung Dr. Yi-Ching Yang Yi-Ching Yang

INER

Institute of Nuclear Energy Research P.O. Box 3 Lung-Tan, Taiwan 325 Republic of China	Tel: 86-2-381-4014 Tlx: 34154 CAEC
Deputy Directors	Sung-Ling Ho 86-2-381-2300 Sen-I Chang 86-2-381-2302
Radwaste Mgmt. Tech. Program	Dr. Tise-Sheng Chou 86-2-381-2525
Radwaste Mgmt. Division	Dr. Chia-Pao Tung 86-2-381-2524
Nuc. Materials Res. Division	Dr. Yaw-Nan Chen 86-2-381-2422
Fuel Engineering Division	Chung-Jyi Wu 86-2-381-2418
Health Physics Division	Dr. Wei-Li Chen

Fuel Cycle R&D: Solvent extraction technology; yellowcake conversion to UO₂; production of Zr, TiO₂ and TiCl₄; cement and thermoplastic waste forms for reactor wastes; HLW conditioning processes; irradiation of sewage sludge with spent fuels; burial of LLW.

TAIPOWER

Taiwan Power Company 17F, 242 Roosevelt Rd., Sec. 3 Taipei 107, Taipei Republic of China	Tel: 86-2-396-7777 Tlx: 2564 TPCAPD
President Director, Nuc. Engineering Dept.	J. H. Chen Eng Lin 86-2-396-2521
Deputy Dir., Nuc. Eng. Dept.	Peng-Chang Chen

UNITED KINGDOM

UNITED KINGDOM

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year
April 17	Good Friday
April 19-20	Easter
May 4	May Day
May 25	May Bank Holiday
August 30	Summer Bank Holiday
December 25-26	Christmas

TIME

Standard Time Washington D.C.: + 5 hours
Daylight Saving Time period: 03/29 - 10/24/87

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = .6609 Pound
per Wall Street Journal, 01/30/87. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

Individual numbers for direct-dial to the United Kingdom are complete as listed, after dialing international access code: 011. Country code is 44; listed local numbers include city code.

US EMBASSY - LONDON

American Embassy	
24/31 Grosvenor Square, W. 1A1AE	
London	Tel: 44-1-499-9000
United Kingdom	Tlx: 26-6777
Science Counselor	James Devine

UNITED KINGDOM

ENERGY

Population	1984	56 million
Electric Power Plant Capacity	1984	66.9 GWe 10% nuclear
	1985	64.0 GWe 11% nuclear
	1990	65.6 GWe 19% nuclear
Electric Power Production	1984	282.5 TWh-- 45% coal 33% oil 19% nuclear 2% hydro 1% gas
	1985	20% nuclear
	1990	28% nuclear

NUCLEAR POWER

Policy: Strong development of nuclear power, based to date on gas-cooled reactors but considering diversifying to PWRs and eventually to FBRs.

Nuclear Power Plant Capacity	1987	10.6 GWe
	1990	13.1 GWe
	2000	11.3 GWe
Reactor Mix	1986	GCR: 26 (1956-72)
		AGR: 10 (1976-85)
		4 (1987-88)
		FBR: 1 (1976)
		HWR: 1 (1968)
Reactor Development		Major LMFB development program, including fuel cycle

INDUSTRIAL FUEL CYCLE

Policy: Reprocess and recycle Pu to FBR and U to AGR systems; develop and maintain complete fuel cycle capability (UF₆ conversion, enrichment, UO₂ and MOX fuel fabrication, spent fuel reprocessing); sell fuel cycle services abroad.

Waste Management Strategy: Reprocess spent fuels as rapidly as plant capacity permits; vitrify HLW (French technology); long-term interim storage of HLW glass, deferring decision on disposal; shallow-land burial or sea-dump of LLW and ILW.

UNITED KINGDOM

Cumulative Spent Fuel	1985	550 tU
Arising (AGR)	1990	1,400 tU
	2000	3,000 tU

Industrial-Scale Activities

- * Power production (GWe): 1981--9.8; 1990--14.8.
- * Uranium conversion (Springfields)
 - UF₆ production--9000 t/a
 - UF₆-UO₂ conversion--650 t/a.
- * Uranium enrichment (Capenhurst)
 - centrifuge plant--650 tSWU/a.
- * Fuel fabrication
 - Springfields
 - U metal (Magnox)--200 t/a
 - UO₂ fuels --300 t/a (AGR), 200 t/a (PWR)
 - Sellafield
 - MOX fuels capacity, 1987--6 t/a (FBR)
- * Fuel reprocessing
 - Magnox fuels (Sellafield)--up to 1500 t/a
 - UO₂ fuels (THORP, ")--1200 t/a (1992)
 - FBR fuels (PFR reprocessing pilot plant, Dounreay)--50 kg HM/day
- * HLW vitrification.
 - Sellafield Vitrification Plant (1988).

INTERNATIONAL RELATIONSHIPS

DOE/UKAEA Umbrella Agreement in the Field of Radioactive Waste Management Technology

- Term: 10-30-86 to 10-29-91
- Scope: LL/ILW, TRU and D&D technology; treatment/ geol. disposal; transportation; storage; environment/safety and public acceptance issues; performance assessment; packaging.
- Emphasis: Technical information exchange, primarily TRU waste treatment.

DOE/UKAEA Implementing Agreement for Reactor Decommissioning Exchange

- Term: 3-1-85 to 3-1-89.
- Scope: Planning and accomplishment of the projects for decommissioning Shippingport, Windscale AGR and other facilities in both countries; D&D technology.

UNITED KINGDOM

Member of EC, IAEA and OECD/NEA. Agreements/partnerships with various nations.

ORGANIZATION

- * UKAEA (United Kingdom Atomic Energy Authority)--nuclear research; laboratories at Harwell, Risley, Sellafield, Springfields, Dounreay
- * DOE (Department of Environment)--develops waste management strategy, funds and coordinates generic waste management R&D
- * BNFL (British Nuclear Fuels Ltd.)--commercial fuel cycle for domestic and foreign customers
- * NIREX (state-owned public company)--disposal of LLW and ILW
- * BGS and IOS (British Geological Survey and Institute of Oceanographic Sciences)--supporting R&D for the waste management program
- * NRPB (National Radiological Protection Board)--environmental R&D
- * NII (Nuclear Installations Inspectorate)--licensing.
- * MAFF (Ministry of Agriculture Fisheries and Food)--regulation of waste management

NUCLEAR FUEL CYCLE RESPONSIBILITIES

National Government

- |-- Department of Environment (DOE)
 - |-- Rad. Waste Mgmt. Advisory Committee (RWMAC)
 - |-- Building Research Establishment (BRE)
 - |-- Radiochemical Inspectorate (RCI)
- |-- Department of Health/Social Services
 - |-- National Radiological Protection Board (NRPB)
- |-- Department of Education and Science (DES)
 - |-- Nat. Environment Research Council (NERC)
 - |-- British Geological Survey (BGS)
 - |-- Inst. of Oceanographic Sciences (IOS)
- |-- Department of Energy (DEN)
 - |-- Electricity Authorities (CEGB, SSEB)
 - |-- British Nuclear Fuels plc (BNFL)
 - |-- UK Atomic Energy Authority (UKAEA)
 - |-- AERE Harwell (Research Group)
 - |-- Northern Division (Reactor Group)
 - |-- Safety and Reliability Directorate
 - |-- Commercial Support
 - * NNC * NIREX
- |-- Health and Safety Executive
 - |-- Health and Safety Executive (HSE)
 - |-- Nuclear Installations Inspectorate (NII)
- |-- Ministry of Defense (MOD)
 - |-- Atomic Weapons Research Establishment (AWRE)
- |-- Ministry of Agriculture Food Fisheries (MAFF)
 - |-- Fisheries Laboratories

DOE FUEL CYCLE/WASTE MANAGEMENT RESPONSIBILITIES

Department of Energy (DEN)

- |— Electricity Authorities (CEGB, SSEB, NSHEB, NIES)
 - * Electricity Production
 - * Reactor Waste Management
- |— British Nuclear Fuels plc (BNFL)
 - |— Risley (HQ)
 - * Engineering
 - |— Sellafield
 - * Reprocessing
 - * Waste Conditioning
 - * MOX Fuel Production
 - |— Springfields
 - * Fuel Fabrication
 - * UO₂ Production
 - * Uranium Conversion
 - |— Capenhurst
 - * Uranium Enrichment
- |— UK Atomic Energy Authority (UKAEA)
 - |— Safety and Reliability Directorate
 - |— National Nuc. Corporation (NNC)
 - * Power Plant Construction
 - |— AERE Harwell (Research Group)
 - * Nuclear Energy
 - * Waste Treatment
 - * Waste Disposal
 - * Reprocessing
 - |— Northern Division (Reactor Group)
 - * Reactor and Fuel Cycle R&D
 - |— Risley Nuc. Power Developmt. Establishment
 - |— Dounreay Nuc. Power Dvlpmnt. Establishment
 - * FBR Demonstration
 - * FBR Fuel Cycle R&D
 - |— Springfields Nuc. Power Development Labs
 - * Fuel Technology

UNITED KINGDOM

AMRE

Atomic Weapons Research
Establishment
Aldermaston, Reading RG7 4PR Tel: 44-7356-4111
United Kingdom Tlx: 848104/5

Waste Management E. Whitehead

BGS

British Geological Survey
Nicker Hill, Keyworth
Nottingham, NG12 5GG Tel: 44-6077-6111
United Kingdom Tlx: 378173 ISGKEY G

Director G. I. Lumsden

British Geological Survey
Harwell Laboratory
Building 151
Harwell, Oxon OX11 0RA Tel: 44-235-2-4141
United Kingdom Tlx: 83135 ATOMHA G

BNFL: RISLEY

British Nuclear Fuels plc
Risley, Warrington
Cheshire WA3 6AS Tel: 44-9253-5953
United Kingdom Tlx: 627581

[About 20 miles by official car or taxi from Manchester
International Airport; or train from London to Warrington
(approx. 3 hours), then 6 miles by official car or taxi to
Risley.]

