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**International
Nuclear Fuel Cycle
Fact Book**

I. W. Leigh

January 1987

Prepared for the Department of Energy
under contract number DE-AC05-76RLO 1830

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INTERNATIONAL NUCLEAR
FUEL CYCLE FACT BOOK

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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 Nuclear Fuel Cycle Fact Book has been obtained from many unclassified sources: nuclear trade journals and newsletters; reports of foreign visits and visitors; CEC, IAEA, and OECD/NEA activities reports; proceedings of conferences and workshops, etc. The data listed herein do not reflect any one single source but frequently represent 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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International Agencies	
CMEA (Council for Mutual Economic Assistance)	INTL-1
CEC (Commission of the European Communities)	INTL-1
IAEA (International Atomic Energy Agency)	INTL-3
ICRP (International Commission on Radiological Protection)	INTL-4
OECD Nuclear Energy Agency (NEA)	INTL-5
Nuclear Societies	INTL-9
Reactors (white bindings only)	RCTR-1

ORGANIZATIONS AND FACILITIES

	Page
A	
ADA	Acid digestion plantSZ-4
AEB	Atomic Energy BureauJA-7
AEB	Atomic Energy BureauKS-3
AEC	Atomic Energy CommissionIN-4
AEC	Atomic Energy CommissionJA-7
AEC	Atomic Energy CommissionKS-3
AEC	Atomic Energy Corporation.SF-2
AEC	Atomic Energy Council.TW-2
AECB	Atomic Energy Control Board.CA-4
AECL	Atomic Energy of Canada Limited.CA-5
AERB	Atomic Energy Regulation BoardIN-4
AERE	Atomic Energy Research EstablishmentUK-13
AGIP	Italian Nuclear Fuel CompanyIT-2
ALKEM	German Fuel Company.GE-6
ALOMA	Closed acid digestion plant.GE-14
AMOS	Waste treatment/interim storage project.SW-7
ANDRA	Agence Nationale pour la Gestion des Déchets Radioactifs.FR-8
ANS	American Nuclear SocietyINTL-13
ANSTO	Australian Nuclear Science and Technology OrganizationAS-1
APM	Atelier Pilote de MarcouleFR-2
ASBL	Forum Nucléaire Belge.INTL-9
Asse	Salt Dome RepositoryGE-11
ATS	Finnish Nuclear Society.INTL-10
AVM	Ateliers de Vitrification de Marcoule.FR-13
AWRE	Atomic Weapons Research Establishment.UK-6
B	
B205	Reprocessing facility.UK-7
BAM	Bundesanstalt für Materialforschung und -prüfungGE-6
BARC	Bhabha Atomic Research Centre.IN-3
BES	Waste materials studies.US-14
BEW	Bundesamt für Energiewirtschaft.SZ-3
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe.GE-6
BGS	British Geological Survey.UK-6
BLG	Brennelementlager Gorleben GmbH.GE-5
BMFT	Bundesministerium für Forschung und Technologie.GE-7
BMU	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit.GE-7
BMWI	Bundesministerium für Wirtschaft und Verkehr.GE-4
BNES	British Nuclear Energy SocietyINTL-13
BNFL	British Nuclear Fuels plc.UK-6

B	
BNS	Belgian Nuclear Society.INTL-9
BNT	British Nuclear TechnologyUK-8
BRE	Building Research Establishment.UK-9
BRGM	Bureau de Recherches Géologiques et MinièresFR-8
C	
CANMET	Canada Centre for Mineral and Energy TechnologyCA-7
CDTN	Centro de Desenvolvimento de Tecnologia Nuclear de NuclebrasBR-3
CEA	Commissariat a l'Énergie Atomique.FR-9
CEC	Commission of the European Communities . .INTL-1
CECE	Combined Electrolysis Catalytic Exchange System.US-15
CEDRA	Société Coopérative Nationale pour l'Entreposage de Déchets Radioactifs . .SZ-3
CEGB	Central Electricity Generating Board . . .UK-9
CEN-CA	Centre d'Études Nucléaires de Cadarache. .FR-9
CEN-FaR	Centre d'Études Nucléaires de Fontenay-aux-RosesFR-10
CEN-G	Centre d'Études Nucléaires de Grenoble . .FR-10
CEN-M	Centre d'Études Nucléaires de la Vallée du Rhône.FR-10
CEN-S	Centre d'Études Nucléaires de Saclay . . .FR-11
CEN/SCK	Centre d'Études de l'Énergie Nucléaire/ Studiecentrum voor KernenergieBE-4
CeTA	Center for Advanced TechnologiesIT-3
CHALMERS	Chalmers Technical University.SW-3
CIEMAT	Centro de Investigaciones Energeticas, Medio Ambientales y TecnologicasSP-2
CIPE	Interministerial Council for Economic PlanningIT-2
CLAB	Central Storage for Spent FuelSW-5
CLIMAX	Spent fuel test facilityUS-15
CMEA	Council for Mutual Economic Assistance . .INTL-1
CNA	Canadian Nuclear AssociationINTL-9
CNEA	Comision Nacional de Energia Atomica . . .AR-2
CNEIC	China Nuclear Energy Industry Corporation. .CH-2
CNEN	Comissão Nacional de Energia Nuclear . . .BR-3
CNS	Canadian Nuclear SocietyINTL-9
COGEMA	Compagnie Generale des Matières Nucléaires .FR-11
COMMOX	Cogema subsidiary.FR-4
COMURHEX	Uranium conversion companyFR-3
COVRA	Centrale Organisatie Voor Radioactief Afval.NL-2
CRESP	Coordinated Research and Environmental Surveillance Program (NEA)INTL-7
CRIEPI	Central Research Institute of Electric Power IndustryJA-7
CRNL	AECL-Chalk River Nuclear Laboratories. . .CA-5

CRPPH	^C Committee on Radiation Protection and Public Health (NEA)	INTL-6
CSN	Consejo de Seguridad Nuclear	SP-2
DAM	^D Direction des Applications Militaires.	FR-13
DAMN	Directeur chargé de l'Approvisionnement en Matières Nucléaires.	FR-5
DAtF	Deutsches Atomforum e.V.	INTL-10
DBE	Deutsche Gesellschaft zum Bau und Betrieb von Endlagern für Abfallstoffe mbH	GE-7
DCAEA	Department under DEA-IRDI-DERDCA	FR-6
DEN	Department of Energy	UK-4
DEPF	Defense Waste Processing Facility.	US-19
DERDCA	Division d'Études de Retraitement des Déchets et de Chimie Appliquée	FR-6
DES	Department of Education and Science.	UK-4
DgDIN	Directeur Délégué pour le Démantèlement des Installations Nucléaires	FR-5
DgMN	Directeur Délégué pour la Mission «Nucléaire»	FR-5
DGR	Department under CEA-IRDI-DERDCA	FR-6
DIP	Department under DEA-IRDI-DERDCA	FR-6
DISP	Directorate for Nuclear Safety and Health Protection	IT-2
DOE	Department of Energy	US-7
DOE	Department of the Environment	UK-10
DPN	Directeur Délégué, Chargé de la Propulsion Nucléaire	FR-5
DRDD	Département de Recherche et Développement Dechets.	FR-6
DWK	Deutsche Gesellschaft für Wiederaufarbeitung von Kernbrennstoffen mbH	GE-8
EBES	^E Societe Reunis d'Energie du Bassin de l'Escaut.	BE-7
EBR-II	Experimental Breeder Reactor No. 2	US-12
ECN	Netherlands Energy Research Foundation	NL-3
EdF	Electricité de France	FR-4
EEC	European Economic Community.	INTL-1
EIR	Eidgenössisches Institut für Reaktorforschung	SZ-3
EMR	Energy, Mines and Resources	CA-7
ENEA	Energia Nucleare e Delle Energie Alternative	IT-3
ENEL	Ente Nazionale per l'Energia Elettrica	IT-5
ENI	Ente Nazionale Idrocarburi	IT-6
ENRESA	Empresa Nacional de Residuos Radioactivos	SP-3
ENS	European Nuclear Society	INTL-9
ENUSA	Empresa Nacional del Uranio S.A.	SP-3

		Page
E		
EPB	Electric Power Bureau	KS-3
ERS	Effluent Recovery System	US-15
ESKOM	South African Company	SF-2
ETEC	Energy technology and engineering center	US-17
EUREX	Fuel reprocessing pilot plant	IT-4
Eurobitum	Bituminization plant	BE-3
EURODIF	Uranium enrichment company	FR-3
Eurowatt	Solvent treatment hot pilot plant.	BE-3
Euro-		
wetcomb	Acid digestion hot pilot plant	BE-3
EWK	Errichtungskonsortium	
	Wiederaufarbeitungsanlage Wackersdorf.	GE-5
F		
FBFC	Société Franco-Belge de Fabrication de	BE-5/
	Combustibles (Belgium and France)	FR-14
FCP	Fuel Cycle Plant	US-20
FEPC	Federation of Electric Power Companies	JA-2
FFTF	Fast Flux Test Facility.	US-20
FIEN	Forum Italiano dell-Energia Nucleare	INTL-10
FIPS	Closed HLLW vitrification facility	GE-12
FLK	Radioactive slagging incinerator	BE-4
FRAGEMA	Cogema subsidiary.	FR-4
FSIF	Cold vitrification demonstration plant	UK-8
FURNAS	Furnas Centrais Electricas	BR-2
FUSRAP	Remedial Action Program.	US-12
G		
GIRIO	Government Industrial Research Institute	JA-8
GNS	Gesellschaft für Nuklear-Service mbH	GE-10
GRS	Gesellschaft für Reaktorsicherheit mbH	GE-10
GSC	Geological Survey of Canada	CA-8
GSF/IFT	Gesellschaft für Strahlen- und Umweltfor-	
	schung mbH/Institut für Tieflagerung	GE-10
H		
HADES	Underground research laboratory.	BE-5
HERMES	Head-End Research Facility on Mockup	
	Engineering Scale.	BE-4
HFEF	Hot Fuel Examination Facility.	US-12
HISS	Hydrogen Isotope Separation System	US-15
HITACHI	Hitachi, Ltd	JA-8
HMI	Hahn-Meitner-Institut Berlin, GmbH	GE-11
HMIP	H.M. Inspectorate of Pollution	UK-10
HQ	Hydro Quebec	CA-2
HSE	Health and Safety Executive	UK-4
HSK	Hauptabteilung für die Sicherheit	
	der Kernenergie	SZ-3
HTF	Hydrostatic Test Facility.	CA-6

<i>I</i>	
IAE	Institute of Atomic EnergyCH-2
IAEA	International Atomic Energy AgencyINTL-3
ICPP	Idaho Chemical Processing Plant.US-20
ICRP	International Commission on Radiological ProtectionINTL-4
IEN	Instituto de Engenharia NuclearBR-4
IFEC	Fuel element fabrication facility.IT-4
IFTF	Immobilized Fuel Test FacilityCA-7
IGCAR	Indira Ghandi Centre for Atomic Research . .IN-4
IHI	Ishikawajima-Harima Heavy Industries Co. .JA-8
ILONA	National Research - Policy Committee . . .NL-2
INER	Institute of Nuclear Energy Research . . .TW-2
INET	Institute of Nuclear Energy Technology . . .CH-2
INTERCOME	Belgian Utility.BE-7
IOS	Institute of Oceanographic Sciences . . .UK-10
IPEN	Instituto de Pesquisas Energeticas e NuclearesBR-4
IPES	Instalacion Piloto Experimental Subterraneo.SP-4
IPSN	Institut de Protection et de Sûreté NucléaireFR-9
IRD	Instituto de Radioproteção e Oosimetria . .BR-5
IRDI	Institut de Recherche Technologique et de Développement IndustrielFR-6
IRF	Institut de Recherche FondamentaleFR-5
ISAG	In-Situ Research/Investigations for Geologic Disposal Advisory Group . . .INTL-6
ITREC	Fuel reprocessing pilot plant.IT-5
IVET-1	Cold vitrification pilot plant.IT-5
IVET-2	Hot vitrification pilot plant.IT-5
IVEX	HLW vitrification plant.IT-4
IVO	Imatra Voima Oy.FI-3
<i>J</i>	
JAERI	Japan Atomic Energy Research Institute . .JA-9
JAIF	Japan Atomic Industrial Forum.INTL-10
JGC	JGC CorporationJA-10
JNFI	Japan Nuclear Fuel Industries CoJA-11
JNFS	Japan Nuclear Fuel Service Co.JA-11
JPDR	Japan Power Demonstration Reactor. . . .JA-6
JRC	Joint Research Center (CEC).INTL-2
<i>K</i>	
KAERI	Korea Advanced Energy Research Institute .KS-3
KAIF	Korea Atomic Industrial Forum Inc. . . .INTL-10
KAIST	Korea Advanced Institute of Science/Tech .KS-2
KEMA	N.V. Tot Keuring van Electrotechnische Materialen ArnhemNL-4
KEMAKTA	Kemakta Konsult ABSW-3
KEPCO	Korea Electric Power CorporationKS-4

K	
KFA	Kernforschungsanlage Jülich GmbHGE-12
KfK	Kernforschungszentrum Karlsruhe GmbHGE-12
KIER	Korea Institute of Energy and ResourcesKS-2
KNFC	Korea Nuclear Fuel Co.KS-5
KOBE	Kobe SteelJA-12
KOPEC	Korea Power Engineering Co., IncKS-5
KPA-STORE	Interim storage facility for spent nuclear fuelFI-4
KRETA	Krypton recovery facility.GE-13
KS-KT-100	Cold vitrification pilot plantUR-3
KTG	Kerntechnische Gesellschaft e.V.INTL-10
KTH	Royal Institute of TechnologySW-4
KWU	Kraftwerk UnionGE-5
L	
LA HAGUE	COGEMA, Centre de la HagueFR-11
Lahde	DMK test facility.GE-9
LLWMP	LLW Management ProgramUS-17
M	
MAFF	Ministry of Agriculture, Fisheries and FoodUK-10
MARCOULE	COGEMA, Centre de MarcouleFR-13
MCC	Materials characterization center.US-16
MER	Ministry of Energy and ResourcesKS-2
MERL	Mechanical Engineering Research LaboratoryJA-12
MG	Metallgesellschaft AGGE-5
MILLI	Fuel reprocessing hot cell facility.GE-13
MINKA	U/Pu hot glove boxesGE-13
MITI	Ministry of International Trade & IndustryJA-12
MMC	Mitsubishi Metal CorporationJA-12
MNI	Ministry of Nuclear IndustryCH-3
MOD	Ministry of DefenseUK-4
MOFA	Ministry of Foreign AffairsJA-13
MOST	Ministry of Science and TechnologyKS-2
MRS	Monitored Retrievable Storage.US-2
MTR	Experimental/research reactor.US-14
N	
NAGRA	Nationale Genossenschaft für die Lagerung Radioaktiver Abfälle.SZ-3
NBEP	New Brunswick Electric Power CommissionCA-2
NEA	Nuclear Energy Agency (OECD)INTL-5
NERC	National Environment Research CouncilUK-4
NERSA	Groupement Centrale Nucléaire Européenne à Neutrons RapidesFR-4
NIES	North Ireland Electricity Board.UK-5
NII	Nuclear Installations InspectorateUK-11
NIREX	UK Nirex LtdUK-11
NIRS	National Institute of Radiological SciencesJA-13
NNC	National Nuclear CorporationUK-4
NNSA	National Nuclear Safety AdministrationCH-3
NNWSI	Nevada Nuclear Waste Storage InvestigationUS-14

N	
NRPB	National Radiological Protection Board . . .UK-11
NSB	National Safety BoardJA-13
NTS	Nevada Test SiteUS-15
NUCLEBRAS	Brazilian OrganizationBR-5
NUCLECO	Italian CompanyIT-6
NUKEM	German (FRG) CompanyGE-14
NWPA	Nuclear Waste Policy ActUS-2
O	
OARAI	PNC-Oarai Engineering CenterJA-14
OECD	Organisation for Economic Cooperation and Development.INTL-5
OH	Ontario HydroCA-8
OMRE	Experimental/research reactor.US-14
ONDRAF	Organisme National de Déchets Radioactifs et des Matières FissilesBE-6
OPLA	National research program.NL-1
P	
PAAG	Performance Assessment Advisory Group. . .INTL-6
PAEC	Pakistan Atomic Energy Commission.PK-1
PAMELA	Vitrification pilot plant.BE-3/ GE-9
PASS	Performance Assessment Scientific Support. .US-16
PASSAT	Filter test facilityGE-13
PEV	Prototype vitrification facilityFR-11
PIVER	Hot Pilot Plant - Vitrification.FR-11
PKA	Pilot KonditionieranlageGE-9
PNC	Power Reactor and Nuclear Fuel Development CorporationJA-14
PREPP	Processing Experimental Pilot Plant.US-14
PSI	Paul Scherrer InstituteSZ-4
PTB	Physikalisch-Technische Bundesanstalt . . .GE-14
PUREX	Pu/U Uranium Redox Extraction Plant. . . .US-19
PUSTA	Fuel reprocessing facilityGE-13
PUTE	Fuel reprocessing facilityGE-13
R	
RIVM	Rijksinstituut voor Volksgezondheid en MilieuhygieneNL-5
RLWTF	Radioactive Liquid Waste Treatment FacilityUS-12
RMC	Radioactive Waste Management Center. . . .JA-17
RSK	Reaktor SicherheitskommissionGE-4
RTZ	Rio Tinto Zinc LtdGE-5
RWE	Rheinisch-Westfälisches Elektrizitätswerk .GE-5
RWMAC	Rad. Waste Management Advisory Committee . .UK-4
RWMC	Rad. Waste Management Committee (NEA). . .INTL-6
RWMC	Radioactive Waste Management Complex . . .US-14
RWVRF	Radioactive Waste Volume Reduction FacilityCA-9

S	
SAFO	Swedish Atomic ForumINTL-12
SCECA	Service under CEA-IRDI-DERDCA-DRDDFR-6
SCUA	State Committee on the Utilization of Atomic EnergyUR-3
SDFMA	Service des Effluents et Déchets de Faible et Moyenne Activité.FR-6
SDHA	Service des Déchets de Haute Activité.FR-6
SESD	Service d'Etude des Stockages de DéchetsFR-6
SFEN	Société Française d'Energie Nucléaire.INTL-10
SFMP	Surplus Facilities Management Program.US-12
SFR	Subseabed Forsmark Repository.SW-5
SGAB	Sveriges Geologiska ABSW-4
SGN	Société Générale pour des Techniques NouvellesFR-14
SIGN	Cogema subsidiary.FR-4
SKB	Svensk Kärnbränslehantering ABSW-5
SKI	Statens KärnkraftinspektionSW-6
SKN	National Board for Spent Nuclear FuelSW-6
SMI	Belgian Utility.BE-7
SPD	Sodium Process Demonstration Facility.US-12
SRD	Safety and Reliability DirectorateUK-12
SSEB	South of Scotland Electricity BoardUK-4
SSI	Statens StrålskyddsinstitutSW-7
SSK	StrahlenschutzkommissionGE-4
STA	Science and Technology AgencyJA-17
STEAG	Steinkohlelektrizitäts AGGE-5
STEM	Simulation Test Facility for Environmental Radionuclide MigrationJA-10
STMI	Nuclear services companyFR-4
STUDSVIK	Energy Technology Co.SW-7
STUK	Finnish Centre for Radiation and Nuclear SafetyFI-3
SVA	Schweizerische Vereinigung für Atomenergie.INTL-12
SWEPP	Stored Waste Examination Pilot PlantUS-14
SWG	Seabed Working GroupINTL-6
SYNATOM	Belgian Company.BE-7
T	
TAIPOWER	Taiwan Power Co.TW-3
TAN	Test Area North.US-14
TEKO	Cold semi-works facilityGE-16
URL	Underground Research Laboratory - Grimsel PassSZ-4
THORP	Thermal Oxide Reprocessing PlantUK-7
THI	Three Mile Island Reactor.US-19
TN	TransnucleaireFR-15
TN	Transnuklear GmbHGE-15

		Page
	T	
TOKAI	PNC-Tokai Works.	.JA-14
TREAT	Transient Reactor Test Facility.	.US-12
TRUEX	TRU waste technology	.US-12
TUM	Technische Universität München	.GE-15
TVO	Industrial Power Company, Ltd.	.FI-4
TWSO	TRU Waste System Office.	.US-17
	U	
UKAEA	United Kingdom Atomic Energy Authority	.UK-12
UMTRA	Uranium Mill Tailings Remedial Action.	.US-16
UNERG	Belgian Utility.	.BE-7
UP1	Fuel reprocessing plant.	.FR-13
UP2	Fuel reprocessing plant.	.FR-12
UP2-800	Fuel reprocessing plant.	.FR-12
UP3	Fuel reprocessing plant.	.FR-12
URENCO	Uranium Enrichment Consortium.	.NL-1
URL	Underground Research Laboratory.	.CA-6
	V	
VTT	Technical Research Center of Finland	.FI-4
	W	
WAK	Wiederaufarbeitungsanlage Karlsruhe Betriebsgesellschaft mbH	.GE-16
WASTEF	Glove box and hot cell facilities.	.JA-10
WAW	Wiederaufarbeitungsanlage Wackersdorf	.GE-9
WCF	Waste Calcining Facility	.US-20
WERF	Waste Environmental Reduction Facility	.US-14
WIP	Waste Immobilization Plant	.IN-6
WIPE	Cold pilot plant - vitrification	.CA-6
WIPP	Waste Isolation Pilot Plant.	.US-21
WNRE	AECL-Whiteshell Nuclear Research Establishment	.CA-6
WTC	Waste Treatment Center	.CA-5
	Y	
YJT	Nuclear Waste Commission	.FI-2
	Z	
ZPPR	Zero Power Plutonium Reactor	.US-12

TECHNICAL ACRONYMS

AFR	Away-from-reactor spent fuel storage facility
AGR	Advanced gas-cooled reactor, UO ₂ fuel (UK)
ATR	Advanced thermal reactor
BWR	Boiling water reactor
CANDU	Canada deuterium uranium reactor
D&D	Decontamination and decommissioning
DOG	Dissolver off-gas
ESTER	Multistage pot calcination-vitrification process for HLW (Italy)
FBR	Fast breeder reactor
FBTR	Fast breeder test reactor
FRP	Fuel reprocessing plant
GCHWR	Gas-cooled, heavy water moderated reactor
GCR	Gas-cooled, graphite moderated reactor
Gwd	Gigawatt days
GWe	10 ⁹ watts of electricity (1000 MWe)
HAO	Head-end oxide
HARVEST	British waste vitrification process
HEPA	High efficiency particulate absolute
HLLW	High-level liquid waste
HLW	High-level waste
HTGR	High-temperature, gas-cooled reactor
HTR	High-temperature reactor
HMLWR	Heavy water moderated, light water cooled (same as LWCHW)
HWR	Heavy water reactor
ILW	Intermediate-level waste
KgHM	Kilograms heavy metal
KgU	Kilograms uranium
LGR	Light water cooled, graphite moderated reactor
LHGW	Low heat generating waste
LLLW	Low-level liquid waste
LLW	Low-level waste
LMFBR	Liquid metal fast breeder reactor
LWCHW	Light water cooled, heavy water moderated (same as HMLWR)
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
PFR	Prototype fast reactor
PHWR	Pressurized heavy water reactor
PLWR	Pressurized light water reactor
Pu	Plutonium
PUREX	Pu/U uranium redox extraction process
PWR	Pressurized water reactor
QUAD	10 ¹⁵ Btu
SYNROC	Synthetic rock (for waste immobilization)
t/a	Metric tons per annum
Th/U	Thorium/Uranium
tHM	Metric tons heavy metal
THTR	Thorium high-temperature reactor
TRU	Transuranic
tSWU/a	Metric tons of separative work (U enrichment) per annum
tU	Metric tons uranium
TWh	Terawatt hour (million megawatt hours)
U	Uranium
VOG	Vessel off-gas

INTRODUCTION

The International Nuclear Fuel Cycle Fact Book has been compiled in an effort to provide current data concerning fuel cycle and waste management facilities, R&D programs and key personnel.

The Fact Book is organized as follows:

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

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

DIRECT DIALING

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

HOLIDAYS

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

MAPS

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

PASSPORTS/VISA

Requirements listed are those applicable to United States citizens.

SOURCES

Electric Power Plant Capacity and Electric Power Production in Austria, Belgium, Canada, Finland, France, Federal Republic of Germany, Italy, Japan, Netherlands, Spain, Sweden, Switzerland, United Kingdom and United States from Energy Balances of OECD Countries 1970/1985 and Electricity, Nuclear Power and Fuel Cycle in OECD Countries, OECD/Nuclear Energy Agency, Paris, France, April 1987.

Nuclear Power Plant Capacity from NUKEM Market Report on the Nuclear Fuel Cycle, 12/87, NUKEM GmbH, Hanau, Federal Republic of Germany.

Reactor Mix from "World List of Nuclear Power Plants," Nuclear News, 8/87.

TIME

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

VISITS TO US DOE FACILITIES

Foreign visitors to U.S. DOE facilities must complete and submit a form IA-473 (OMB 1901-0130) "Request for Foreign National Unclassified Visit or Assignment" to DOE Office of International Affairs, Washington, DC 20585, at least 30 days before the proposed visit. The itinerary should be based on prior arrangement with appropriate DOE or DOE contractor staff concerning a suitable time for the visit.

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

NATIONAL SUMMARIES

ARGENTINA

ARGENTINA

MAJOR PUBLIC HOLIDAYS (1988)

Jan. 1	New Year	July 9	Independence Day
Jan. 6	Epiphany	Aug. 15	Assumption
Feb. 14-16	Carnival	Aug. 17	General San Martin
March 31	Holy Thursday	Oct. 12	Columbus Day
April 1	Good Friday	Nov. 1	All Saints
May 1	Labor Day	Nov. 6	Bank Holiday
May 25	Revolution Anniv.	Dec. 8	Immac. Conception
June 5	Corpus Christi	Dec. 25	Christmas
June 10	Sovereignty		
June 20	Flag Day		

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\$ = 4.00 Austral
per Wall Street Journal, 01/29/88. 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	Tel: 54-1-774-7611
1425 Buenos Aires	Fax:
Argentina	Tlx: 18156 USIS AR
Science Counselor	Dr. Robert G. Morris

ARGENTINA**ENERGY**

Population	1985	30.6 million
Electric Power Plant Capacity	1985	14 GWe
Electric Power Production	1985	41.5 TWh 36% oil/coal 50% hydro/geoth 14% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity	1987	0.9 GWe
	1995	1.6 GWe
	2000	1.6 GWe
Reactor Mix	1988	HWR: 2 (1974/83) 1 (1992)

INDUSTRIAL FUEL CYCLE

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

Waste Management Strategy: Reprocess spent fuel; vitrify HLW in pot process; dispose of HLW glass canisters in granite host-rock repository (Sierra del Medio, Chubut Province, Patagonia). Reduce volumes of LLW/ILW for disposal in shallow ground.

Cumulative Spent Fuel	1980	416 tU
Arising (HWR)	1985	940 tU
	1987	945 tU
	1990	1,900 tU
	2000	5,800 tU

Demonstration/Production Activities

- * D₂O production: 1988--250 t/a D₂O enrichment plant, supplied by a Swiss firm; develop domestic technology.

ARGENTINA

- * Uranium mining and milling (t/a):
1983--170; 1985--680.
Uranium enrichment (kg/a): 1989--500 ($\leq 20\%$ enr.U).
- * Conversion of yellowcake to UO_2 ;
 UO_2 fuel fabrication.
- * Heavy water production.