Chairman Christopher Harding
Chief Executive Neville Chamberlain
Dep. Chief Exec., and Director, Bill Wilkinson
Spent Fuel Management Services

BNFL: SELLAFIELD

British Nuclear Fuels plc
 Sellafield, Seascale
 Cumbria CA20 1PG
 United Kingdom

Tel: 44-9402-8333
 Tlx: 64237/8

Director, Reproc. Operations Gordon Steele

[By train from London-Euston Station to Carlisle Station (4 hours); transport can be arranged by BNFL from Carlisle to site (approx. 1-1/2 hours). From Manchester International Airport to site by car is approx. 3 hours.]

Reprocessing Facilities:* **B205**

Mission: Reprocess Magnox (magnesium-clad, U metal) fuels from UK GCRs. Oxide head-end added in 1969 to handle AGR and LWR fuels.

Design Basis: Magnox fuels: mechanical declad; PUREX flowsheet; "no-maintenance" concept; nominal capacity, 1500 t/a. Liquid HLW storage: SS tanks, 70 m³ and 150 m³, in SS-lined concrete cells.

History: Magnox fuels: B205 startup, 1964; annual throughput of Magnox fuels, 1000-1200 tHM. Oxide head-end (installed in B204), operated 1969-1973 and processed 90 t oxide fuel, before plant was shut down after a contamination release incident.

* **Magnox Fuel Handling Plant**

- Storage and decanning of magnox fuel.
- Storage and dismantling of AGR fuel.

* **THORP (Thermal Oxide Reprocessing Plant)**

Mission: Reprocess AGR and domestic or foreign LWR fuels.

Design Basis: PUREX flowsheet, pulsed columns and mixer-settlers. AVM process for HLW vitrification. Nominal capacity, 1200 tU/a.

Milestone: Startup, 1992.

MOX Fuel Fabrication Facilities* **MOX Fuel Fabrication Pilot Plant**

Capacity: 6 t/a FBR fuels.

* **MOX Fuel Fabrication Production Plants (planned)**

Capacity: 100 t/a; startup 1995.

BNFL: SELLAFIELD (contd)**Waste Treatment Facilities**

- * **FSIF** (cold demonstration plant-vitrification)
Mission: Test prototype equipment and maintenance techniques.
Design Basis: French AVM process (rotating-tube calciner/metal melter); capacity, 11 kg/hr glass; product, borosilicate glass blocks.
History: Startup, 1983.
- * **Vitrification Plant**
Mission: Solidify Sellafield HLW.
Design Basis: AVM process; product, borosilicate glass blocks.
Capacity: 250-300 t/a glass.
Milestone: Startup, 1989.
- * **Waste Treatment Complex**
Mission: Prepare non-HLW for disposal.
Construction: Start 1986 (estimated cost: US\$90 million).

BNFL: SPRINGFIELDS

British Nuclear Fuels plc
 Springfields Works
 Salwick, Preston,
 Lancashire PR4 0XJ
 United Kingdom

Tel: 44-772-72-8262
 Tlx: 67526/7

Director, Fuels

Anthony Stephens

BRE

Building Research Establishment
 Department of the Environment
 Building Research Station
 Garston, Watford WD2 7JR
 United Kingdom

Tel: 44-9273-74040
 Tlx: 92-3220

Asst. Director, Geotechnics/
 Structural Engineering
 Geotechnics Division
 Seabed Disposal
 Continental Disposal

Dr. J. B. Menzies
 J. B. Boden
 T. Freeman
 Ms. C. M. Cooling

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

UNITED KINGDOM

CEGB

Central Electricity Generating Board
Sudbury House
15 Newgate Street
London, EC1A 7AU
United Kingdom

Tel: 44-1-634-5111
Tlx: 88-3141

Chairman
Director, Plant Engineering
Director, Nuclear Operations

Sir Walter Marshall
P. M. Billman
Dr. B. Edmonson

DOE

Department of the Environment
Directorate of Waste Disposal
43 Marsham Street
London SW1 3PY
United Kingdom

Tel: 44-1-212-8673
Tlx: 22-221

Director

Brian D. Ponsford
44-1-212-6506
Dr. Frank Feates
44-1-212-8804

Chief Radiochemical Inspector

Waste Management Responsibility: Administer UK waste management programs; fund and coordinate waste treatment and waste isolation R&D at Harwell, BGS, NRPB, etc.; regulate discharge of radioactive materials to the environment.

IOS

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

Tel: 44-42-879-4141
Tlx: 85-8833

Director
Nuclear Waste

Dr. Anthony S. Laughton
Dr. T. J. G. Francis

MAFF

Ministry of Agriculture Fisheries and Food
Fisheries Laboratories
Pakefield Road
Lowestoft, Suffolk NR33 0HT
United Kingdom

Tel: 44-502-62244
Tlx: 97470

Director, Fisheries Research
Aquatic Environment Protection

Alan Preston
Harry Hill

UNITED KINGDOM

NII

Nuclear Installations Inspectorate

Baynards House
1 Chepstow Place
London W2 4TF
United Kingdom

Tel: 44-1-229-3456
Tlx: 25-683
Fax:

Chief Inspector/Nuc.Installations E. A. Ryder
Overseas Liaison J. S. Macleod

NIREX

UK Nirex Ltd.
Curie Avenue, Harwell
Didcot, Oxon OX11 0RA
United Kingdom

Tel: 44-235-83-5153
Tlx: 83-7567 UKNIRX G
Fax:

Chairman John Baker
Managing Director P. Tom McInerney
Technical Program Maurice E. Ginniff

Function: Locate, develop and operate facilities and sites for disposal of LLW and ILW.
State-owned public company: CEGB, BNFL, UKAEA and SSEB (South of Scotland Electricity Board) as partners, with Secretary of State for Energy having absolute powers of veto.

NRPB

National Radiological Protection Board

Chilton Didcot
Oxfordshire OX11 0RO
United Kingdom

Tel: 44-235-83-1600
Tlx: 83-7124
Fax: 44-235-83-3891

Director H. J. Dunster
Secretary Dr. R. H. Clarke
Asst. Director, Operations G. A. M. Webb

SRO

Safety and Reliability Directorate

Wigshaw Lane, Culcheth
Warrington WA3 6AT
United Kingdom

Tel: 44-925-31244
Tlx: 629301 atomry-g

Function: Advise the UKAEA on safety, coordinate reactor safety research, and provide advice and services on safety to government and industry.

UKAEA

UK Atomic Energy Authority
11 Charles II Street
London SW1 4QP
United Kingdom

Tel: 44-1-930-5454
Tlx: 22 565

Chairman Arnold M. Allen

UKAEA: DOUNREAY

Dounreay Nuclear Power Development
Establishment
UKAEA (Northern Division)
Thurso, Caithness KW14 7TZ
Scotland
United Kingdom

Tel: 44-847-62121
Tlx: 75297

[From London by air to Wick (via Aberdeen), then approx. 30 miles by car to Dounreay; or by train from London to Thurso (via Inverness), then approx. 10 miles by car to Dounreay.]

Director Clifford W. Blumfield
Asst. Director, Fuels O. Pugh

Facilities

- * **PFR Reprocessing Plant**
Mission: Reprocess Dounreay Prototype Fast Reactor (MOX) fuels.
Design Basis: Shear single pins and leach; PUREX process; capacity 9-10 tHM/a of 180-day cooled PFR assemblies with 8-10% burnup.
History: Dounreay Fast Reactor fuels processed from 1961 to 1975; plant rebuilt to handle PFR oxide fuels, resumed operation in October 1980.
- * **Solidification Plant**
Mission: Condition liquid wastes by cementation.
Milestone: Construction--start 1985, completion 1987 (cost US\$ 884 million)

UKAEA: HARWELL

Atomic Energy Research
Establishment
AERE, Harwell
Didcot, Oxon OX11 0RA
United Kingdom

Tel: 44-235-2-4141
Tlx: 83135

UNITED KINGDOM

UKAEA: HARWELL (contd)

Director	Dr. Graeme Low
Director, Fuel Processing	Dr. Ron H. Flowers (ext. 2323)
	Norm J. Keen
Director, Underlying Research	Dr. Jack Williams
Director, Nuc. Power Research	Dr. Stuart Nelson

Facilities

- * **Harwell Ceramic Melter Test Unit** (nonradioactive)
Mission: Develop ceramic melter capability for UKAEA.
Design Basis: Liquid-fed ceramic melter; capacity, 700 kg/day glass; product, borosilicate glass.
History: Initial studies in 1/3 (linear) scale unit 1982-84. Startup, (full scale) 1986.