Major Milestone

- * HLW geologic repository 2010
(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 Tel: 54-1-70-7711
1429 Buenos Aires Fax:
Argentina Tlx: 21388 PREAT AR
President E. V. Perez Ferreira

EZEIZA ATOMIC CENTRE

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

Facilities

- * Conversion of yellowcake to UO_2 (150 tU/a).
- * Fuel fabrication: the first of three planned
fabrication lines started up in 1982; capacity,
1-1/2 PHWR assembly per day; MOX fuel R&D. Second
line 1985.
- * Fuel reprocessing: Ezeiza pilot plant, planned
capacity of 20 kgU/day feed, 10-15 kgPu/a product;
non-radioactive runs--1987; hot startup--1990.
Potential--expansion of pilot plant to commercial
facility or new plant with 160 kg/d (40 MTU/yr)
capacity (late 1990s).

AUSTRALIA

AUSTRALIA

MAJOR PUBLIC HOLIDAYS (1988)

January 1	New Year
January 26	Australia Day
April 1	Good Friday
April 3-4	Easter
April 25	ANZAC Day
June 8	Queen's Birthday
December 25-26	Christmas

TIME

Standard Time Washington D.C.: (New S. Wales) + 15 hours
Standard Time period: 03/20 - 10/23/88

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\$ = 1.40 Australian Dollar
per Wall Street Journal, 01/29/88. 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
Australian Capital
Territory (A.C.T.) 2600

Tel: 61-62-70-5000
Fax:
Tlx: 62-104

Science Counselor

Russell A. La Mantia

ENERGY

Population	1985	15.8 million
Electric Power Production	1985	120.4 TWh 74% coal 12% hydro/geoth 10% gas 4% 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; replacement of the AAEC).
- * Lucas Heights Research Laboratory.

INTERNATIONAL RELATIONSHIPS

Member of IAEA and OECD/NEA.

Cooperative agreements for the development of the SYNROC process with Japan, Italy and the UK.

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

Joint Alligator Rivers analogue project with Japan, Sweden, UK and US.

ANSTO

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

AUSTRALIA

ANSTO (contd)

Chairman	Prof. R. E. Collins
Deputy Chairman	Brian Hill

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

ANSTO LUCAS HEIGHTS

ANSTO Lucas Heights Research Laboratory
New Illawarra Road, Lucas Heights
Private Mail Bag 7
Sutherland N.S.W. 2232
Australia

Tel: 61-2-543-3111
Fax: 61-2-543-5097
Tlx: 24-562

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.

AUSTRALIA

AUSTRALIAN NATIONAL UNIVERSITY

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

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

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

GRIFFITH UNIVERSITY

Griffith University Tel: 61-7-275-7111
Nathan, Queensland 4111 Fax:
Australia Tlx: AA40362

Chancellor Sir Theodore Bray

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

BELGIUM

BELGIUM

MAJOR PUBLIC HOLIDAYS (1988)

January 1	New Year	July 21	National Day
April 3-4	Easter	August 15	Assumption
May 1-2	Labor Day	November 1	All Saints
May 12	Ascension	November 11	Armistice Day
May 22-23	Pentecost	December 25-26	Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time period: 03/27 - 09/24/88

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\$ = 35.02 Franc
per Wall Street Journal, 01/29/88. 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	Tel: 32-2-513-3830
1000 Brussels	Fax:
Belgium	Tlx: 846-21336
Economic Officer	Donald E. Booth

ENERGY

Population	1985	9.9 million
Electric Power Plant Capacity	1985	14.1 GWe 38% nuclear
	1986	14.1 GWe 38% nuclear
	1990	14.2 GWe 38% nuclear
Electric Power Production	1985	57.3 TWh 60% nuclear 26% coal 7% oil 4% gas 3% hydro/geoth.
	1986	67% nuclear
	1990	61% 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	1988	5.5 GWe
	1995	5.5 GWe
	2000	6.8 GWe
Reactor Mix	1988	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 made to dismantle former Eurochemic plant.

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

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

BELGIUM

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 LMFBR demonstration project (FRG). Belgian underground laboratory at Mol is co-sponsored by CEC.

ORGANIZATION

MINISTRY OF ECONOMIC AFFAIRS

PRIVATE INTERESTS

-- CEN/SCK--50%-->	BELGONUCLEAIRE	<-----	50% --
-- ONDRAF/NIRAS --	Belgoprocess		
-- 50% ----->	SYNATOM	<-----	50% --

BELGONUCLEAIRE

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

Tel: 32-2-513-9690
Fax:
Tlx: 22187 NUCBRU B

General Manager

J. Van Dievoet

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

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

Facilities

- * **MOX Plant** (at Dessel, near Mol)
Mission: Produce MOX fuels for FBRs and LWRs.
Design Capacity: 30 t/a LWR or 10 t/a FBR fuel.
History: Startup, 1973.

BELGOPROCESS

Belgoprocess
Gravenstraat
2480 Dessel
Belgium

Tel: 32-14-24-41-11
Fax:
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; operation of
PAMELA pilot plant (Mol) which vitrifies liquid high-level
radioactive waste.

Owner: ONDRAF/NIRAS

Facilities

- * Eurobitum (bituminization plant)
Mission: Immobilize ILW.
Design Basis: Batch chemical pretreatment; screw
extruder-evaporator (continuous); capacity, 650
m³/a ILW.
History: Startup, 1978; on-stream time, 87%
through June 1983. Plant now operated batchwise.
- * Eurowatt (hot pilot plant-solvent treatment)
Mission: Treat Purex (TBP-kerosene) solvent.
Design Basis: Extract TBP with concentrated H₃PO₄,
pyrolyze H₃PO₄ fraction; capacity, 1 m³/day.
History: Startup, 1982.
- * PAMELA HLLW Vitrification Plant [built by FRG (see
DNK, GE-8) and operated by DNK/Belgoprocess team]
- * Eurowetcomb (hot pilot plant-acid digestion)
Mission: Wet combustion of combustible TRU wastes
and Pu recovery.
Design Basis: Acid digestion with H₂SO₄-HNO₃.
History: Startup, 1982. Now defunct.

BELGIUM

CEN/SCK (Nuclear Energy Research Center)

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

Tel: 32-14-31-18-01
Fax: 32-14-31-50-21
Tlx: 31-922 ATOMOL

Chairman of the Board	I. Van Vaerenbergh
General Manager	(vacant)
Deputy General Manager	Paul Dejonghe
Research Laboratories	L. H. Baetsle
Waste	Herman Spriet
Geological Disposal Research	A. A. Bonne

Owner: Government--Ministry of Economic Affairs.
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, offgas 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: Hot operation, depending on authorization and budget allocation. Used only for research purposes.
- * **FLK Slagging Incinerator (radioactive)**
Mission: Volume reduction of combustible, and of selected noncombustible, low-activity TRU wastes.
Design Basis: High-temperature combustion (1200-1500°C); capacity, 50 kg/hr; product, insoluble granular slag.

CEN/SCK (contd)

History: Operational since 1975. First tests with Pu-bearing wastes (tens of grams Pu in several tons of waste), 1983.

- * **CEN/SCK Waste Preparation Plant**
 Mission: Immobilize Belgian LLW.
 Design Basis: Stirred evaporator, batch process; capacity, 800 l/hr liquid LLW or 100 kg/hr dried sludge.
 History: Startup, 1964 (liquids), 1970 (solids).

- * **HADES Underground Research Laboratory**
 Mission: In-situ investigation in a deep clay formation to develop technology for disposal of ILW, TRU waste, and HLW.
 Description: Access shaft to -230 m level, 2.65 m useful dia; laboratory gallery, 3.5 m useful dia by 30 m length; cast iron liner. Demo/test facility to be added for tests with actual wastes.

 Test Program: Geomechanical behavior of clay around underground structures, water-flow measurements, in-situ heater tests, clay stability studies, liner stresses, borehole atmospheres, corrosion; test emplacement of HLW and TRU incinerator residues.
 History: Laboratory operational, late 1984.

FBFC (French-Belgian Fuel Fabrication Company)

Société Franco-Belge de
 Fabrication de Combustibles

FBFC

Europalaan 12
 2480 Dessel
 Belgium

Tel: 32-14-31-58-51
 Fax:
 Tlx: 32357 SOFACO B

Plant Manager

M. Huberlant

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

FBFC Tour Manhattan-La Defense
 6 Place de l'Iris
 92400 Courbevoie, France

Tel: 33-1-4762-8800

BELGIUM

MINISTRY OF ECONOMIC AFFAIRS

Ministry of Economic Affairs
Administration of Energy
Rue de Mot, 30
1040 Brussels
Belgium

Tel: 32-2-233-6636
Fax:
Tlx: 23509 ENERGI B

MINISTRY OF PUBLIC HEALTH AND ENVIRONMENT

Ministère de la Santé Publique
et de l'Environnement
Quartier Vésale 2-3/32
1010 Brussels
Belgium

Tel: 32-2-210-4978
Fax: 32-2-210-4967
Tlx: 25768 MUGSP

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

Organisme National des Déchets
Radioactifs et des Matières
Fissiles (ONDRAF/NIRAS)
Boulevard du Regent 54
1000 Brussels
Belgium

Tel: 32-2-513-7460
Fax:
Tlx: 65784 NIROND

Chairman, Board of Directors M. Frerotte
Chairman, Perm. Tech. Committee F. Deconinck
General Manager E. Dettileux
Tech. Manager/Deputy General Mgr. F. Decamps

Owner: Government.

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

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

SYNATOM

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

Tel: 32-2-518-66-66
Fax:
Tlx: 24-152 SYNAT B

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

Function: Provide commercial fuel cycle services for the Belgian nuclear utilities.
Owners: Government/SNI (50%), INTERCOM (20%), EBES (20%), UNERG (10%).

BRAZIL

BRAZIL

MAJOR PUBLIC HOLIDAYS (1988)

January 1	New Year	Sept. 7	Independence
Feb. 14-16	Carnival	Oct. 12	N. S. Aparecida
April 1	Good Friday	Nov. 2	All Souls
April 21	Tiradentes Day	Nov. 15	Proclamation of the Republic
May 1	Labor Day		
June 5	Corpus Christi	Dec. 25	Christmas

TIME

Standard Time Washington D.C.: (East/all coast) + 2 hours
Standard Time Period: 02/13 - 10/23/88

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\$ = 83.40 Cruzados (Cz\$)
per Wall Street Journal, 01/29/88. 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 Nações, Lote 3	Tel: 55-61-223-0120
CEP 70403, Brasília	Fax:
Brazil	Tlx: 61-1091
Science Counselor	James W. Chamberlin

ENERGY

Population	1987	141 million
Electric Power Plant Capacity	1984	42 GWe
Electric Power Production	1984	175.71 TWh 94% hydro 6% 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	1988	0.6 GWe
	1995	1.9 GWe
	2000	3.1 GWe
Reactor Mix	1986	PWR: 1 (1984) 2 (1992/95)
Reactor Development		Low power PWR Research/isotope production reactor (light water-low enrichment) FBR (experimental)

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	48 tU
Arising (LWR)	1990	147 tU
	1995	472 tU
	2000	-1,000 tU

Demonstration/Production Activities

- * Uranium mining and milling: 500 t U_3O_8 /a--in operation.
- * UF_6 production: (1984) 90 tU/a; planned expansion delayed indefinitely.

BRAZIL

- * Uranium enrichment (gas centrifuge): small experimental demonstration (1987).
- * 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, currently delayed indefinitely).

INTERNATIONAL RELATIONSHIPS

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

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

ORGANIZATION

- * **President** (Brazilian Republic)--Nuclear Policy (proposed by CNEN).
- * **Federal Ministry of Mines and Energy**--planning, execution and control of nuclear power program.
- * **CNEN** (Nuclear Energy Commission)--regulatory/R&D.

Research Institutes: IPEN, IEN, IRD

- * **Nuclebras**--plant engineering, construction and operation; operates through partly-owned subsidiaries--
 - **Nuclen** (design and construction)
 - **Nuclep** (heavy components)
 - **Nuclei** and **Nustep** (enrichment)
 - **Nuclemon** (thorium production), andFederal/State utilities, such as FURNAS.

Research institute: CDTN

CDTN (Center for the Development of Nuclear Technology)

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

Tel: 55-31-441-5422
Fax:
Tlx:

Director

V. Mattos Andrade Silva

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

CNEN (Nuclear Energy Commission)

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

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

President

Rex Nazare Alves

Director, Nuclear Safety

Nuiz Arrieta

Function: Regulation, financing and licensing of nuclear
reactors, fuel cycle facilities and radiation-emitting
installations. Promotion of nuclear technology R&D--
technology transfer to private industry. Promotion/training
of personnel.

IEN (Nuclear Engineering Institute)

Instituto de Engenharia Nuclear
Cidade Universitária
Ilha do Fundão
Caixa Postal 2186
CEP 20001, Rio de Janeiro, RJ
Brazil

Tel: 55-21-280-5622
Fax:
Tlx: 21-21112 CNEN BR

Director

Alcyr Mauricio

BRAZIL

IEE (contd)

Activities: Nuclear physics; cyclotron radioisotope production; reactor engineering; reactor physics; research reactor operation (Argonaut type - 10 KW); metallurgy; nuclear/applied chemistry; nuclear instrumentation (development/production); health physics; mathematics/computation and sodium technology; reactor development.

Facilities

- * Reactor for radioisotope production
- * Experimental Fast Breeder Reactor

IPEN (Energy and Nuclear Research Institute)

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

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

Superintendent

Claudio Rodrigues

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

Facilities

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

IRD (Health Physics and Dosimetry Institute)

Instituto de Radioproteção
e Dosimetria
Avenida das Américas Km 11,5
Barra Da Tijuca
CEP 22700, Rio de Janeiro, RJ
Brazil

Tel: 55-21-5252
Fax:
Tlx: 21-31624 IRD

Director

Anamelia Habib de Mendonça

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

Facility

- * Brazilian Secondary Standards Dosimetry Laboratory

NUCLEBRAS

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

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

President

Licínio Seabra

Director-Superintendent

General Jose Pinto de
Araujo Rabello

Director, Mineral Production

Paulo Lima

Director, Nuclear Fuel

David Neiva Simon

Director, Nuclear Plants

Fernando Henning

Director, Financier

Rodolpho Paulo Gonçalves

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 (1988)

January 1	New Year
April 1	Good Friday
April 3-4	Easter
May 23	Victoria Day
July 1	Dominion Day
September 5	Labor Day
October 10	Thanksgiving
November 11	Remembrance Day
December 25-26	Christmas

TIME

Time zones correspond to those in the United States.
Daylight Saving Time period: 04/03 - 10/30/88

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\$ = 1.27 Canadian Dollar
per Wall Street Journal, 01/29/88. 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	Tel: 613-238-5335
Ottawa K1P 5T1	Fax:
Canada	TLx: 053-3582
Science Counselor	Francis M. Kinnelly

ENERGY

Population	1985	25.4 million
Electric Power Plant Capacity	1985	97.4 GWe
		10% nuclear
	1986	97.5 GWe
		11% nuclear
Electric Power Production	1990	101.5 GWe
		14% nuclear
	1985	459.0 TWh
		66% hydro/geoth
		17% coal
		13% nuclear
		2% oil
		2% gas
	1986	15% nuclear
	1990	20% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity	1988	11.7 GWe
	1990	13.5 GWe
	1995	15.9 GWe
	2000	15.9 GWe
Reactor Mix	1988	HWR: 18 (1968-87)
		4 (1988-92)

INDUSTRIAL FUEL CYCLE

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

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

Cumulative Spent Fuel Arisings (HWR)	1980	3,650 tU
	1985	9,000 tU
	1987	12,300 tU
	1990	17,700 tU
	2000	33,900 tU

Major Milestones

*	URL completion	1989
*	Submission of concept assessment/documentation	1991

CANADA

INTERNATIONAL RELATIONSHIPS

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

- Term: 9-8-76 to 8-25-92.
- Scope: Waste treatment; storage; 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 Subsidiary Agreement #1 for a Radioactive Waste Management Technical Cooperation 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.

Member of IAEA and OECD/NEA. Exchange agreements with CEC (Euratom), BMFT/Germany, SKB/Sweden, UKAEA/United Kingdom, PNC and JAERI/Japan, and KAERI/South Korea.

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 and slower reactors. Waste management R&D at Whiteshell and Chalk River.
- * OH (Ontario Hydro)--provincial public utility, owns/operates 10,000 MWe CANDU nuclear power plants and has 3,000 MWe more under construction. Waste management R&D.
- * HQ (Hydro Quebec)--provincial public utility, owns and operates Gentilly 2 (600 MWe CANDU station).
- * NBEPC (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 Control Board (AECB)
 - * Regulations, Licensing
- Atomic Energy of Canada, Limited (AECL)
 - CANDU Operations
 - * Reactor Design, Engineering, Export
 - AECL Radiochemical Company
 - * Radioisotopes/Medical Applications
 - AECL Research (see CA-4)
- El Dorado Resources, Inc.
 - * Uranium Enrichment
- Department of Energy, Mines and Resources (EMR)
 - 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
 - Rock Mechanics Laboratory
 - * Rock Properties
 - Mineral Sciences Laboratories
 - * Radionuclide Recovery from Thorium Mill Tailings

CANADA

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
 - * Performance Assessment
- 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
Fax: 613-995-5086
Tlx: 053-3771

President
Fuel Cycle/Materials Regulations
Waste Management
Fuel and Heavy Water Plant
Regulatory Research
Safety/Safeguards

Dr. Rene J. A. Levesque
W. D. Smythe
G. G. Jack -3181
J. P. Didyk
J. W. Beare
J. R. Coady

AECL

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

Tel: 613-236-6444
Fax: 613-996-9638
Tlx: 053-3126

Chairman
President
President, AECL Research

Basil A. Bénéteau
James Donnelly
Dr. Stanley R. Hatcher

AECL-CRNL

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

Tel: 613-584-3311
Fax: 613-589-2039
Tlx: 053-34555

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

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

Facilities

- * **Waste Treatment Center (WTC)**
Mission: Development and operation of processes for (1) the treatment of low- and intermediate-level wastes using incineration, compaction, ultrafiltration/reverse osmosis, evaporation, ion exchange, pyrohydrolysis and solification in bitumen and (2) the solidification of high-level wastes using in-can melting.
- * **CRNL Waste Disposal Project**
Mission: Design, site, construct and operate a shallow-land disposal facility for low- and intermediate-level wastes on the Chalk River property.
Milestone: Complete design of first concept (shallow-land burial) in 1988; begin operations in 1989. Select site for shallow-rock cavity concept in 1989; complete design and cost estimate for cavity concept in 1990.

CANADA

AECL-WNRE

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

Tel: 204-753-2311
Fax: 204-753-8404
Tlx: 075-7553

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

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

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.
- * **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/d.
History: Hot operation, 1980; Shutdown, 1985.
- * **URL (Underground Research Laboratory)**, located about 20 km from WNRE, on the Lac du Bonnet Batholith.
Mission: Provide a research facility in a virgin granite pluton characteristic of the Canadian granite formations which may be selected for waste repository construction. (USDOE participating in experimental programs)
Design Basis: Horizontal tunnel with adjoining rooms located 240 m below the surface, with vertical shaft. Start of shaft extension to the 465 m level and development of horizontal tunnels on the 440 m level, July 1987. Licensed radioactive sources and selected licensed tracers may be used in the facility, but no radioactive wastes are to be emplaced there.
Milestones: Underground operation startup, 1986; completion of shaft extension, 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.

AECL-WNRE (contd)

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.

- * **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.

ELDORADO RESOURCES INC.

Eldorado Resources Inc.
 360 Albert St., Suite 700 Tel: 613-238-5222
 Ottawa, Ontario K1R 7X7 Fax: 613-234-8439
 Canada Tlx: 053-3382

Chairman	L. G. Bonar
President	N. M. Ediger
Vice President, Fuel/Waste Mgmt.	Dr. A. W. Ashbrook
Environment/Waste Management	D. Moffett

Crown corporation - under Ministry of Energy, Mines and Resources.

EMR

Energy, Mines and Resources Canada
 Science and Technology
 580 Booth Street Tel: 613-995-3065
 Ottawa, Ontario K1A 0E4 Fax: 613-996-6424
 Canada Tlx: 053-3117

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

CANADA

EMR-CANMET

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

Tel: 613-995-4029
Fax: 613-952-2587
Tlx: 053-3396

Director General,
Policy Planning/Services
Director General,
Mineral Technology
Rock Mechanics
Waste Management (Elliot Lake)

J. Ferron
Dr. J. T. Jubb
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
580 Booth Street
Ottawa, Ontario K1A 0E8
Canada

Tel: 613-992-5910
Fax:
Tlx: 053-3117

Assistant Deputy Minister Dr. R. A. Price

ON

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

Tel: 416-592-5111
Fax: 416-592-2753
Tlx: 06-217662

Director, Design Development,
Division Generation
Nuclear Materials Management
Radioactive Materials Mgmt.
Radioactive Materials Storage
Fuel Cycle - Isotope

H. S. Irvine -5103
H. N. Isaac
P. Stevens-Guille
P. J. Armstrong
R. A. McEachran

OH (contd)

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

Facilities

- * **RMVRF (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 Complex, Tiverton, Ontario.
Components: In-ground concrete tile holes or trenches, above-ground concrete "Quadricell."

CHINA
(People's Republic of China)

CHINA

MAJOR PUBLIC HOLIDAYS (1988)

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
Standard Time period: 03/13 - 10/08/88

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\$ = 3.7220 Yuan
per Wall Street Journal, 01/29/88. 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
	1986	91 GWe
Electric Power Production	1985	406 TWh
		~70% coal
		~24% oil
		hydro/geoth. gas
	1986	445 TWh

NUCLEAR POWER

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

Nuclear Power Plant Capacity	1990	0.3 GWe
	2000	5.0 GWe
Reactor Mix	1988	PWR: 3 (1990-93)
Reactor Development		BWR, HTR, FBR

INDUSTRIAL FUEL CYCLE

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

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

INTERNATIONAL RELATIONSHIPS

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

CHINA

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

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

INET

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

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

CHINA

MNI

Ministry of Nuclear Industry
Beijing
People's Republic of China

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

NNSA

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 (1988)

January 1	New Year
April 1	Good Friday
April 3-4	Easter
May 1	May Day
June 24	Midsummer Eve
December 6	Independence Day
December 24-26	Christmas

TIME

Standard Time Washington D.C.: + 7 hours
Daylight Saving Time period: 03/27 - 09/24/88

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\$ = 4.07 Markka (FIM)
per Wall Street Journal, 01/29/88. 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	Tel: 358-0-17-1931
Itäeinen Puistotie 14A	Fax:
00140 Helsinki	TLx: 12-1644 USEMB SF
Finland	

FINLAND

ENERGY

Population	1985	4.9 million
Electric Power Plant Capacity	1985	11.4 GWe 20% nuclear
	1986	11.4 GWe 20% nuclear
	1990	11.7 GWe 20% nuclear
Electric Power Production	1985	49.4 TWh 39% nuclear 25% hydro/geoth. 18% coal 3% gas 2% oil
	1986	38% nuclear
	1990	32% nuclear

NUCLEAR POWER

Nuclear Power Plant Capacity	1988	2.3 GWe
	1995	2.3 GWe
	2000	2.3 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: According to current plans, spent fuel or HLW from non-Soviet fuels will be stored for 40 years, then placed in granitic bedrock; reactor wastes are bituminized and stored above ground at the nuclear power station sites.

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

FINLAND

Major Milestones

* Complete LLW/ILW repository (TVO)	1992
* Complete updated final disposal concept for spent fuel	1992
* Complete LLW/ILW repository (IVO)	1997
* Complete repository (spent fuel) site selection	2000
* Complete repository (spent fuel)	2020

INTERNATIONAL RELATIONSHIPS

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

ORGANIZATION

- * IVO (government-owned power company)--operates two Soviet-built PWR reactors;
- * TVO (power company, jointly owned by IVO and several industrial companies)--operates two Swedish-built BWR plants.
- * YJT (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.
- * STUK (Finnish Centre for Radiation and Nuclear Safety)--regulatory authority which also conducts research, in particular, related to transport of radionuclides in biosphere.
- * Geological Survey of Finland--bedrock-related research.
- * University of Helsinki--basic research on radio-chemistry.

ATOMIC ENERGY COMMISSION

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

Tel: 358-0-160-5229
 Fax:
 Tlx: 125-452 EDEPT SF

Chairman
 Secretary-General

Prof. Pekka Jauho
 Lasse Mattila

GEOLOGICAL SURVEY OF FINLAND

Geological Survey of Finland
 Kivimiehentie 1
 02150 Espoo
 Finland

Tel: 358-0-46931
 Fax:
 Tlx: 12-3185 GEOLO SF

Director
 Research Director
 Nuclear Waste Disposal

Prof. L. K. Kauranne
 Prof. K. Korpela
 Paavo Vuorela

IVO (National Power Company)

Imatra Voima Oy (IVO)
 Rajatorpantie 8
 01600 Vantaa
 Finland

Tel: 358-0-5081
 Fax:
 Tlx: 12-4608

Function: Operate two nuclear power plants at Loviisa, southeastern Finland.
 Owner: Government.

STUK (Finnish Centre for Radiation and Nuclear Safety)

Finnish Centre for Radiation
 and Nuclear Safety
 P.O. Box 268
 00101 Helsinki
 Finland

Tel: 358-0-7082-1
 Fax: 358-0-7082-392
 Tlx: 12-2691 STUK

Nuclear Fuel Cycle

Hannu H. Koponen
 Esko Ruokola

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

FINLAND

IVO (Industrial Power Company)

Teollisuuden Voima Oy (TVO)
Fredrikinkatu 51-53 B
00100 Helsinki
Finland

Tel: 358-0-605-022
Fax: 358-0-605-135
Tlx: 122-065

Nuclear Waste Veijo Ryhänen

Function: Operate two nuclear power plants at Olkiluoto in Eurajoki, southwestern Finland.

Owners: IVO/industrial companies.

Facility:

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

VTT (Technical Research Center of Finland)

VTT Nuclear Engineering Laboratory
P.O. Box 169
00181 Helsinki
Finland

Tel: 358-0-648-931
Fax: 358-0-642-1382
Tlx: 122-972 VTTHA SF

Director, Nuclear Waste Prof. Pekka Silvennoinen
Nuclear Waste Management Dr. Seppo Vuori

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

VTT Reactor Laboratory
Otakaari 3A
02150 Espoo
Finland

Tel: 358-0-4561
Fax:
Tlx: 122-972 VTTHA SF

Director Prof. Pekka Hiismäki
Nuclear Waste Management Arto Muurinen

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

FINLAND

VTT (contd)

VTT Metals Laboratory

Metallimiehenkuja 6
02150 Espoo
Finland

Tel: 358-0-4561
Fax:
Tlx: 122-972 VTTHA SF

Director
Nuc. Fuel Material Research

Dr. Jarl Forsten
Esa Vitikainen

R&D Activities: Corrosion of encapsulation materials in
Finnish bedrock. Nuclear fuel studies.