UKAEA: RISLEY

Risley Nuclear Power Development Establishment
UKAEA (Northern Division)
Risley, Warrington
Cheshire WA 3 6AT
United Kingdom

Tel:	44-925-31244
Tlx:	629301

Director, Process Technology and Safety	R. Harry Allardice (ext. 2181)
Waste Management (General)	H. Barton (ext. 2451)
Decommissioning	D. F. Rawson (ext. 2919)

UKAEA: SPRINGFIELDS

UK Springfields Nuclear Power
Development Laboratories
Salwick, Preston
Lancashire PR4 0RR
United Kingdom

Laboratory	John V. Shennan
Chem. Plant Development	P. Laurie Allen
Process Eng. Technology	Cliff Etherington
Head-End/Solid Waste Mgmt.	Brian E. Meredith

UNITED STATES

UNITED STATES

MAJOR PUBLIC HOLIDAYS (1987)

January 1	New Year
January 19	M. Luther King Day
February 16	Presidents Day
May 25	Memorial Day
July 4	Independence Day
September 7	Labor Day
November 11	Veterans Day
November 26	Thanksgiving
December 25	Christmas

STATE ABBREVIATIONS

AL-Alabama	LA-Louisiana	OH-Ohio
AK-Alaska	ME-Maine	OK-Oklahoma
AZ-Arizona	MD-Maryland	OR-Oregon
AR-Arkansas	MA-Massachusetts	PA-Pennsylvania
CA-California	MI-Michigan	RI-Rhode Island
CO-Colorado	MN-Minnesota	SC-South Carolina
CT-Connecticut	MS-Mississippi	SD-South Dakota
DE-Delaware	MO-Missouri	TN-Tennessee
FL-Florida	MT-Montana	TX-Texas
GA-Georgia	NE-Nebraska	UT-Utah
HI-Hawaii	NV-Nevada	VT-Vermont
ID-Idaho	NH-New Hampshire	VA-Virginia
IL-Illinois	NJ-New Jersey	WA-Washington
IN-Indiana	NM-New Mexico	WV-West Virginia
IA-Iowa	NY-New York	WI-Wisconsin
KS-Kansas	NC-North Carolina	WY-Wyoming
KY-Kentucky	ND-North Dakota	

VISITS TO US DOE FACILITIES

Foreign visitors to U.S. DOE facilities must complete and submit an IA-473 form (OMB 1901-0130) "Request for Foreign National Unclassified Visit or Assignment" to DOE Office of International Affairs at least 60 days before the proposed visit. The itinerary should be based on prior arrangement with appropriate DOE or DOE contractor staff concerning a suitable time for the visit.

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

UNITED STATES

ENERGY

Population	1984	235 million
Electric Power Plant Capacity	1984	672 GWe 11% nuclear
Electric Power Production	1984	2,563 TWh-- 56% coal 14% nuclear 13% hydro/geoth. 12% gas 5% oil
	1986	17% nuclear
	1990	20% nuclear

NUCLEAR POWER GENERATION

Policy: Encourage construction and operation of nuclear power stations by private and public utilities under close regulatory control by NRC and State Public Review Commissions; continue R&D emphasizing LWR safety and small, modular concepts.

Nuclear Power Plant Capacity	1987	97.7 GWe
	1995	108.9 GWe
	2000	111.1 GWe
Reactor Mix	1986	PWR: 65 (1961-86) 14 (1987-2002) BWR: 36 (1960-86) 3 (1987-91) LGR: 1 (1966) HTR: 1 (1979)

NUCLEAR FUEL CYCLE

Policy: Current US industrial activities include all phases of the nuclear fuel cycle except spent fuel reprocessing: uranium mining, milling, and enrichment; fuel fabrication; interim spent fuel and waste storage; transportation, conditioning, and disposal of radioactive waste. Mining, milling, fabrication of UO₂ fuel, and LLW disposal is done predominantly by private firms; enrichment and HLW disposal are the responsibilities of the federal government. While permitted by law, commercial reprocessing is not envisioned in the near future because of economic considerations.

Waste Management Strategy: Disposal of US spent fuel in geologic repository, possibly after consolidation and packaging in a Monitored Retrievable Storage (MRS) Facility. The Nuclear Waste Policy Act (NWPA) of 1982 mandates start of spent fuel and high-level waste acceptance in 1998 by US Government. Short-lived LLW/ILW is disposed of by shallow-land burial or alternative non-geologic means.

UNITED STATES

Cumulative Spent Fuel Arisings	1986	13,751 tHM
	1990	20,928 tHM
	2000	40,782 tHM

Major Milestones

* Startup of Waste Isolation Pilot Plant (Defense TRU waste)	1989
* Recommendation of site for first repository to Congress	1994
* Startup of MRS Facility	1998
* Startup of first repository for civilian waste	2003

INTERNATIONAL RELATIONSHIPS

Member of OECD/NEA and IAEA. Bilateral agreements for waste management cooperation with Belgium, Canada, CEC, Germany (FRG), France, Japan, Spain, Sweden, Switzerland and the United Kingdom. A brief outline of the agreements is provided in the appropriate country's section. International cooperation and exchange of waste management technology is encouraged through visits by foreign nationals to US sites and through foreign travel by US staff.

ORGANIZATION

- * DOE (Department of Energy) - Responsible for planning and implementing of programs for the safe handling of radioactive waste generated by federal activities, and for disposal of all high-level and TRU waste. Responsible also for ensuring availability of adequate technology for safe and efficient management of nuclear waste from both civilian and federal activities.
- HQ (Headquarters) - Responsibilities for the nuclear waste management and fuel cycle programs are divided among the offices of:
 - NE (Nuclear Energy) - R&D technologies for treatment of civilian low-level radioactive waste; remedial action to treat or stabilize radioactive waste; D&D of selected facilities.

UNITED STATES

DOE (contd)

- RW (Civilian Radioactive Waste Management) - Storage and disposal of spent nuclear fuel and HLW; development of monitored retrievable storage (MRS) facilities; development of transportation systems for spent fuel/HLW.
 - DP (Defense Programs) - Safe management of radioactive nuclear waste generated primarily by federal facilities, except disposal of HLW which will be co-mingled with commercial waste disposal.
 - IE (International Affairs and Energy Emergencies) - Coordination of DOE's international activities.
 - F.O. (Field/Operation Offices) - Implement HQ policy and directives, issuing orders to specific sites. Direct efforts of DOE contractors.
 - Contractors - Operate DOE facilities in accordance with HQ and F.O. guidance and orders.
- * DOI (Department of the Interior) -
- USGS (US Geological Survey) - Conducts laboratory and field geologic investigations in support of DOE's waste disposal programs; acts as consultant to NRC.
- * DOT (Department of Transportation) - Development, issuance and enforcement of safety standards, governing all aspects of waste transit.
- * EPA (Environmental Protection Agency) - Establishment and enforcement of standards for the protection of the general environment.
- * NRC (Nuclear Regulatory Commission) - Issuance of regulations and licenses for disposal of HLW by DOE and for commercial nuclear activities, in compliance with the general environmental standards issued by the EPA.

DOE (DEPARTMENT OF ENERGY) PARTIAL ORGANIZATION

Secretary

Deputy Secretary

Under Secretary

- |— NE - Nuclear Energy
- |— DP - Defense Programs
- |— RM - Civilian Radioactive Waste Management
- |— IE - International Affairs and Energy Emergencies
- |— Field/Operations Offices
 - * AL - Albuquerque
 - |— LANL — MRC — RFP — SML — WIPP
 - * CH - Chicago
 - |— ANL — BNL — BPMD
 - * ID - Idaho
 - |— INEL — WV — WINCO — TMI
 - * NV - Nevada
 - |— REECO — LLNL
 - * OR - Oak Ridge
 - |— ORNL
 - * RL - Richland
 - |— PNL — RHO — WHC — UNC
 - * SAN - San Francisco
 - |— EPRI — GAT — LLNL — ROCKETDYNE
 - * SR - Savannah River
 - |— SRL — SRP

NRC (NUCLEAR REGULATORY COMMISSION) PARTIAL ORGANIZATION

UNITED STATES

DOE

US Department of Energy	TEL:	202-586-5000
Forrestal	FTS:	896-5000
Washington, DC 20585	TWX:	710-822-0176
	FAX:	202-586-8134
	VERIF:	586-5100
 US Department of Energy	 TEL:	 202-586-5000
Germantown	FTS:	896-5000
Washington, DC 20545	TWX:	710-828-0475
	FAX:	301-353-4767
	VERIF:	301-353-3486

Please note: Due to space limitations the area code, necessary for calls on commercial lines, has been omitted in the listing of telephone numbers for individuals:

202 precedes 586- and 301 precedes 353-.