VTT Geotechnical Laboratory

Betonimiehenkuja 1
02150 Espoo
Finland

Tel:
Fax:
Tlx: 122-972 VTTHA SF

Director
Rock Mechanics

Dr. Markku Tammirinne
Dr. Kari Saari

UNIVERSITY OF HELSINKI

University of Helsinki
Department of Radiochemistry
Unioninkatu 35
00170 Helsinki
Finland

Tel: 358-0-192-4392
Fax:
Tlx: 12-4690 UNIH SF

Director

Prof. T. Jaakkola

FRANCE

FRANCE

MAJOR PUBLIC HOLIDAYS (1988)

January 1	New Year
April 3-4	Easter
May 1	Labor Day
May 12	Ascension
May 22-23	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: 03/27 - 09/24/88

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\$ = 5.66 Franc
per Wall Street Journal, 01/29/88. 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: 33-1-42-96-12-02
75382 Paris	Fax: 33-1-42-61-80-75
France	Tlx: 650-221
Science Counselor	Dr. Alan L. Sessoms

ENERGY

Population	1985	55.04 million
Electric Power Plant Capacity	1985	88.5 GWe 44% nuclear
	1986	92.5 GWe 49% nuclear
	1990	107.6 GWe 53% nuclear
	1995	118.6 GWe 54% nuclear
Electric Power Production	1985	344.3 TWh 65% nuclear 19% hydro/geoth. 13% coal 2% oil 1% gas
	1986	70% nuclear
	1990	76% nuclear
	1995	78% 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	1988	49.6 GWe
	1990	52.5 GWe
	1995	60.3 GWe
	2000	64.4 GWe
Reactor Mix	1988	GCR: 4 (1967-72)
		PWR: 45 (1970-87)
		12 (1988-93)
		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).

FRANCE

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

Cumulative (PWR) Spent Fuel Arisings, tU	1980	1985	1990	2000
	248	2,900	7,300	20,000

Cumulative Waste Arisings, m ³	1983	1990	2000
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: 400 t/a, UO₂ (to be expanded to 1,600 t/a).

Major Milestones

- * APM demonstration reprocessing plant for FBR fuels (Marcoule) 1988
- * UP3 reprocessing plant (La Hague) including T7 vitrification plant startup 1989
- * UP2-800 reprocessing plant (La Hague) including R7 vitrification plant startup 1992
- * New LLW disposal facility (Public interest decree (DUP) signed 1987) Early 1990s
- * Underground Research Laboratory (Site recommendation 1989/90) 1995

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 LLW and TRU waste management; exchange of waste repository site characterization technology and data for granite and salt host rocks.

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

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

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

ORGANIZATION

- * CEA (Atomic Energy Commission)--controls practically all nuclear R&D; controls long-term waste management, disposal included (ANDRA)
 - Nuclear Research Centers: Cadarache, Fontenay-aux-Roses, Grenoble, Marcoule, Saclay
- * CEA INDUSTRY: Industrial group concerned by all industrial fuel cycle activities in France
 - COGEMA (CEA 100%): mining, reprocessing
 - COMURHEX (COGEMA 49%): uranium conversion
 - EURODIF (COGEMA 51.5%): commercial enrichment

FRANCE

- SIGN, FRAGEM, FBFC, COMMOX (COGEMA subsidiaries part or whole): fuel fabrication
 - SGM, USSI (COGEMA part subsidiary),
 - TECHNICATOME (90% CEA): design, construction, operation of fuel cycle and/or waste facilities
 - STMI (60% CEA): waste management, decontamination, dismantling services
 - TRANSMUCLEAIRE: transport
- * EdF (Electricité de France, 100% government)-- public power generation; owns and operates all nuclear plants except Phenix (50% EdF, 50% CEA) and SuperPhenix (NERSA: 51% EdF, 33% ENEL, 16% RWE)

CEA STRUCTURES

Minister of Industry, Telecommunication and Tourism

|--CEA CHAIRMAN ---- HIGH COMMISSIONER

OPERATIONS UNITS

- DAM - Military Applications
- IPSN - Institute for Nuclear Safety
- IRF - Institute for Fundamental Research
- IRDI - Institute for Research/Ind. Development
- See page FR-6
- ANDRA- National Agency for Waste Management

RESEARCH CENTERS

- CEN - See Page FR-7

PROGRAM DIRECTORS

- Direction des Technologies
 - DgMN - Nuclear R&D (Reactor/Fuel Cycle)
 - DgED - Waste Management
 - DgDIN - Decommissioning
 - DgSTV - Life Sciences and Techniques
 - DgV - Diversification
- DAMN - Nuclear Materials
- DPN - Nuclear Propulsion

CENTRAL OFFICES

- General Management/Planning/Programs/Strategy & Industrial/Intl. Relations/Safety/Inspectorate

FRANCE

INSTITUT DE RECHERCHE
TECHNOLOGIQUE ET DE
DEVELOPPEMENT INDUSTRIEL (IRDI)

DIRECTION DES
TECHNOLOGIES

Division of Reprocessing Waste
and Applied Chemistry (DERDCA)

Director for Nuclear
Waste Management (DgED)

- DRDD - Department for Waste R&D --
 - SESD - Engineered Barriers, Modeling
 - SDHA - High-Level Waste
 - SDFMA - Low- and Medium-Level Waste
 - SCECA - Characterization
- DCAEA - Department for Analysis, Corrosion and Applied Chemistry
- DIP - Department for Technology Transfer/ Process Industrialization
- DGR - Department for Reprocessing, R&D Pilots

COGEMA

- La Hague Center
 - * Reprocessing (LWR)
- Marcoule Center
 - * APM - Reprocessing (Metal)
 - * AVM - Vitrification

CEA

RESEARCH CENTERS (CEN)

- Cadarache
 - * MOX Fuel
 - * TRU Waste and LL/ILW
 - * Environmental
- Fontenay-aux-Roses
 - * Disposal R&D
 - * MOX Fuel
 - * TRU Waste and LL/ILW
 - * Engineered Barriers
 - * Safety and Health Protection
- Grenoble
- Saclay
 - * MOX Fuel Fabrication
 - * TRU Waste and LL/ILW Treatment
 - * Engineered Barriers
- Marcoule
 - * FBR Fuel Cycle
 - * Reprocessing
 - * HLW
 - * TRU Waste and LL/ILW R&D

FRANCE

ANDRA (National Agency for Radioactive Waste Management)

Agence Nationale pour la Gestion
des Déchets Radioactifs
Commissariat à l'Energie Atomique
31, Rue de la Federation
75752 Paris Cedex 15
France

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

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

Facilities

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

Mission: Disposal of ILW and LLW; capacity:
460,000 m³ (1985: 265,000 m³ in place; to
be full and shut down in early 1990s).
- * Two new centers planned; one site approved (1987):
Soulaines (Aube), to be commissioned early 1990s.
- * Four possible sites (in clay, granite, shale
and salt) selected for characterization of under-
ground HLW storage. Site selection of URL early
1990s; disposal facility--2000/TRU; 2010/glass.

BRGM (Bureau of Geological and Mineral Research)

Bureau de Recherches Géologiques
et Minières
B.P. 6009
45060 Orléans Cedex 2
France

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

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

CEA (Atomic Energy Commission)

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

Tel: 33-1-40-56-1000
Fax:
Tlx: 200671 ENERGAT

CEA-IPSN (Institute for Nuclear Safety)

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

Tel: 33-14-654-7080
Fax:
Tlx: 204841 ENERGAT FNAYR

CEN-CA (Cadarache Nuclear Research Center)

Centre d'Etudes Nucléaires
de Cadarache
B.P. 1
13115 Saint-Paul-lez Durance
France

Tel: 33-42-25-7000
Fax:
Tlx: CEACA 440678 F

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

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

FRANCE

CEN-CA (contd)

- * Resin Embedding Pilot Facility
- * Solvent Incinerator

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

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

Tel: 33-14-654-8000
Fax:
Tlx: FAR 20481

CEN-G (Grenoble Nuclear Research Center)

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

Tel: 33-76-97-4111
Fax:
Tlx: 320323 ENERGAT GRENO

- * Waste Resin Embedding Facility

CEN-M (Marcoule Nuclear Research Center)

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

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

Facilities

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

CEN-S (Saclay Nuclear Research Center)

Centre d'Etudes Nucléaires	
de Saclay	Tel: 33-16-908-6000
91191 Gif-sur-Yvette	Fax:
France	Tlx: 690641 F ENERGAT
	SACLAY

Facilities

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

COGEMA (Compagnie Generale des Matières Nucléaires)

COGEMA, Inc.	
Direction Generale	
B.P. 4	Tel: 33-13-946-9641
78141 Velizy Villacoublay Cedex	Fax:
France	Tlx: 69-7833 COGEM

Vice President, Reprocessing	Claude Aycoberry
Ind. Director, Reprocessing	Maurice Delange
La Hague Expansion Proj./Reproc.	Francois Chenevier
Marcoule Expansion Proj./Reproc.	Andre Bekiarian

COGEMA-LA HAGUE CENTER

COGEMA, Centre de La Hague	
B.P. 270	Tel: 33-13-303-6000
50107 Cherbourg	Fax:
France	Tlx: 170030 ENERGAT

COGEMA-LA HAGUE (contd)

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: PUREX flowsheet; oxide fuels: shear-leach HAO head-end; remote maintenance; capacity, 400 t/a of LWR fuels.
History: UP2 startup, 1967; HAO startup, 1976. From startup (6/76) through 11/87 total HAO throughput was 2,000 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, 1992; R7 startup, 1988 (UP2 HLLW backlog).
- * **UP3 (Fuel Reprocessing Plant)**
Mission: Reprocess LWR fuels.
Design Basis: Chop-leach head-end; PUREX flowsheet; AVM vitrification process (T7 plant: identical to R7 vitrification plant).
Milestone: Startup, 1989.

COGEMA-MARCOULE CENTER

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

Tel: 33-16-689-5390
 Fax:
 Tlx: 480232F MARCOGEMA

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

Director
 Reprocessing Plant
 AVM Manager

Maurice Alles
 Maurice Chotin
 Pierre Hugony

Facilities

- * **UPI (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 UPI wastes.
Design Basis: Rotary calciner feeding an induction-heated metallic melter; capacity 30 l/hr HLLW feed and 360 kg/d (1 canister) borosilicate glass product; waste form, glass blocks 0.5 m dia x 1.0 m high.
History: Hot startup, 6/78; as of 4/01/87, 1,144 m³ of HLLW had been vitrified (1,453 canisters = 504 t borosilicate glass).
- * **Incinerator**
- * **Bituminization Facility**

DAM (Directorate of Military Applications)

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

FRANCE

FBFC (Franco-Belge Company for Fuel Fabrication)

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

Tel: 33-1-47-66-52-00
Fax:
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
77305 Fontainebleau
France

Tel: 33-1-64-22-48-21
Fax: 33-1-43-25-94-97
Tlx: 600736 MINEFON

Director, Math. Geol. Center
Deputy Director

Dr. Ghislain de Marsily
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

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

Tel: 33-1-30-58-60-00
Fax: 33-1-30-58-60-61
Tlx: 698316 F

President
Managing Director
Technical Director

Louis Pradere
Pierre B. de la Combe
Claude Bernard

FRANCE

SGN (contd)

SGN US Operations

NUMATEC
2550 M Street NW, Suite 400
Washington, DC

Tel: 202-857-0713
Fax: 202-822-9438
Tlx: 089-2605

IN

Transnucleaire
11 Rue Christophe-Colomb
75008 Paris
France

Tel: 33-1-47-23-78-50
Fax:
Tlx: 280992

General Manager
Technical Manager

Bernard Savornin
Paul Blum

GERMANY
(Federal Republic of Germany)

GERMANY (FRG)

MAJOR PUBLIC HOLIDAYS (1988)

January 1	New Year
April 1	Good Friday
April 3-4	Easter
May 1	May Day
May 12	Ascension
May 22-23	Pentecost
June 17	Day of Unity
December 25-26	Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time period: 03/27 - 09/24/88

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\$ = 1.68 DMark (DM)
per Wall Street Journal, 01/29/88. 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	Tel: 49-228-3391
5300 Bonn 2	Fax:
Federal Republic of Germany	Tlx: 885-452
Science Counselor	Edward M. Malloy

ENERGY

Population	1985	59 million
Electric Power Plant Capacity	1985	92.7 GWe 17% nuclear
	1986	95.7 GWe 20% nuclear
	1990	100.0 GWe 23% nuclear
Electric Power Production	1985	408.7 TWh 57% coal 31% nuclear 6% gas 4% hydro/geoth. 2% oil
	1986	30% nuclear
	1990	35% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity	1988	21.7 GWe
	1990	23.0 GWe
	1995	23.0 GWe
	2000	24.2 GWe
Reactor Mix	1986	PWR: 11 (1972-86)
		3 (1988-89)
		BWR: 7 (1972-85)
		FBR: 1 (1988)
		HTR: 1 (1987)

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 abandoned iron mine or salt repository.

GERMANY

Cumulative Spent Fuel Arisings (LWR)		1980	960 tU
		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 1988.
 - 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	1988
* Acceptance of HLW from Cogema/La Hague	1990
* Fuel reprocessing plant/Wackersdorf	1997
* Konrad (iron mine) repository	1992/3
* Gorleben repository, HLW	2003/4

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.

DOE/BMFT Implementing Agreement for Asse Mine Studies

- Term: 10-1-81 to 10-1-88.
- 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.

ORGANIZATION

- * Federal Government
 - Coordinate FRG nuclear program
 - Sponsor R&D
 - Build and operate radioactive waste disposal facilities (through PTB)
 - Set licensing rules
- * States (Länder)
 - License nuclear installations
 - Provide LLW interim storage area
- * Utilities
 - Provide spent fuel/reactor waste storage, reprocessing and waste treatment
 - Pay for waste disposal

GERMANY

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

BMWi (Federal Ministry for Economics)

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

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

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

LÄNDER (State Governments)

- * Licensing of Nuclear Installations

INDUSTRIAL/UNIVERSITY RESPONSIBILITIES

EW - Consortium for the Construction of WAW

DMK - Owned by FRG Nuclear Utilities

- * Fuel Reprocessing/Waste Conditioning Services
- * Funding of Waste Disposal Services provided by Federal Government
- * Operation of PAMELA Pilot Plant
- * Construction/Operation of Wackersdorf Reprocessing Facility (WAW)
- * Construction of Spent Fuel Conditioning Plant at Gorleben (PKA)

-- WAK (DMK Subsidiary)

- * Reprocessing Pilot Plant
- * DMK R&D Program Management

-- BLG (DMK Subsidiary)

- * Operation of Gorleben Spent Fuel/LLW Storage Facilities

NUKEM - Owned by Degussa (35%), RWE (45%), RTZ (10%), MG (10%)

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

ALKEM - Owned by NUKEM (40%), KMW (60%)

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

TN - Owned by NUKEM (80%), Transnucleaire SA (20%)

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

GNS - Owned by STEAG, DMK

- * Transportation of Radioactive Materials
- * Shipping Cask Development

TUM - Technical University Munich

- * Actinide Chemistry R&D

GERMANY

ALKEM

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

Tel: 49-6181-58-0
Fax: 49-6181-58-3502
Tlx: 418-4124 RBU D

Director Horst Roepenack
49-6181-58-4600

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 für Materialforschung
und -prüfung (BAM)
Unter den Eichen 87
1000 Berlin 45
Federal Republic of Germany

Tel: 49-30-8104-1
Fax: 49-30-8112-029
Tlx: 18-3261 BAM D

BGR (Federal Institute for Geosciences
and Natural Resources)

Bundesanstalt für Geowissenschaften
und Rohstoffe
Stilleweg 2, Postfach 510153
3000 Hannover 51
Federal Republic of Germany

Tel: 49-511-643-0
Fax: 49-511-643-2304
Tlx: 92-3730 BFB (BGR)

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

Rock Mechanics Prof. Dr. A. Pahl
Soil Mechanics Dr. R. Lüdeling
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 für Forschung
und Technologie

Heinemannstrasse 2
Postfach 200706
5300 Bonn 2
Federal Republic of Germany

Tel: 49-228-591
Fax: 49-228-593-105
Tlx: 88-5674 BMFT

Minister, Science/Technology
Director General, Energy/
Environment/Raw Materials
Director, Energy Sci. Tech.
Fuel Cycle/Reprocessing

Dr. Heinz Riesenhuber
Dr. Günter Lehr

Dr. Knut Bauer
Dr. Rolf-Peter Randl
49-228-59-3275
Dr. Karlheinz Hübenthal
Dr. Hamacher
49-228-59-3282
Helmut H. Geipel

Waste Treatment
Waste Disposal

Repository Programs

BMU (Federal Ministry for Environmental
Protection and Reactor Safety)

Bundesministerium für Umwelt,
Naturschutz und Reaktorsicherheit

Husarenstrasse 30
5300 Bonn 1
Federal Republic of Germany

Tel: 49-228-6811
Fax:
Tlx: 88-6664

Minister

Prof. Dr. Klaus Töpfer

Chairman, Reactor Safety
Commission (RSK)
Chairman, Radiation Protection
Commission (SSK)

Prof. Dr. Adolf Birkhofer
Prof. Oberhausen

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

Deutsche Gesellschaft zum Bau
und Betrieb von Endlagern
für Abfallstoffe mbH

Woltorfer Strasse 74
3150 Peine 1
Federal Republic of Germany

Tel: 49-5171-43-1
Fax: 49-5171-43-218
Tlx: 92-646 DBE D

GERMANY

DRE (contd)

Managing Directors	Dr. Hans-Jürgen Krug Dr. Peter Young
Project Gorleben, Mgr.	Gernot Grubler 49-5171-43-291
Project Konrad, Mgr.	Gerhard Holtz 49-5171-43-310
Project-Related R&D, Mgr.	Hans-Jürgen Engelmann 49-5171-43-272

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

DHI (German Hydrographic Institute)

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

DWK (German Fuel Reprocessing Company)

Deutsche Gesellschaft für Wiederaufarbeitung von Kernbrennstoffen mbH Hamburger Allee 4, Postfach 1407 3000 Hannover 1 Federal Republic of Germany	Tel: 49-511-3390-0 Fax: 49-511-3390-699 Tlx: 9-220-201 DWK
--	--

Board Member/Plant Operations R&D/Cooperation Division	Dr. Walter Weinländer Dr. Karl-Dieter Kuhn 49-511-3390-676
Project Direction, PKA Project Direction, WAW PAMELA Plant Manager	Dr. Klaus Einfeld Dr. Klaus W. Storck *Horst Wiese
* DWK-PAMELA c/o Belgoprocess Gravenstraat 24800 Dessel, Belgium	Tel: 32-14-240-400

DWK (contd)

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, 1988.
- * **WAW Fuel Reprocessing Plant** (Wackersdorf)
Mission: Demonstrate operability and safety of small industrial plant; reprocess spent LWR fuels commercially.
Design Basis: Shear-leach head-end; PUREX process; capacity: 350 t/a.
Milestone: Startup, 1997.
- * **Lahde Test Facility** (90 km west of Hannover)
Mission: Confirm DWK concepts for remote maintenance of Wackersdorf reprocessing plant.
Design Basis: Full-scale mockup of WAW process cells and components.
- * **PAMELA Pilot Plant** (Mol, Belgium--ownership transferred to Belgoprocess in 1986)
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). As of November 1987: 170 m³ waste vitrified, 1000 canisters filled.
- * **PKA Pilot Fuel Conditioning Plant** (Gorleben)
Mission: Conditioning and encapsulation of spent fuel to meet the requirements for interim storage and final disposal.
Design Basis: Hot cell with installations for rod consolidation, compaction of fuel assembly skeletons, loading of canisters. Maximum throughput 35 tHM/y.
Milestone: Startup, 1994.

GERMANY

GRS (Company for Nuclear Service)

Gesellschaft für
Nuklear-Service mbH
Goethestrasse 88
4300 Essen 1
Federal Republic of Germany

Tel: 49-201-7220-0
Fax: 49-201-7220-8
Tlx: 857-9993 gns d

Managers

Dr. Klaus Janberg
49-201-7220-102
Dr. Henning Baatz
Erich von Wedelstadt

GRS (Company for Reactor Safety)

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

Tel: 49-221-2068-0
Fax: 49-221-2068-442
Tlx: 8881-807 GRS D

General Manager

Prof. Dr. Adolf Birkhofer

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

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

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

Tel: 49-531-8012-1
Fax: 49-531-8012-200
Tlx: 2627-531-8228 IFT

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
Director, Disposal Technology
Engineering Development
Geotechnology
Test Fields

Dr. Klaus Kühn
49-531-8012-231
Alfred Beinlich
Manfred W. Schmidt
Tilman Rothfuchs
49-5336-89232
Dr. Dieter Flach

Geophysics

GE-10

GSE/IFT (contd)

Director, Disposal Safety	Dr. Werner Hild
Safety Analysis	Dr. Richard Storck
Geology	Dr. Thomas Brasser
Geochemics	Dr. Hermann J. Gies
Director, Project Management	Dr. Wernt Brewitz
ILW/HLW Project	Dr. Rolf Stippler
Gorleben	Jürgen Kunze
Asse	Dr. Helmut Fleck
Konrad	Wolfgang Busch

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

Director, Mine Operations	Klaus Dürr
	49-531-8012-211
Mine Manager	Oswald Opp
Tech. Planning	Helmut Kolditz
Radiation Protection	Dr. Ingo Müller-Lyda

Facilities

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

HMI

Hahn-Meitner-Institut Berlin, GmbH	
Postfach 390128	
Glienicker Strasse 100	Tel: 49-30-8009-1
1000 Berlin 39	Fax:
Federal Republic of Germany	Tlx: 18-5763
Scientific Technical Director	Prof. Dr. H. Lindenberg
Managing Director	Dr. M. Nettesheim
Ceramic Materials Section	Dr. Werner Lutze
(HMI Waste Program)	

GERMANY

KFA (Jülich Nuclear Research Center)

Kernforschungsanlage Jülich GmbH
Postfach 1913
5170 Jülich
Federal Republic of Germany

Tel: 49-2461-610
Fax: 49-2461-6153-27
Tlx: 833 556 KFD

Director, Institute of
Chemical Technology
HTGR Fuel Cycle Project
Waste Treatment
Director, Institute of
Reactor Materials

Prof. Dr. Erich R. Merz
49-2461-3114
Dr. Norbert Kirsch
Dr. Manfred Laser
Prof. Dr. Hubertus Nickel
49-2461-3058

Function: Develop advanced waste management procedures.
Activities: Hot cell experiments dealing with the
development of advanced ILW and HLW conditioning processes.
Characterization of waste products and packages. Development
and demonstration of quality assurance measures for waste
packages. Retrievable in-situ testing of ILW disposal
techniques in the Asse salt mine including direct disposal of
HTR fuel elements. Incineration of LLW using the Jülich
furnace design.

HTR fuel reprocessing R&D terminated 1987;
FIPS (HLLW vitrification facility) closed down 1987.

KfK (Karlsruhe Nuclear Research Center)

Kernforschungszentrum Karlsruhe GmbH
Postfach 3640
7500 Karlsruhe 1
Federal Republic of Germany

Tel: 49-7247-821
Fax: 49-7247-82-5503
Tlx: 78-26484

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

Director, Waste Treatmt. (HDB)
Manager, Fuel Reproc./Waste
Management Project (PWA)
Director, Inst. for Hot Chem.

Wolfgang Pfeiffer
Dr. Reinhard Kroebel
49-7247-82-2032
Prof. Klaus Ebert
49-7247-82-2400

Deputy Director

Dr. Gunter Koch
49-7247-82-2405

Director, Institute for Nuc.
Waste Tech. (INE)
Final Disposal

Dr. Helmut Krause
49-7247-82-2230
Dr. R. Koester
49-7247-82-2302

Chemistry (WMRD)

Dr. Horst Pentinghaus
49-7247-82-4476

Process Engineering

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

Director, Institute for
Radiochemistry (IRCh)

Prof. Ache
49-7247-82-3200

GE-12

KfK (contd)

Director, Ctrl. Eng. Dept. (IT)	Dr. Hermann Rininsland
	49-7247-82-3000
Remote Handling	G. Boehme
	49-7247-82-2600
Director, Lab. for Aerosol	J. Wilhelm
Phys./Filter Tech. (LAF II)	49-7247-82-3107

Facilities

- * **MILLI Hot Cell Facility** (fuel reprocessing)
Mission: LWR and FBR fuel reprocessing R&D.
- * **MINKA Hot Glove Boxes** (U and Pu)
Mission: Extraction code verification for pulsed columns and maloperation experiments.
Design Basis: Small scale pulse columns first extraction cycle.
History: U startup, 1985; Pu startup, 1986.
- * **PUTE Hot Facility** (fuel reprocessing)
Mission: U/Pu Separation.
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.
- * **KRETA Facility**
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 (program completion, 1990/91).
- * **BEATE Facility**
Mission: Aerosol source term destination and VOG-behavior.
Design Basis: Stirring and transport of liquids by air and steam.
History: Startup, 1983 (program completion, 1990/91).

GERMANY

KfK (contd)

- * **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, 1976; WA-350 melter program completion expected 1993.
- * **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 H_2SO_4 - HNO_3 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	
Rodenbacher Chaussee 6	
Postfach 110080	Tel: 49-6181-58-0
6450 Hanau 11	Fax: 49-6181-2081
Federal Republic of Germany	Tlx: 41-84113 NUK D
Director	Bernhard Liebmann
Process Engineering	H. Pirk
Research and Development	R. Gerhardt
Fuel Fabrication	O. Pfahls
Services	Dr. H. Keese
	K. Schreiber

PTB (Federal Science/Engineering Institute)

Physikalisch-Technische Bundesanstalt	
Bundesallee 100	Tel: 49-531-5921
3300 Braunschweig	Fax: 49-531-5927614
Federal Republic of Germany	Tlx: 9-52 822 PTB D

PTB (contd)

Director, Department Long-Term Storage/Disposal of Radwaste	Prof. Dr. H. Roethemeyer
Systems Management/Projects	Henning Rösel
Management of Mine Engineering	Gert Wosnik
Director, Division Nuclear/ Mine Safety	Prof. Dr. Horst Schneider 49-531-592-7620
R&D Coordination/System Analysis	Dr. Heinrich Illi
Radioactive Waste	Dr. Ernst Warnecke
Mine Safety	Dr. Gerhard Stier- Friedland
Director, Division Transport/ Storage of Radioactive Waste	Prof. Dr. Wilhelm Collin

Facilities

- * **Gorleben Site** (planned repository), 100 km northeast of Braunschweig.
Mission: Disposal of all types of solid radioactive waste.
Repository Concept: 300 to 600 m deep boreholes in tunnel floors at depths of about 850 m in the Gorleben salt dome.
Milestone: Startup of disposal, 2003/2004.
- * **Konrad Site** (planned repository in a former iron ore mine), 10 km southwest of Braunschweig
Mission: Disposal of waste with negligible thermal impacts on host rock formation.
Milestone: Startup of disposal, 1992/1993.

TN (Nuclear Transport Company)

Transnuklear GmbH	
Postfach 110030	Tel: 49-6181-58-0
6450 Hanau 11	Fax:
Federal Republic of Germany	Tlx: 4184123 TNF D
Managing Director	Günther Lurf

TUM (Technical University Munich)

Technische Universität München	
Institut für Radiochemie	
Walther-Meißner-Strasse	Tel: 49-89-3209-220
8046 Garching (München)	Fax: 49-89-3209-2204
Federal Republic of Germany	Tlx: 17-898174 TUNGAR
Director	Prof. Franz Baumgärtner

GERMANY

WAK (Fuel Reprocessing Company)

Wiederaufarbeitungsanlage Karlsruhe

Betriebsgesellschaft mbH

Postfach 220

7514 Eggenstein-Leopoldshafen 2

Federal Republic of Germany

Tel: 49-7247-881

Fax: 49-7247-4755

Tlx: 78-26893 WAK D

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

Chief Executive	Dr. Walter Schüller 49-7247-88-204
Executive/R&D Division	Dr. K. L. Huppert 49-7247-88-507
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 1987, 190 tHM (90 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, centrifuge, solvent extraction battery; capacity: 4 tHM/day.