Civilian Radioactive Waste Management

RW-1	Director	Ben C. Rusche	586-6850
RW-2	Deputy Director	C. Ed Kay	586-6850
RW-10	Resource Mgmt.	Samuel Rouso	586-9116
RW-20	Geo. Repositories	Stephen H. Kale	586-9694
	Deputy Assoc. Dir.	Thomas H. Isaacs	586-9692
	Repository Coordin.	James C. Bresee	586-1116
	Eng./Geotechnology	Ralph Stein	586-5355
	Siting, Licensing/QA	James P. Knight	586-5792
RW-30	Storage/Transportation	J. Roger Hillley	586-5292
	Storage	Keith Klein	586-9433
	Transp./Waste Systems	Lake Barrett	586-6046
RW-40	Policy and Outreach	Roger W. Gale	586-2277
	Deputy Director	Jerome Saltzman	586-1252
	International Coord.	Carl R. Cooley	586-1252

International Affairs and Energy Emergencies

IE-1	Assistant Secretary	David B. Waller	586-5800
IE-10	Deputy Asst. Secretary	R. Sean Randolph	586-5858
IE-12	Internatl. R&D Policy	Harold Jaffe	586-6770

UNITED STATES

Please note: Due to space limitations the area code, necessary for calls on commercial lines, has been omitted in the listing of telephone numbers for individuals:

202 precedes 586- and 301 precedes 353-.

Nuclear Energy

NE-1	Assistant Secretary	James W. Vaughan	586-6630
NE-14	Interntl. Programs	Sol Rosen	353-3218
NE-20	Remedial Action/ Waste Technology	William R. Voigt	353-5006
NE-22	Mill Tailings	James A. Turi	353-2585
NE-23	Site Decommissioning	James J. Fiore	353-9761
NE-24	Waste Treatment	Joseph Coleman	353-4728
NE-30	Dep.Asst.Sec./U Enr.	John R. Longenecker	353-4321
NE-40	Dep.Asst.Sec./Reactor Syst.Devel./Technol.	Jerry D. Griffith	353-3950
NE-471	Fuels/Reprocessing	David E. Bailey	353-4078

Defense Programs

DP-1	Assistant Secretary	Sylvester R. Foley	586-2177
DP-10	Dep.Asst.Sec./Nuc.Mtls.	John L. Meinhardt	586-2185
DP-12	Waste/Transp. Mgmt.	Jill E. Lytle	353-3641
DP-14	Nuc.Mtls.Resource Mgmt.	James E. Dieckhoner	353-3982
DP-121	Transportation	Larry H. Harmon	353-3506
DP-122	Operations/Projects	Walter A. Frankhauser	353-5292
DP-123	Waste R&D	Jerry H. Daly	353-3031
		Roger K. Heusser	353-2588
DP-124	Remedial Action	Critz H. George	353-5909

UNITED STATES

DOE OPERATIONS OFFICESALBUQUERQUE OPERATIONS (AL)

US Department of Energy	TEL:	505-846-3118
Albuquerque Operations Office	FTS:	846-3118
PO Box 5400	TLX:	66-0424
Albuquerque, NM 87115	FAX:	844-4197
	VERIF:	same
Manager	R. G. Romatowski	844-7231
Waste Mgmt./Transp.Devel.	J. M. McGough	846-2340
Waste Isolation Pilot Plant	Jack B. Tillman	505-887-8102
Seabed Programs	W. O. Forster	505-766-3401
Uranium Mill Tailings	James R. Anderson	844-3941

CHICAGO OPERATIONS (CH)

US Department of Energy	TEL:	312-972-2000
Chicago Operations Office	FTS:	972-2000
9800 South Cass Avenue	TWX:	910-258-3285
Argonne, IL 60439	FAX:	972-2343
	VERIF:	972-2209
Manager	Hilary J. Rauch	-2110
Repository Technology/ Transportation Div.(RTTD)	Sally A. Mann	-2257
Repos. Tech. Program (RTP)	Richard C. Baker	-2071
Transportation Program.(TPO)	Paul K. Kearns	-2253
Waste Operations-Materials Integration Office (MIO)	Joel C. Haugen	-2093
Salt Rep. Proj. Office (SRPO) Columbus, OH	Jeff O. Neff	FTS 976-5916

IDAHO OPERATIONS (ID)

US Department of Energy	TEL:	208-526-0111
Idaho Operations Office	FTS:	583-0111
785 DOE Place	TWX:	910-977-5915
Idaho Falls, ID 83402	FAX:	583-0524
	VERIF:	583-1503
Manager	Troy E. Wade II	-1322
Nuclear Programs	J. Phillip Hamric	-1395
Fuel Process	James Solecki	-1989
Waste Management	Robert E. Stiens	-9316
TMI Project	Willis Young	-1415
/Site		FTS 590-1011
West Valley Proj. (Site)	Willis W. Bixby	716-942-4312
	Elf Maestas	716-942-4314

UNITED STATES

NEVADA OPERATIONS (NV)

US Department of Energy	TEL:	702-295-1212
Nevada Operations Office	FTS:	575-1212
PO Box 14100	TWX:	910-397-6868
Las Vegas, NV 89114-4100	FAX:	575-1370
	VERIF:	575-1369

Manager	Thomas R. Clark	-3211
Waste Management	Donald L. Vieth	-1092

OAK RIDGE OPERATIONS (OR)

US Department of Energy	TEL:	615-576-5454
Oak Ridge Operations Office	FTS:	626-5454
PO Box E	TWX:	810-572-1076
Oak Ridge, TN 37831	FAX:	626-1064
	VERIF:	626-1057

Manager	Joe LaGrone	-4444
Nuclear R&D	Peter J. Gross	-6694

RICHLAND (HANFORD) OPERATIONS (RL)

US Department of Energy	TEL:	509-376-7411
Richland Operations Office	FTS:	444-7411
825 Jadwin Avenue	TWX:	510-770-5108
PO Box 550	FAX:	444-7280
Richland, WA 99352	VERIF:	444-7317

Manager	Michael J. Lawrence	-7395
Asst.Mgr.,Commercial Nuc.Waste	John H. Anttonen	-7591
Commercial Spent Fuel Mgmt.	Jim M. Peterson	-6731
Basalt Waste Isolation (BWIP)	Jack J. Keating	-7334
Asst.Mgr., Operations	Jack L. Rhoades	-7434
Waste Management	Jerry D. White	-1366
Asst.Mgr.,Facilities/Lab.	Ken W. Bracken	-7219
Surplus Facilities Mgmt.	Clarence E. Miller	-7473
Shippingport Stn.		
Decommissioning		
Shippingport, PA site	J. J. Schreiber	FTS 722-2639

UNITED STATES

SAN FRANCISCO OPERATIONS (SAN)

US Department of Energy	TEL:	415-273-7111
San Francisco Operations Office	FTS:	536-7111
1333 Broadway	TWX:	910-366-7228
Oakland, CA 94612	FAX:	536-6207
	VERIF:	536-7956
Manager	Richard A. DuVal	-7111
Nuclear Materials	F. T. Fong	-7836

SAVANNAH RIVER OPERATIONS (SR)

US Department of Energy	TEL:	803-725-6211
Savannah River Operations Office	FTS:	239-6211
PO Box A	TWX:	810-771-2670
Aiken, SC 29801	FAX:	239-2130
	VERIF:	239-3160
Manager	Robert L. Morgan	-2277
Defense Waste Process Facility (DWPF)	Donald C. Fulmer	-3915

DOE CONTRACTORSANL

Argonne National Laboratory	TEL:	312-972-2000
9700 South Cass Avenue	FTS:	972-2000
Argonne, IL 60439	TWX:	910-258-3285
	FAX:	972-2343
	VERIF:	972-2209

Director	Allan Schriesheim	-3872
Waste Management	Stanley S. Borys	-6677
Materials Review Board	Martin J. Steindler	-4383
Natl. Energy Software Center	M. K. Butler	-7250
ANL-West, Manager	R. J. Teunis	FTS 583-7106

Fuel Cycle and Waste Management Activities:

Remedial action for formerly-used MED/AEC sites (FUSRAP) and for surplus facilities management program (SFMP) - D&D of ANL-East contaminated facilities - Materials review board and materials integration office - Salt repository development - repository technology program, interaction of waste package materials with simulated salt repository environments, waste package strategy development - Low-level waste technology - TRU waste technology, TRUEX process development - Manage national energy software center - Pyrometallurgical and pyrochemical fuel reprocessing - Sodium waste management.

Major Facilities:

ANL-West: Experimental Breeder Reactor No. 2 (EBR-II) - Zero Power Plutonium Reactor (ZPPR) - Transient Reactor Test Facility (TREAT) - Hot Fuel Examination Facility (HFEF) - Radioactive Scrap and Waste Facility - Sodium Process Demonstration (SPD) Facility - Radioactive Liquid Waste Treatment Facility (RLWTF).
ANL-East and ANL-West: High-Level Hot-Cell Facilities. Large Gamma Radiation Facility.

BPMO

Battelle Project Management Division	TEL:	614-424-6424
505 King Avenue	FTS:	976-6424
Columbus, OH 43201	TLX:	24-5454
	FAX:	976-4874
	VERIF:	976-5600

General Manager	Richard A. Nathan	-4295
Nuc. Waste Isolation (ONWI)	Wayne A. Carbiener	-4507
Transp.Syst. Planning (OTSP)	C. Charles Kimm	-6463
Waste Tech. Devel. (OWTD)	Walter E. Newcomb	312-655-8620
Battelle-Office of Waste Technology Development		
7000 S. Adams Street		
Willowbrook, IL 60521	TEL:	312-655-8600

US-11

BPMO(cont'd)

Fuel Cycle and Waste Management Activities:

Site survey/characterization - Waste packaging - Disposal technology - Transportation - Performance assessment - Environmental/Socioeconomic assessments - Systems integration - Quality assurance - Licensing

Major Facilities:

Hot and Cold Development Laboratories - Hot Cells for both destructive and nondestructive examination for development programs.

BNL

Brookhaven National Laboratory	TEL:	516-282-2123
Associated Universities, Inc.	FTS:	666-2123
Upton, NY 11973	TLX:	68-52516
	FAX:	666-3000
	VERIF:	666-2546

Director	N. P. Samios	-2772
High-Level Waste	D. G. Schweitzer	-3510
DOE LLW Programs	Peter Colombo	-3045
NRC LLW Programs	Peter Soo	-4094

Fuel Cycle and Waste Management Activities:

Low-level waste form evaluation - Waste mgmt. criteria

Major Facilities:

Hot and Cold Development Laboratories.

EPRI

Electric Power Research Institute	TEL:	415-855-2000
3412 Hillview Avenue	FTS:	same
PO Box 10412	TWX:	910-373-1163
Palo Alto, CA 94303	FAX:	415-855-2954
	VERIF:	415-855-2717

President	Floyd L. Culler	-2125
VP, Director, Nuclear Power	John Taylor	-2030
LWR Fuel/Spent Fuel Storage	David Franklin	-2408
Low-Level Waste	Robert Shaw	-2026

Fuel Cycle and Waste Management Activities:

Direct assay of low-level radioactive waste - Spent fuel rod consolidation equipment - On-site demonstration of spent fuel storage in metal casks/concrete silo - Conceptual designs for LLW disposal sites - Demonstration of transportable spent fuel metal storage cask - Fuel performance during load-following, high-temperature operation and extended burnup - Fuel performance computer models.

UNITED STATES

GAT

GA Technologies, Inc.	TEL:	619-455-3000
PO Box 85608	FTS:	same
10955 John Day Hopkins Drive	TLX:	69-5065
San Diego, CA 92138	TWX:	910-335-1260
	FAX:	619-455-3621
	VERIF:	619-455-3457

Chairman/Chief Executive	J. Neal Blue	-2151
HTGR Spent Fuel Technology	Robert Burgoyne	-4122
Transportation Systems	Robert C. Noran	-3217

Fuel Cycle and Waste Management Activities:

HTGR spent fuel treatment - Transportation technology for commercial and defense waste.

Major Facilities:

Pilot Plant for HTGR Fuel Cycle Studies - Fuel Production Facility.

INEL

Idaho National Engineering Laboratory	TEL:	208-526-0111
EG&G Idaho, Inc.	FTS:	583-0111
PO Box 1625	TWX:	910-977-5915
Idaho Falls, ID 83415	FAX:	583-9591
	VERIF:	583-9500

Manager	James O. Zane	-9671
Waste Management	Dale L. Uhl	-1014
National LLW Technology	Ed A. Jennrich	-9490
TMI-2 Program (TMI Site)	Phil J. Grant	FTS 590-1010

Fuel Cycle and Waste Management Activities:

National LLW technology - D&D (EBR-II, MTR, OMRE, Spent Reactors) - TMI-2 R&D - Operation of stored waste examination pilot plant (SWEPP) for TRU waste - Operation of process experimental pilot plant (PREPP) for TRU waste - Dry rod consolidation technology - LLW disposal operation.

Major Facilities:

Radioactive Waste Management Complex (RWMC) - Processing Experimental Pilot Plant (PREPP) - Waste Environmental Reduction Facility (WERF) - Loss-of-Fluid Test (LOFT) Facility - Stored Waste Examination Pilot Plant (SWEPP) - Major Test Area North/Spent Fuel Storage Area - LLW Disposal Site.

UNITED STATES

LANL

Los Alamos National Laboratory	TEL:	505-667-5061
University of California	FTS:	843-5060
PO Box 1663	TWX:	910-988-1773
Los Alamos, NM 87545	FAX:	843-6937
	VERIF:	843-5113

Director	Siegfried Hecker	-5101
Nuclear Waste Mgmt.	Donald T. Oakley	-1310

Fuel Cycle and Waste Management Activities:

Fundamental studies of waste materials (BES) - Migration from low-level waste sites (BES) - D&D of various site facilities - Tuff repository support (NNWSI).

Major Facilities:

Waste Disposal Field Experimental Facility - Controlled Air Incinerator Demonstration Facility - Glove Box Reduction Facility - TRU Waste Assay Systems.

LIN

Lawrence Livermore National	TEL:	415-422-1100
Laboratory	FTS:	532-1100
University of California	TWX:	910-386-8339
PO Box 808	FAX:	532-1370
Livermore, CA 94550	VERIF:	532-4546

Director	Roger E. Batzel	-1178
Nuclear Waste Management	L. D. Ramspott	-4176

Fuel Cycle and Waste Management Activities:

Particulate filter development - Fundamental geoscience studies - CLIMAX spent fuel test at NTS - Development of waste package for Tuff repository - Waste package design criteria - Monitoring techniques for geologic repositories - Geochemical code for repository performance assessment.

Major Facilities:

CLIMAX Spent Fuel Test Facility at NTS.

MSC

Monsanto Research Corporation	TEL:	513-865-4020
Mound Facility	FTS:	774-4020
PO Box 32	TWX:	810-473-2974
Miamisburg, OH 45342	FAX:	774-3742
	VERIF:	774-3575

Director	Wylie Hogeman	-3222
Nuclear Waste	John K. Mills	-4708
D&D	Ralph R. Jaeger	-3275

UNITED STATES

MRC (contd)

Fuel Cycle and Waste Management Activities:

Solid waste volume reduction with glass melter - TRU waste technology/record systems - TRU waste treatment/liquid waste, incineration - tritium recovery from waste - D&D of Pu-238 facilities.

Major Facilities:

Glass Melter - Incinerator - Waste Treatment Facility - Combined Electrolysis Catalytic Exchange System (CECE) - Tritium Effluent Recovery System (ERS) - Hydrogen Isotope (Cryogenic Distillation) Separation System (HISS).

ORNL

Oak Ridge National Laboratory	TEL:	615-576-5454
Martin Marietta Energy	FTS:	626-5454
Systems, Inc.	TWX:	810-572-1076
PO Box X	FAX:	626-2912
Oak Ridge, TN 37831	VERIF:	624-6068

Director	Herman Postma	6-2900
Nuclear & Chemical Waste	Thomas H. Row	4-5974

Waste Management Activities:

Operate waste management facilities, including disposal - Development of TRU waste technology, including assay and package certification - Hazardous waste remedial actions - Sedimentary rock studies - Waste operations control center - UMTRA radiological survey - Environmental restoration and facilities upgrade - waste management R&D.

Major Facilities:

Integrated Equipment Test Facility - Fuel Element Shearing and Decladding Facilities - Rotary Resolver - LLW Disposal/Storage Facilities - TRU Assay Facility - Tower Shielding Facility (fuel/waste cask drop tests).

PNL

Pacific Northwest Laboratory	TEL:	509-375-2271
Battelle Pacific Northwest	FTS:	same
Laboratories	TLX:	15-2874
Battelle Boulevard	FAX:	509-375-2718
PO Box 999	VERIF:	509-375-2580
Richland, WA 99352		

Director	William R. Wiley	-2201
Director, Eng. Technology	Thomas T. Claudson	-2878
Waste Technology Center	Wade W. Ballard	-2354
International Support	L. T. (Pete) Lakey	376-0933
Process Technology	Jack L. McElroy	376-6253
Waste Systems/Transportation	Jackie L. Braitman	376-4453
Waste Package/Perf. Assessmt.	Don J. Bradley	-2587
Materials Characterization	Max R. Kreiter	-2666

PNL (contd)

Fuel Cycle and Waste Management Activities:

Commercial spent fuel management - Civilian nuclear waste treatment (HLW/TRU) - Monitored retrievable storage (MRS) - Materials characterization center (MCC) - International program support - NRC environmental studies on LLW and uranium mill tailing sites - Salt repository (ONMI), Basalt repository (BWIP) and Tuff repository (NNWSI) support studies - HLW technology (SR, WV, Hanford) - TRU technology (TWSO, Hanford) - LLW technology (LLWMP, Hanford) - Remedial action planning and technology - Byproduct utilization - Transport technology.

Major Facilities:

Hot and Cold Development Laboratories - Hot Cells for Development Programs.

REECO

Reynolds Electrical & Engineering Co.	TEL:	702-295-1000
PO Box 440	FTS:	575-1000
Las Vegas, NV 89114	TLX:	910-397-6868
	FAX:	702-295-1370
	VER:	702-295-1369

President/Gen. Manager	Dale L. Fraser	-3379
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Fuel Cycle and Waste Management Activities:

Operate Nevada Test Site.

Major Facilities:

Nevada Test Site.