Manager Dr. Klaus Eiben
49-7247-88-450

INDIA

INDIA

MAJOR PUBLIC HOLIDAYS (1988)

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

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\$ = 13.07 Rupee
per Wall Street Journal, 01/29/88. 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	Tel: 91-11-600651
New Delhi	Fax:
India	Tlx: 031-65269 USEM IN
Science Counselor	S. Ahmed Meer

ENERGY

Population	1986	760 million
Electric Power Plant Capacity	1986	45 GWe
	2000	100 GWe
Electric Power Production	1986	150 TWh
		58% coal
		33% hydro
		6% oil
		3% nuclear
	2000	10% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity	1987	1.3 GWe
	1990	1.7 GWe
	1995	3.0 GWe
	2000	6.3 GWe
Reactor Mix	1988	BWR: 2 (1969)
		HWR: 4 (1973-85)
		4 (1988/92)
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 - PuO_2 .

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

INDIA

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

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

Industrial-Scale Activities

- * Heavy-water production (t/a): 1985--85,
1988--150; additional
capacity is planned.
- * Uranium mining and milling (t/a): 1985--130,
1988--170.
- * UO₂ fuel fabrication (t/a): 1981--100;
1984--210;
2000--1500.
- * Fuel reprocessing:
Trombay pilot plant, 30 t/a (1962--)
Tarapur plant, 100 t/a (1982--) Kalpakkam plant,
100 t/a (1992/93).
- * HLW vitrification: Tarapur (1985--)

Major Milestones

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

INTERNATIONAL RELATIONSHIPS

Member of IAEA.

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

ORGANIZATION

Prime Minister

BARC

Bhabha Atomic Research Centre
Trombay, Bombay 400 085
India

Director	Dr. P. K. Iyengar
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. Division	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.

INDIA

BARC (contd)

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
Startup construction, 1981; commissioning, 1990.
- * Experimental Uranium Enrichment Facility

DAE

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

Minister, Science/Technology K. R. Narayanan

Atomic Energy Commission (AEC)
Chairman Dr. Madhav R. Srinivasan
Secretary K. V. Mahadeva Rao

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

Function: Regulation and licensing of nuclear facilities.

Nuclear Power Corporation (formerly Nuclear Power Board)
Function: Design, construction, and operation/maintenance of
nuclear power stations. Help realize nation's goal of having
10,000 MWe of nuclear power on line by the year 2000.

IGCAR

Indira Gandhi Centre
for Atomic Research
Kalpakkam
Tamilnadu
PIN 603102, India

Fast Breeder Reactor Centre C. V. Sundaram

Located near Madras power station.

IGCAR (contd)

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

Facilities:

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

KOLAR WASTE DISPOSAL RESEARCH STATION

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

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

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

History: Startup, late 1979.

MADRAS ATOMIC POWER STATION

Madras Atomic Power Station
Kalpakkam, India

Function: Nuclear power production, fuel reprocessing and waste treatment, plutonium fuel fabrication for FBRs.

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/d for PHWR fuels.
- * Kalpakkam HLW Vitrification Plant
Startup construction, 1983; commissioning, 1993.

INDIA

TARAPUR ATOMIC POWER STATION

Tarapur Atomic Power Station
Tarapur, Maharashtra
India

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

Facilities

- * **Tarapur Fuel Reprocessing Plant (PreFre)**
Mission: Reprocess natural and low-enriched UO₂ fuels.
Design Basis: Chop-leach head-end; PUREX flow-sheet; contact maintenance; capacity, 0.5 tHM/d.
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/d; 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.
Milestone: Completion, 1990.
- * **ILW Bituminization Plant**
- * **Polymerization Facility**

ITALY

ITALY

MAJOR PUBLIC HOLIDAYS (1988)

January 1	New Year
April 1	Good Friday
April 3-4	Easter
April 25	Liberation Day
May 1	Labor Day
May 22-23	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: 03/27 - 09/24/88

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\$ = 1238.00 Lira
per Wall Street Journal, 01/29/88. 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
00187 Rome
Italy

Tel: 39-6-46-742
Fax:
Tlx: 61-0450 AMBRMA

Science Counselor

Gerald J. Whitman

ENERGY

Population	1985	58 million
Electric Power Plant Capacity	1985	55.6 GWe 2% nuclear
	1986	56.6 GWe 2% nuclear
	1990	60.7 GWe 2% nuclear
Electric Power Production	1985	185.7 TWh 41% oil 26% hydro/geoth. 16% coal 13% gas 4% nuclear
	1986	5% nuclear
	1990	4% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity	1988	1.3 GWe
	1990	2.1 GWe
	1995	3.1 GWe
	2000	5.7 GWe
Reactor Mix	1988	GCR: 1 (1963)
		PWR: 1 (1964)
		BWR: 1 (1981)
		2 (1990)
		HWR: 1 (1988)
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	1980	160 tU
Arising (LWR)	1985	330 tU
	1990	520 tU
	2000	2,000 tU

ITALY

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.

AGIP

AGIP S.p.A
Viale Brenta, 29
20139 Milano
Italy

Tel: 39-2-520-1
Fax:
Tlx: 320192 AGN I

Director,
Nuclear Fuel Development

Ing. Enrico Crispino

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

AGIP (contd)

Facilities:

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

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

ENEA

Regina Margherita 125
00198 Rome
Italy

Tel: 39-6-85281
Fax:
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
00100 Rome
Italy

Tel: 39-6-9481
Fax:
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).

ITALY

ENEA-SALUGGIA

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

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

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

Function: Applied nuclear research.

Facilities

- * EUREX (fuel reprocessing pilot plant-radioactive)
Mission: Reprocess MTR and low-enriched uranium (including UO₂) fuels.
Design Basis: EUREX process for MTR fuel has capacity of 30 kg U-Al/d. 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 Tel: 39-835-972241
S.S. 106 Ionica, km 419.5 Fax:
75025 Rotondella (Matera) Tlx: 760085 ENEATR I
Italy

(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

ENEA-TRISAIA (contd)

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

Facilities

- * ITREC (fuel reprocessing pilot plant-radioactive)
Mission: Special fuel reprocessing R&D; reprocess thorium and MOX (FBR) fuels.
Design Basis: Chop-leach head-end; maintenance by remote removal of modules; capacity, 15 kg HM/d (ThO_2 and UO_2).
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 HLLW/a; product, borosilicate glass cylinders, 0.25 m dia x 1 m.
History: Startup, late 1980s.

ENEL (National Electric Energy Agency)

Ente Nazionale per l'Energia Elettrica

Casella Postale 386

Via Giovan Battista Martini 3

00198 Rome

Italy

Tel: 39-6-85091

Fax:

Tlx: 610518

President

Franzo Viezzoli

Vice President

Dr. Marcello Inghilesi

Director General

Dr. Alberto Negroni

Government agency, responsible for all electric power production.

ITALY

ENI

Ente Nazionale Idrocarburi
Piazza Enrico Mattei
00144 Rome
Italy

Tel: 39-6-59001
Fax:
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
00060 Rome
Italy

Tel: 39-6-948-3052
Fax:
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 S.p.A
Via A. Bargonì 34
00153 Rome
Italy

Tel: 39-6-589-4041
Fax:
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 (1988)

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

1 US\$ = 127.93 Yen
per Wall Street Journal, 01/29/88. As rates fluctuate daily, it is recommended to obtain current rates from local banks or newspapers prior to departure.

DIRECT DIALING

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

US EMBASSY - TOKYO

American Embassy	
10-1, Akasaka 1-chome, Minato-ku	Tel: 81-3-583-7141
Tokyo 107	Fax:
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	160 GWe 15% nuclear
	1986	170 GWe 15% nuclear
	1990	180 GWe 18% nuclear
Electric Power Production	1985	672.1 TWh 29% oil 24% nuclear 19% gas 15% coal 13% hydro/geoth.
	1986	25% nuclear
	1990	25% 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	1988	26.9 GWe
	1990	29.4 GWe
	1995	40.5 GWe
	2000	50.4 GWe
Reactor Mix	1988	GCR: 1 (1966)
		BWR: 18 (1970-87)
		7 (1988-97)
		PWR: 16 (1970-87)
		7 (1989/95)
		HWR: 1 (1979)
		FBR: 1 (1993)
Reactor Development		HWR (ATR), LMFB, 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 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 12-3-96.
- Scope: HLW/TRU waste; waste form development, assay and characterization; treatment/packaging/transportation; storage/disposal; D&D; facility operations; environment/safety and public acceptance issues.
- Emphasis: Information exchange of HLW and TRU waste conditioning technology.

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

- Term: 11-11-84 to 11-11-89.
- Scope: Cooperation in experimental and analytical studies through technology information exchange. LLW: radionuclide migration through soils; source terms of radionuclides in shallow-land burial sites; safety performance assessment of shallow-land burial sites. HLW: understanding of materials/engineering; characterization of natural barriers; performance assessment.

Member of IAEA and OECD/NEA. Cooperative agreements with Australia (SYNROC development), Canada, China, France, UK. 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.

JAPAN

NUCLEAR FUEL CYCLE/WASTE MANAGEMENT RESPONSIBILITIES

PARTIAL PNC ORGANIZATION

Board of Directors

|-- President

- Technology Management Division
 - International Coordination
- Reactor Development Coordination Division
- Reactor R&D Project
- Reactor Construction/Operation Project
- Uranium Enrichment Development Project
- Waste Isolation and Ore Processing Division
- Nuclear Fuels Development Division
- Reprocessing Development Division
- Oarai Engineering Center
 - Technology Development Division
 - Systems and Components Division
 - Fuels and Materials Division
 - Experimental Reactor Division
 - Safety Engineering Division
- Tokai Works
 - Engineering Technology Development Div.
 - Plutonium Fuel Division
 - Conversion Technology Development Div.
 - Uranium Enrichment Development Division
 - Waste Management Technology Devel. Div.
- Tokai Reprocessing Plant

JAPAN
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

AEB

Atomic Energy Bureau

Tel: 81-
Fax:
Tlx:

Japan

Director, Policy
Dir., Power Reactor Development
Dir., Nuclear FuelHiroto Ishida
Toshio Okazaki
Akio YukiAECAtomic Energy Commission
2-2-1 Kasumigaseki
Chiyoda-ku, Tokyo 100
JapanTel: 81-3-581-2585
Fax:
Tlx:Chairman (Minister of State
for Science/Technology)
Deputy ChairmanYataro Misubayashi
Takahashi MukaiboFunction: Formulate national policy on nuclear energy
research, development and utilization.CRIEPICentral 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
JapanTel: 81-3-480-2111
Tlx: 2423098 CRIEPI J

JAPAN

GIRIO

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

Tel: 81-727-51-8351
Fax:
Tlx:

Director, 4th Department
Nuclear Waste Program

Dr. Ryoza Hayami
Dr. Ryohei Teraï

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
Fax:
Tlx: J26375 HITACHI

General Manager,
Nuclear Power Generation
Nuclear Power Development

Yoshiaki Korei
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
Fax:
Tlx: 03645511

Nuc. Power Plant Construction
Nuc. Fuel Project
Nuc. Fuel Cycle Project

Kiyoshi Shimizu
Yasuo Hirose
Sadatoshi Inoue

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

IHI

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

Tel: 81-3-286-2185
Fax:
Tlx:

JA-8

IHI (contd)

President Kousaku Inaba
 Gen.-Mgr., Nuclear Power Kugao Nojima

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 Tel: 81-3-503-6111
 Chiyoda-ku, Tokyo 100 Fax:
 Japan 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 Tel: 81-292-67-4111
 Ibaraki-ken Pref. 311-13 Fax:
 Japan Tlx:

JAERI: TOKAI

Tokai Research Establishment
 Tokai-mura, Naka-gun Tel: 81-292-82-5111
 Ibaraki-ken Pref. 319-11 Fax: 81-292-82-5408
 Japan Tlx: 3632340 J TOKAI J
 3632339 JAERIF J

JAPAN

JAERI: TOKAI (contd)

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	Tel: 81-3-279-5441
Chiyoda-ku, Tokyo 100	Fax:
Japan	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.

JGC (contd)

Facilities

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

JNEI

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

Tel:
 Fax:
 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
 Fax:
 Tlx:

President Masatoshi Toyota
 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.

JAPAN**KOBE STEEL**

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

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

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
Fax: 3-287-2278
Tlx: 222-6736 KOBSTL J

Nuc. Power R&D Planning
General Manager, Engineering

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

Technical Advisor

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
Fax:
Tlx:

Minister
V.-Minister, Science/Technology
Deputy Minister
Director, Nuc. Energy Industry
Deputy Director

Hajime Tamura
Isao Uchida
Moritaka Nakamura
Tashimitsu Arai
Masaki Mishiro

MMC

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

Tel: 81-3-213-2111
Fax:
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

JGC (contd)

Facilities

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

JNFI

Japan Nuclear Fuel
 Industries Co., Inc.

Daiichi Seimei Bldg.
 Hirakawa-cho 1-7, Chiyoda-ku
 Tokyo, Japan

Tel:
 Fax:
 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.

JNFS

Japan Nuclear Fuel
 Service Company, Ltd.

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

Tel: 81-3-580-6911
 Fax:
 Tlx:

President Masatoshi Toyota
 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.