REP

Rocky Flats Plant	TEL:	303-966-7000
Rockwell International Corporation	FTS:	320-7000
Energy Systems Group	TWX:	910-940-5898
PO Box 464	FAX:	320-4092
Golden, CO 80402-0464	VERIF:	320-2719

President	D. J. Sanchini	-4361
Waste Management	Ed R. Naimon	-7900

Fuel Cycle and Waste Management Activities:

Defense TRU waste technology - TRU waste technology development - Operate waste treatment facilities.

Major Facilities:

Solid Waste Reduction Facility - TRU Waste Incinerators - TRU Waste Assay - Liquid Waste Treatment and Fixation Facilities.

UNITED STATES

RHO*

Rockwell Hanford Operations	TEL:	509-376-7411
Energy Systems Group	FTS:	444-7411
PO Box 800	TWX:	510-770-5108
Richland, WA 99352	FAX:	376-6430
	VERIF:	376-6793

General Manager	Paul G. Lorenzini	373-1277
Bas. Waste Isol. Proj. (BWIP)	D. Clark Gibbs	376-8723
Waste Management	Ronald D. Prosser	373-3001
Decommissioning	William F. Heine	373-1184

Fuel Cycle and Waste Management Activities:

Fuel reprocessing (PUREX) - HLW tank storage - Cs/Sr recovery and encapsulation - HLW concentration and solidification - Low-level liquid waste treatment and fixation - D&D (hot semi works) - TMI support/waste packaging and disposal - TRU waste assay - Basalt waste isolation program (BWIP) - Hanford waste disposal - D&D Hanford reactors.

Major Facilities:

PUREX Reprocessing Plant - Cs/Sr Encapsulation Plant - BWIP site and Near Surface Test Facility (NSTF).

* All RHO activities/facilities will be transferred to WHC (US-19) by September 30, 1987, to consolidate operations at the Hanford Site.

ROCKETDYNE

Rockwell International Corporation	TEL:	818-700-8200
Atomics International Division	FTS:	983-8200
Rocketdyne	TLX:	69-8478
6633 Canoga Avenue	FAX:	983-2866
Canoga Park, CA 91303	VERIF:	983-2471

Director	John S. McDonald	-3722
Nuclear Products/Services	Larry G. Kellog	-3978
Fuel Decladding	William Dennison	-4156

Fuel Cycle and Waste Management Activities:

Decladding of fuels - Operation of energy technology and engineering center (ETEC) - Remote handling development - Large component fabrication.

Major Facilities:

Large Inert Hot Cell - Energy Technology and Engineering Center (ETEC).

UNITED STATES

SNL

Sandia National Laboratories	TEL:	505-844-5678
Albuquerque, NM 87185-5800	FTS:	844-5678
	TWX:	910-989-1600
	FAX:	844-7091
	VERIF:	844-8971

President	Irwin Welber	-7261
Nuclear Fuel Cycle	A. W. Snyder	-8203
Nuc. Waste Mgmt./Transp.	Richard W. Lynch	-3763
Transp. Tech. Center	Joe Stiegler	6-0896
WIPP Scientific Support	Wendel D. Weart	-4855
Subseabed Disposal	D. R. Anderson	-6553

Fuel Cycle and Waste Management Activities:
 Transportation of Pu and HLW - Tuff repository support
 (NWSI) - Operate transportation technology center - Salt
 repository scientific support (WIPP) - Safety assessment of
 facilities for NRC.

Major Facility:
 Transportation Technology Center.

SRL

Savannah River Laboratory	TEL:	803-725-6211
E.I. du Pont de Nemours & Co.	FTS:	239-6211
Aiken, SC 29808-0001	TWX:	810-771-2670
	FAX:	239-2130
	VERIF:	239-3160

Director, Research	John T. Lowe	-3422
Defense Waste Processing	D. L. McIntosh	-3113
Chemical Processes	Randolph J. Guschl	-3701

Fuel Cycle and Waste Management Activities:
 Fuel reprocessing R&D - HLW storage and solidification
 R&D-HLW form development and characterization - HLW
 packaging R&D - TRU technology development - LLW tech-
 nology development - Defense HLW technology develop-
 ment.

Major Facilities:
 TNX HLW Vitrification Pilot Plant - TNX HLW Tank Mockup
 - HLW Caves for Process Development - TRU Waste
 Incinerator.

UNITED STATES

SRP

Savannah River Plant	TEL:	803-725-6211
E.I. du Pont de Nemours & Co.	FTS:	239-6211
Aiken, SC 29808-0001	TWX:	810-771-2670
	FAX:	239-2130
	VERIF:	239-3160

Manager	John T. Granaghan	-2701
Defense Waste Processing	L. M. Papouchado	-3320

Fuel Cycle and Waste Management Activities:

Operate fuel reprocessing facilities - Operate associated spent fuel storage, HLW tank storage and liquid waste treatment facilities - Operate LLW incinerator - Operate LLW shallow-land burial grounds - Build and operate defense waste processing facility.

Major Facilities:

F&H Reprocessing Plants - Canyon Mockup Shop - LLW Incinerator - HLW Tank Farm - Defense Waste Processing Facility (DWPF)

UNC*

UNC Nuclear Industries, Inc.	TEL:	509-376-7411
PO Box 490	FTS:	444-7411
Richland, WA 99352	TWX:	510-770-5108
	FAX:	376-6000
	VERIF:	376-2726

President	Larry L. Humphreys	373-1123
Shippingport Decom. Site	Charles A. Broom	FTS 643-5552

Fuel Cycle and Waste Management Activities:

Waste management operations for N-Reactor - DOE surplus facilities program.

Major Facilities:

N-Reactor - N-Reactor Fuel Fabrication Facilities.

* All UNC activities/facilities will be transferred to MHC (US-19) by September 30, 1987, to consolidate operations at the Hanford Site.

MHC

Westinghouse Hanford Company	TEL:	509-376-7411
PO Box 1970	FTS:	444-7411
Richland, WA 99352	TWX:	510-770-5108
	FAX:	444-4668
	VERIF:	444-5777

US-19

UNITED STATES

WHC (contd)

President	William M. Jacobl	-7803
Defense Waste Management	Ronald E. Lerch	-9758

Fuel Cycle and Waste Management Activities:

Breeder fuel development and fabrication - Spent fuel integrity in storage.

Major Facilities:

Fast Flux Test Facility (FFTF) - Fuel Cycle Plant (FCP previously FMEF) - Fuel Development Laboratories.

WV

West Valley Nuclear Services, Inc.	TEL:	716-942-3235
Subsidiary of Westinghouse Electric	FTS:	473-3235
PO Box 191	TLX:	none
West Valley, NY 14171-0191	FAX:	473-4246
	VERIF:	473-4267

President	James E. Krauss	-4344
Engineering	Stephen Marchetti	-4337

Fuel Cycle and Waste Management Activities:

Demonstration of HLW vitrification - D&D of West Valley reprocessing plant.

Major Facilities:

Reprocessing Plant - HLW Vitrification Component Test Stand.

WINCO

Westinghouse Idaho Nuclear Co., Inc.	TEL:	206-526-0111
Idaho Chemical Processing Plant	FTS:	583-0111
PO Box 4000	TLX:	none
Idaho Falls, ID 83401	FAX:	583-5436
	VERIF:	583-5233

President	Ed W. Pottmeyer	-0998
Production	W. C. Moffit	-3864
Technology	Bert R. Wheeler	-3373

Fuel Cycle and Waste Management Activities:

Operate associated spent fuel storage, HLW tank storage, and liquid waste treatment facilities.

Major Facilities:

Idaho Chemical Processing Plant (ICPP) - Waste Calcining Facility (WCF) and Remote Mockup - Wet Fuel Storage - Dry HTGR Fuel Storage - Kr-85 cryogenic recovery plant.

UNITED STATES

WIPP

WIPP Project	TEL:	505-887-8100
Westinghouse Electric Corporation	FTS:	same
Advanced Energy Systems Division	TLX:	none
PO Box 2078	FAX:	505-887-0707
Carlsbad, NM 88221	VERIF:	505-887-8205

Manager	Raymond C. Mairson	-8200
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Fuel Cycle and Waste Management Activities:

WIPP technical support, including design review, construction support, safety assurance, operational planning, quality assurance systems.

Major Facilities:

Waste Isolation Pilot Plant.

WESTON

Weston	TEL:	202-646-6600
955 L'Enfant Plaza	FTS:	same
8th Floor	TLX:	none
Washington, DC 20024	FAX:	202-646-2220
	VERIF:	202-646-6600

Civilian Rad. Waste Program	William M. Hewitt	-6610
International Programs	James F. Strahl	-6654

UNITED STATES

Other US Government Agencies

EPA

Environmental Protection Agency	TEL:	202-382-2090
401 M Street S.W.	FTS:	382-2090
Washington, DC 20460	TLX:	89-2758
	FAX:	382-7883
	VERIF:	382-2078

International Activities

Associate Administrator	Fitzhugh Green	382-4870
Multilateral Staff	Alan Stelen	382-4878

Radiation Programs

Director	Sheldon Meyers	475-9600
Waste Management Standards	Floyd L. Galpin	475-9633

NRC

US Nuclear Regulatory Commission	TEL:	301-492-7000
Washington, DC 20555	FTS:	492-7000
	TLX:	90-8142
	FAX:	492-7617
	VERIF:	492-7371

Nuclear Material Safety and Safeguards -NMSS-

Director	Hugh L. Thompson	427-4063
HLW Management	Robert E. Browning	427-4069
LLW Management/D&D	Malcolm R. Knapp	427-4433
Safeguards/Transportation	Robert F. Burnett	427-4033
Fuel Cycle	Richard E. Cunningham	427-4485

Nuclear Regulatory Research -RES-

Director	Eric S. Beckjord	443-7991
Regulatory Applications	Bill Morris	443-7970
Reactor/Plant Systems	Brian Sheron	443-7923
Reactor Accident Analysis	Robert M. Bernero	443-7373
Engineering	Guy A. Arlotto	443-7995

Nuclear Reactor Regulation -NRR-

Director	Thomas E. Murley	492-7691
Reactor Projects	Frank Miraglia	492-7207
Inspection/Tech. Assessment	Richd. W. Starosteck	492-8177

US-22

UNITED STATES

NRC (contd)

International Programs

Director	James R. Shea	492-7886
International Security		
Export/Import Regulations	Marvin R. Peterson	492-7866
International Cooperation	Ronald C. Hauber	492-7131

Regional Offices

Philadelphia - Region I	Richard Vollmer	215-337-5299
Atlanta - Region II	J. Nelson Grace	404-331-5500
Chicago - Region III	A. Bert Davis	312-790-5181
Dallas - Region IV	Robert D. Martin	817-860-8225
San Francisco - Region V	John B. Martin	415-943-3707

USGS

US Geological Survey		
410 National Center	TEL:	703-648-7000
12201 Sunrise Valley Drive	FTS:	202-648-7000
Reston, VA 22092	TLX:	89-9153
	FAX:	648-7793
	VERIF:	648-7209
Director	Dallas L. Peck	-7411
Hazardous Waste Hydrol.	John B. Robertson	-6976
High-Level Waste	George A. Dinwiddie	-6976

USSR
(Union of Soviet Socialist Republics)

USSR

MAJOR PUBLIC HOLIDAYS

January 1	New Year
March 8	Women's Day
May 1-2	May Day
May 9	Victory over Fascism
November 7-8	October Revolution
December 5	Constitution Day

TIME

Standard Time Washington D.C.: + 8 hours
Daylight Saving Time period: 03/29 - 09/26/87

PASSPORT/VISA

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

DIRECT DIALING

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

US EMBASSY - MOSCOW

American Embassy	
Ulitsa Chaykovskogo 19/21/23	
Moscow	Tel: 7-96-252-2451
USSR	Tlx: 41-3160 USGSO SU
Science Attache	Dr. John C. Zimmerman

ENERGY

Population	1984	275 million
Electric Power Plant Capacity	1982	281 GWe
	1983	460 GWe
Electric Power Production	1982	1376 TWh-- 7% nuclear
	1985	1510 TWh-- 10% nuclear

NUCLEAR POWER

Policy: Major program to develop nuclear power, to avoid transport of fossil fuels from east of the Ural Mountains to European Russia.

Nuclear Power Plant Capacity	1982	17 GWe
	1985	25 GWe
	1992	90-100 GWe
Reactor Mix	1986	LGR: 23 (1958-86)
		4 (1987-90)
		PWR: 18 (1964-86)
		23 (1987-90)
		BWR: 1 (1966)
		FBR: 2 (1973/80)
Reactor Development	LMFBRs, 1,500-MWe PWRs	

INDUSTRIAL FUEL CYCLE

Policy: Complete domestic fuel cycle capability, including enrichment, fuel fabrication (UO₂ and MOX); develop commercial reprocessing capability; provide complete fuel cycle services, including spent fuel storage and waste disposal to foreign buyers of USSR reactors and fuel.

Waste Management Strategy: Vitrify HLW, provide terminal storage in geologic repository.

ORGANIZATION**Nuclear Program Control**

- * State Committee on Utilization of Atomic Energy
- * Ministry of Nuclear Energy

Research and Development

- * Institute of Physical Chemistry, Moscow, a branch of the USSR Academy of Sciences (geologic waste disposal; waste form properties)
- * V. G. Khlopin Radium Institute, Leningrad (chemical separation; fuels reprocessing; geochemistry)
- * All-Union Scientific Research Institute for Inorganic Materials, Moscow (properties of solid waste forms)
- * Chemical Plant Research Institute, Sverdlovsk (vitrification pilot plants)

KHLOPIN RADIUM INSTITUTE

Khlopin Radium Institute
Ul. Rentgena 1
Leningrad 22
USSR

Chief of Laboratory Yergeny Shashukov

MINISTRY OF NUCLEAR ENERGY

Minister Nikolai Lukonin

**STATE COMMITTEE ON THE UTILIZATION
OF ATOMIC ENERGY**

State Committee on the Utilization
of Atomic Energy
Staromonetny Pereulok 26
Moscow 109180
USSR

Chairman A. M. Petrosyants
Deputy Chairman Prof. I.D. Morokhov

Waste Management R&D: Develop processes for treating spent fuel (cladding, thermal decladding, meltdown of hulls), improved partitioning of TRU wastes, handling off-gases, and storing ⁸⁵Kr.

STATE COMMITTEE ON THE UTILIZATION OF ATOMIC ENERGY (contd)

Facilities^(a)

- * **Reprocessing Pilot Plant (radioactive)**
Owner: Khlopin Radium Institute, Leningrad
Mission: Develop LWR fuel reprocessing technology.
Design Basis: Chop-leach head-end; PUREX flowsheet; capacity, 3 kg/day uranium.
History: Startup, 1973.
- * **Cold Pilot Plant-Vitrification**
Mission: Develop waste vitrification technology.
Design Basis: Liquid-fed ceramic melter, two-chamber unit; 150 l/hr HLLW; 30 l/hr glass; product, phosphate glass blocks.
History: Startup, 1974.
- * **KS-KT-100 (cold pilot plant-vitrification)**
Location: Chemical Plant Research Institute, Sverdlovsk.
Design Basis: Fluid bed calciner; in-crucible melter (two-stage process); capacity, 20 kg/hr glass; 160-180 kg glass/batch; product, phosphate glass blocks.

(a) Because there is only limited information available, it is not always known at which nuclear agency a facility is located.

YUGOSLAVIA

YUGOSLAVIA

MAJOR PUBLIC HOLIDAYS

January 1	New Year
May 1-2	Labor Day
July 4	Fighter's Day
November 29-30	Republic Day

TIME

Standard Time Washington D.C.: + 7 hours
Daylight Saving Time Period 03/29 - 09/26/87

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 Yugoslavia. Most travel agencies can provide up-to-date information concerning requirements.

DIRECT DIALING

Individual numbers for direct-dial to Yugoslavia are complete as listed, after dialing international access code: 011. Country code is 38; listed local numbers include city code.

US EMBASSY - BELGRADE

American Embassy
Kneza Milosa 50
Belgrade
Yugoslavia

Tel: 38-11-645-655
Tlx: 11-529 AMEMBA YU

Science Attache

Dr. Thomas Vrebalovich

ENERGY

Population	1983	22.8 million
Electric Power Plant Capacity	1980	14.9 GWe 46% hydro 42% coal 12% gas/oil
Electric Power Production	1982	62.1 TWh-- 4% nuclear
	2000	25% nuclear

NUCLEAR POWER

Policy: Start construction of four new nuclear 1000 MW power plants by the year 2000 (utilities have formally called for international bids to supply technology, equipment and services to the planned nuclear program, estimated at US\$ 15 billion); develop indigenous plant construction capability.

Nuclear Power Plant Capacity	1987	0.6 GWe
	1990	0.6 GWe
	2000	1.6 GWe
Reactor Mix	1986	PWR: 1 (1981)

INDUSTRIAL FUEL CYCLE

Policy: Develop a high degree of fuel cycle self-sufficiency, including spent fuel reprocessing.

Waste Management Strategy: Keep spent fuel assemblies in storage pool at power station (15-17 years), then transport to reprocessing plant. Purify liquid waste at waste treatment facility; compress solid waste, encapsulate in steel casks and store at power station.

Cumulative Spent Fuel	1985	50 tU
Arisings (LWR)	1990	130 tU
	2000	420 tU

Industrial-Scale Activities

- * Yellowcake production--at Zirovski VRH uranium mine (design capacity 120 t/a uranium concentrate) since 1984.
- * Uranium recovery (85 tU/a)--planned, as a by-product of phosphoric acid production.

YUGOSLAVIA

PROPOSED FUEL CYCLE R&D

- * Geologic research to locate additional mineral resources
- * Technological investigations of uranium ores and design parameters for uranium ore processing plants
- * Obtaining uranium from unconventional sources
- * Processes for production of pure uranium compounds from concentrates
- * Processes for production of heavy water
- * Uranium enrichment research: centrifuge, chemical exchange and laser enrichment
- * Fuel element fabrication
- * Spent fuel reprocessing
- * Treatment and storage of radioactive wastes
- * Safety and environmental studies

ORGANIZATION

- * Nuclear Energy Commission and Committee for Energy and Industry--federal agency
- * Savska Eletrarna (Serbia) and Elektroprivreda (Croatia)--utilities, industrial fuel cycle activities
- * JUGEL--Association of Yugoslav Electric Utilities, coordination of fuel cycle planning
- * NUKLIN--Association of Nuclear Research Institutes of Yugoslavia, R&D planning and coordination
- * Boris Kidric Institut of Nuclear Sciences-Vinca 11001 Belgrade, Yugoslavia

INTERNATIONAL AGENCIES

INTERNATIONAL

CMEA

Council for Mutual Economic Assistance
Prospekt Kalinina 56
Moscow
USSR

MEMBER STATES

Bulgaria	Mongolia
Cuba	Poland
Czechoslovakia	Rumania
German Democratic Republic	USSR
Hungary	Yugoslavia

FUNCTION

Promote economic and industrial cooperation among the Member States with centrally-controlled economies.

ORGANIZATION

- * Standing Commission on the Use of Atomic Energy for Peaceful Purposes. The Commission holds meetings to review national waste management R&D programs and defines areas for additional cooperation.

CEC

Commission of the European Communities
200 Rue de la Loi
B-1049 Brussels
Belgium

Tel: 32-2-235-1111
Tlx: 21877 COMEU B

Vice-President for Industrial
Affairs, Energy, Euratom
Supply Agency, Research and
Science, Joint Research
Centre

Etienne Davignon

Director, Nuclear R&D
Dir., Fuel Cycle
Dir., Reactors/Technologies
Dir., Nuclear Plant Safety
Director General, JRCs

Sergio Finzi
Serge Orłowski
Mario De Bacci
Willem Vinck
Jean-Albert Dinkespiller

Function: Executive body for the European Communities
[(EC) combined Euratom, Coal and Steel, Common Market].

INTERNATIONAL

CEC (contd)

FUEL CYCLE PROGRAM ADMINISTRATION

- * R&D Programs
 - Direct action--fully funded by EC (by a tax on Member States), conducted by Joint Research Centre Establishments at Ispra (Italy) and Karlsruhe (FRG)
 - Indirect action--partly funded by EC under cost-sharing contracts, conducted by research centers in the Member States:
 - Belgium - Denmark - France
 - Germany/FR - Greece - Ireland
 - Luxembourg - Netherlands - United Kingdom
- * Cooperation with US
DOE/CEC UMBRELLA AGREEMENT FOR WASTE MANAGEMENT EXCHANGE
 - Term: 10-6-82 to 10-6-87.
 - Scope: Characterization of waste forms; disposal in geologic formations.

CEC-JRC: ISPRA

CEC Joint Research Center
Ispra Establishment
I-21020 Ispra (Varese)
Italy

Tel: 39-332-78-0131
39-332-78-0271
Tlx: 380042/38058 Eu I

Location: Northern Italy; may be reached by air-travel to Milan, ground transport to Ispra, about 50 km.

Director: George Robert Bishop
Waste Management Programs: Francesco Girardi

Waste Management R&D: R&D in treatment and storage of radioactive waste. TRU wastes--volume reduction and actinide separation; waste disposal--risk analysis, nuclide migration, and waste form properties.

CEC-JRC: KARLSRUHE

Karlsruhe Establishment
(European Institute for
Transuranium Elements)
Postfach 2266
D-7500 Karlsruhe
Federal Republic of Germany

Tel: 49-7247-841
Tlx: 7825483 Eu D

INTERNATIONAL

CEC-JRC: KARLSRUHE (contd)

Director: Roland Lindner

Function: Basic research in the transuranium elements, especially plutonium, reactor fuels development.

Fuel Cycle R&D: Plutonium conversion and plutonium fuels, characterization of waste forms.

IAEA

International Atomic Energy Agency
P.O. Box 100 Tel: 43-222-2360-0
A-1400 Vienna Fax: 43-222-23-0184
Austria Tlx: 1-12645

Director General	Hans Blix
Deputy Director General	Leonard V. Konstantinov
Director, Nuc. Fuel Cycle	Jia-Luo Zhu
Waste Management	Jozsef Hirling
U.S. Waste Mgmt. Staff	Donald E. Saire

MEMBER STATES: Over 100 nations (UN members, incl. USA).

Function: Develop the peaceful use of atomic energy: safe-guards, nuclear safety and standards, information exchange, and technical assistance.

Waste Management Activities

- * Collection, review and dissemination of technical, scientific and regulatory information in the area of:
 - handling, treatment, storage and conditioning of waste
 - decontamination and decommissioning of nuclear facilities
 - underground disposal of waste
 - environmental consequences due to sea dumping and effluent discharges.
- * Development of internationally acceptable guidelines, standards and codes of practice for use by national authorities.
- * Protection of the environment (carry out responsibilities as requested under international conventions).

INTERNATIONAL

IAEA (contd)

- * Promotion and sponsorship of research work and development of data and technology in promising areas.
- * Technical advice and training to Member States upon request.

US Mission to IAEA
Kundmannngasse 21-25
A-1030 Vienna
Austria

Waste Management

Maurice Katz
43-222-31-5511

ICRP

International Commission
on Radiological Protection
Clifton Avenue
Sutton, Surrey SM2 5PU
United Kingdom

Tel: 44-1-642-4680
Tlx: 895 1244 ICRPG

Chairman, Main Commission
Scientific Secretary
Committee Chairman,
Radiation Effects

Dr. B. Lindell
Dr. F. D. Sowby
Dr. A. C. Upton

Function: Provide principles of radiation protection as a basis for each country to use in establishing technical codes of practice.

OECD (ORGANISATION FOR CO-OPERATION AND DEVELOPMENT)/NEA

OECD Nuclear Energy Agency (NEA)
38 Boulevard Suchet
F-75016 Paris
France

Tel: 33-14-524-7477
Tlx: 63-0668
Fax: 33-14-524-9624

OECD/NEA (contd)

MEMBER STATES

Australia	Germany (FR)	Netherlands	Turkey
Austria	Greece	New Zealand	United Kingdom
Belgium	Iceland	Norway	United States
Canada	Ireland	Portugal	
Denmark	Italy	Spain	
Finland	Japan	Sweden	
France	Luxembourg	Switzerland	* Yugoslavia

* Not Member State, but participates in certain projects.

Function: Promote orderly development of peaceful uses of nuclear energy through cooperation among Member States. Initiate, encourage, and coordinate cooperative work in the following areas: reactor research, nuclear fuel cycle studies, radiation protection and waste management, nuclear safety, regulatory matters, and nuclear data collection.

Activities

- * Workshops, technical meetings, symposia, and publications.
- * Maintenance of the Multilateral Consultation and Surveillance Mechanism for Sea Disposal, which monitors sea dumping of LLW/ILW in the Northeast Atlantic.
- * Joint activities.

US PARTICIPATION IN NEA JOINT WASTE MANAGEMENT ACTIVITIES

Committees and Coordinating Groups

- * Radioactive Waste Management Committee (RWMC)
 - Performance Assessment Advisory Group (PAAG)
 - Advisory Group on Research and Investigations
 - Seabed Working Group (SWG)
- Participants: Belgium, Canada, CEC, France, FRG, Italy, Japan, Netherlands, Switzerland, UK, US
- Term: Not defined; feasibility report to be issued by 1989
- Scope: Site and barrier assessment; engineering emplacement studies; environmental, radiological and safety studies, regulatory/institutional issues.

INTERNATIONAL

OECD/NEA (contd)

- Working Group on Decommissioning
 - Advisory Committee on Mill Tailings
 - Stripa Technical Committee (Stripa Mine test program)
Participants: Canada, Finland, France, Japan,
Spain, Sweden, Switzerland, UK, US
Term: 5-1-80 to 1-1-87 for Phases 1 & 2
7-1-86 to 7-1-90 (tentative) for Phase 3
Scope: In-situ investigations in fractured-
granite host rock
 - ISIRS Technical Committee (International Sorption
Information Retrieval System)
 - Liaison Committee for D&D Project Exchange
- * Committee on Radiation Protection and Public Health
(CRPPH)
- * Executive Group - Coordinated Research and Environmen-
tal Surveillance Program (CRESPE)

US Mission to OECD
Nuclear Energy Agency
38 Boulevard Suchet
F-75016 Paris
France

DOE Representative Frank A. Goldner
33-14-524-7424

US Mailing Address:
c/o US Embassy, Paris, APO New York, NY 09777

NEA ORGANIZATION

Director General

H. K. Shaper

Dep. Dir. General

P. Strohl

— Legal Affairs

P. Reyners

— Safety and Regulation

K. Stadie

— Radiation Protection/Waste Management

J. P. Olivier
O. Ilari
S. Carlyle
B. Ruegger
C. Thegerstroem

— Nuclear Safety

W. Haeussermann

Committees

- * CRPPH-Radiation Protection/Public Health
- * RWMC -Radioactive Waste Management
- * CRESF-Coordinated Research/Environmental Surveillance Program
- * Safety of Nuclear Installations
- * Fuel Cycle

— Science and Development

T. Sasaki

— Nuclear Development Division

H. Sexton

— Nuclear Science/Data Bank

J. Rosen