JAPAN**KOBE STEEL**

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General Manager, Mechanical
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Nuclear Engineering

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Fumiaki Komatsu

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Fax: 3-287-2278
Tlx: 222-6736 KOBSTL J

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
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3-1, Kasumigaseki
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Tlx:

Minister
V.-Minister, Science/Technology
Deputy Minister
Director, Nuc. Energy Industry
Deputy Director

Hajime Tamura
Isao Uchida
Moritaka Nakamura
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Masaki Mishiho

MMC

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5-2 Ohtemachi 1-chome
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Tel: 81-3-213-2111
Fax:
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

MRC (contd)

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

MOFA

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

Tel: 81-3-580-3311
Fax:
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
Fax:
Tlx:

Director General
Director

Toyozo Terashima
Toshiyuki Kumatori

NSB

Nuclear Safety Bureau

Tel: 81-
Fax:
Tlx:

Japan

Director-General
Deputy Director-General
Reactor Regulation Division

Mitsugu Ischizuka
Kenjiro Ogata
Kaoru Naito

NSC

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

Tel: 81-3-581-5271
Fax:
Tlx:

Chairman

Keisuke Misonou

JAPAN

PNC

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

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

President
Vice Presidents
Exec. Director
Director, Nuclear Fuels Devel.
Waste Isolation
Director, Reprocessing
Director, Technology Mgmt.
International Cooperation
U.S. DOE Tech. Representative

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

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

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

Manager

Takao Yagi

PNC: OARAI

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

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

Director
Waste Management

A. Katagishi
H. Miyao

PNC: TOKAI

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

Tel: 81-292-82-1111
Fax:
Tlx:

PNC: TOKAI (contd)

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

Facilities

- ★ **Fuel Reprocessing Plant**
Mission: Reprocess low-enriched UO_2 .
Design Basis: Oxide fuels: chop-leach head-end. PUREX flowsheet; capacity, 0.7 tHM/d. Remote maintenance of chop-leach equipment; contact maintenance of other components.
History: Startup, 9/77; 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/d 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/d.
- * **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 HLLW/d or 1 canister (76 l)/d 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/d (12 t/a).
Milestone: Hot operation, 1997.

RMC

Radioactive Waste Management Center

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

Tel: 81-3-504-1081
 Fax:
 Tlx:

President
 Managing Director

Syunichi Suzuki
 Syunichi Murakoshi

Function: Studies 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
 Fax:
 Tlx: 2226720 STASGD

Minister, Science/Technology
 Deputy Minister
 Administrative Vice Minister
 Director General
 Director-General, AEB
 Deputy Director-General
 Director, Nuclear Fuel
 Deputy Director
 Director-General, NSB
 Deputy Director-General
 Director, Nuc. Mtls. Regulations
 Deputy Director

Tetsuro Shimura
 Isao Uchida
 Soichiro Ito
 Takashi Matsui
 Misugu Ishizuka
 Akio Yuki
 Sadayuki Tsuchiya
 Mitsugu Ishitsuka
 Kenjiro Ogata
 Saichiro Yoshimura
 Isamu Tsukayoshi

KOREA
(Republic of Korea)

REPUBLIC OF KOREA

MAJOR PUBLIC HOLIDAYS (1988)

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
Daylight Saving Time Period: 5/08 - 10/08/88

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\$ = 783.90 Won (W)
per Wall Street Journal, 01/29/88. 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	Tel: 82-2-732-2601
Seoul	Fax:
Korea	Tlx: 23-108 AMEMB
Science Attaché	Dr. Jerome J. Bosken

KOREA

ENERGY

Population	1985	41 million
Electric Power Plant Capacity	1985	16.1 GWe 18% nuclear
	1986	18.1 GWe 26% nuclear
Electric Power Production	1985	50.7 TWh 36% nuclear
	1986	56.3 TWh 44% nuclear

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	1988	6.3 GWe
	1990	7.2 GWe
	1995	8.2 GWe
	2000	9.1 GWe
Reactor Mix	1988	PWR: 6 (1978-87)
		4 (1988-95)
		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/d 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.

KS-1

KOREA

Major Milestones

*	LLW Disposal Site (550,000 t)	1996
*	HLW Disposal Site (1,500 t)	1996

ORGANIZATION

Fuel Cycle/Waste Management Responsibilities

Ministry of Energy and Resources (MER)

- |-- Electric Power Bureau (EPB)
 - |-- Korea Electric Power Corporation (KEPCO)
 - |-- Korea Nuclear Fuel Company (KNFC)

Ministry of Science and Technology (MOST)

- |-- Atomic Energy Commission (AEC)
 - Atomic Energy Bureau (AEB)
 - International Cooperation Division
 - Nuclear Policy Division
 - Nuclear Reactor 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)
 - Radwaste Division
 - Nuclear Safety Center

KOREA

AEB

Atomic Energy Bureau	
Ministry of Science and Tech.	Tel: 82-2-591-9038
Gwacheon 171-11	Fax:
Republic of Korea	Tlx: K24230
Director-General	Kyong-Ho Whang
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/Technology	Tel: 82-2-591-7694
Gwacheon 171-11	Fax:
Republic of Korea	Tlx: K24230
Commissioners	Dr. Yong-Kyu Lim
	Byoung Whie Lee

Function: Decision-making body for policies regarding nuclear energy: research and development plan for nuclear fuel and nuclear energy applications.

EPB

Electric Power Bureau	
Ministry of Energy and Resources	Tel: 82-2-720-2369
Seoul	Fax:
Republic of Korea	Tlx: K23472
Director, Nuclear Power	Se-Jong Kim

KAERI

Korea Advanced Energy Research Institute	
Head Office (Daeduk Center)	
P.O. Box 7, Daedukdanji	Tel: 82-42-822-6821
Choongnam 300-32	Fax:
Republic of Korea	Tlx: K45553

KOREA

KAERI (contd)

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

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

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

KAERI: SEOUL

Korea Advanced Energy Research
Institute

Seoul Research Center	Tel: 82-2-972-2081
P.O. Box 7, Cheongryang	Fax:
Seoul 131	Tlx: K24230
Republic of Korea	

Sr. Vice President	Dr. Dong-Hoon Kim
Nuclear Reactor Research	Dr. Changgun Lee
Nuc. Radiation Application	Dr. Yongkuk Kim

KEPCO

Korea Electric Power Corporation	Tel: 82-2-562-9926
87, Samseong-Dong	Fax:
Gangnam-Ku	Tlx: KELECCO K24287
Seoul	K28350
Republic of Korea	

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

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

KOREA

KNEC

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

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

President
Director

Dr. Pilsoon Han
Ui-Kyum Lee

Function: Development of domestic nuclear fuel fabrication.
Owners: KEPCO (90%), KAERI (10%).

Facility

- * Fuel Fabrication Plant, Daeduck Site,
200 tU/a (under construction) 1989

KOPEC

Korea Power Engineering Co., Inc.
P.O. Box 109
YE0EU1D0
Seoul 150
Republic of Korea

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

President

Dr. Kun-Mo Chung

Function: Development of Korea's self-reliance in nuclear
power technology. Involved in plant design for all Korean
nuclear power plants.

NETHERLANDS

NETHERLANDS

MAJOR PUBLIC HOLIDAYS (1988)

January 1	New Year
April 1	Good Friday
April 3-4	Easter
April 30	Queen's Birthday
May 12	Ascension
May 22-23	Pentecost
December 25-26	Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time period: 03/27 - 09/24/88

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\$ = 1.88 Guilder (Fl.)
per Wall Street Journal, 01/29/88. 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	Tel: 31-70-62-4911
2514 The Hague	Fax:
Netherlands	Tlx: 044-31016

ENERGY

Population	1985	15 million
Electric Power Plant Capacity	1985	17.0 GWe 3% nuclear
	1986	14.4 GWe 3% nuclear
	1990	14.5 GWe 3% nuclear
Electric Power Production	1985	62.9 TWh 61% gas 28% coal 6% nuclear 5% oil
	1986	6% nuclear
	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	1988	0.5 GWe
	1998	0.1 GWe
	2000	0.0 GWe
Reactor Mix	1988	BWR: 1 (1969) PWR: 1 (1973)
Reactor Development	Participation in SNR-300 FBR	

INDUSTRIAL FUEL CYCLE

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

Waste Management Strategy: Designate single centralized waste collection service; extend interim storage of all wastes (50-100 years). Studies on final disposal of all radioactive wastes in geological formations are executed in the framework of the national research program (OPLA). Ocean dumping of LLW and ILW has been terminated.

NETHERLANDS

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

ORGANIZATION

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

COVRA (CENTRAL ORGANIZATION FOR RADIOACTIVE WASTE)

Centrale Organisatie Voor
Radioactief Afval
Westerduinweg 3
1755 ZG Petten
Netherlands

Tel: 31-2246-3344
Fax:
Tlx:

Director
Radiation Protection
Waste Storage/Transportation

Dr. Jan Vrijen
Dr. H.D.K. Codee
U. Bakema

Function: Responsible for collection, treatment and storage of all waste. (Multi-funded: utilities, government, ECN).
Facility: New interim storage center for all radioactive wastes is in preparation and will be fully operational in 1994.

ECN (Netherlands Energy Research Foundation)

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

Tel: 31-2246-4949
Fax: 31-2246-4480
Tlx: 57211 REACP NL

Chairman, Governing Board J. H. Bakker

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

Research Center

Managing Director, Research
Nuclear Energy
Nuc. Waste/Geologic Disposal
Exp. Underground Disp. Program

Dr. J. F. Van de Vate
Dr. A. M. Versteegh
Dr. L. H. Vons
Dr. K. A. Duijves
R. R. van Seuren
Dr. J. Pru
Dr. A. van Dalen

Safety Assessment
Radionuclide Migration

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

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

GEOLOGICAL SURVEY OF THE NETHERLANDS

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

Tel: 31-23-319362
Fax:
Tlx: 71105 GEOLD

Dr. H. M. van Montfrans

NETHERLANDS

**KEMA (Research and Testing Electrochemical
Materials Company)**

N.V. Tot Keuring van Elektro-
technische Materialen Arnhem
Utrechtseweg 310
Postbus 9035
6800 ET Arnhem
Netherlands

Tel: 31-85-457057
Fax:
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.

MINISTRY OF ECONOMIC AFFAIRS

Ministerie van Economische Zaken
Postbus 20101
2500 EC Gravenhage
Netherlands

Tel: 31-70-797849
Fax: 31-70-796358
Tlx: 31099 ECZA NL

Nuclear Energy

Dr. H.F.G. Geyzers
Dr. R. M. Korthof

MINISTRY OF HOUSING, PHYSICAL PLANNING AND ENVIRONMENT

Ministerie van Volkshuisvesting
Ruimtelijke Ordening en
Milieubeheer

Postbus 450
dr. v.d. Stamstr. 2
2260 MB Leidschendam
Netherlands

Tel: 31-70-209367
Fax: 31-70-279868
Tlx: 32691

Director, Rad. Protection

Dr. W.J.K. Brugman

MINISTRY OF SOCIAL AFFAIRS

Ministry of Social Affairs
Postbus 6g
2270 MA Voorburg
Netherlands

Tel: 31-70-624611
Fax: 31-70-714357
Tlx:

Nuclear Safety

Dr. J. Versteeg

RIVM (National Institute of Public Health
and Environment Protection)

Rijksinstituut voor Volksgezondheid
en Milieuhygiene
Antonie van Leeuwenhoeklaan 9
Postbus 1
3720 BA Bilthoven
Netherlands

Tel: 31-30-743366
Fax: 31-30-742971
Tlx: 47215 RIVM NL

Project Leader

Dr. Peter Glasbergen

PAKISTAN

PAKISTAN

MAJOR PUBLIC HOLIDAYS (1988)

January	Mavlid An-Nabi (Birth of the Prophet)
March 23	Pakistan Day
April 1	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\$ = 17.54 Rupee
per Wall Street Journal, 01/29/88. 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	Tel: 92-51-8261
Islamabad	Fax:
Pakistan	Tlx: 82-5-864

PAKISTAN

ENERGY

Population	1986	103.6 million
Electric Power Plant Capacity	1986	5.7 GWe
Electric Power Production	1986	22.6 TWh 50% thermal 42% hydro 2% nuclear

NUCLEAR POWER

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

Nuclear Power Plant Capacity	1988	0.1 GWe
	1995	0.1 GWe
	2000	1.1 GWe
Reactor Mix	1988	HWR: 1 (1972)

INDUSTRIAL FUEL CYCLE

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

Cumulative Spent Fuel Arisings	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

PK-1

SOUTH AFRICA

SOUTH AFRICA

MAJOR PUBLIC HOLIDAYS (1988)

January 1	New Year
April 1	Good Friday
April 4	Family Day
April 6	Founder's Day
May 6	Worker's Day
May 12	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\$ = 1.98 Rand
per Wall Street Journal, 01/29/88. 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

U.S. Consulate, Johannesburg	
Kine Center, 11th Floor	Tel: 27-11-331-1681
Commissioner Street	Fax:
Johannesburg 2001, South Africa	Tlx: 483780 SA
Science Officer	Robert J. McSwain

SOUTH AFRICA

ENERGY

Population	1985	33 million
Electric Power Plant Capacity	1985	25.7 GWe
		7.5% nuclear
	1986	28.1 GWe
		7% nuclear
Electric Power Production	1985	122.5 TWh
	1986	126.8 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 (1985: 5,751 tU; 1986: 5,460 tU) and export uranium; 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 Arising (LWR)	1985	22 tU
	1990	254 tU
	2000	714 tU

Major Milestone

- * Dry spent fuel storage facility (Vaalputs) 1994

SOUTH AFRICA

ATOMIC ENERGY CORPORATION

Atomic Energy Corporation
of South Africa Ltd.
Private Bag X256
Pretoria 0001
South Africa

Tel: 27-12-296-9111
Fax:
Tlx: 3-21047 SA

Chief Executive Officer
Senior General Manager:
 Uranium Enrichment
 Uranium Processing
 Research and Development
 Engineering

Dr. J. W. L. de Villiers

Dr. J. J. Wannenburg
Dr. W. E. Stumpf
Dr. D. M. Kemp
L. S. Snyders

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

Facility:

 Pelindaba Atomic Research Center 27-12-324-2811

ESKOM

ESKOM
P.O. Box 1091
Johannesburg 2000
South Africa

Tel: 27-11-800-8111
Fax:
Tlx: 4-24481 SA

Chairman, Electricity Council
Sr.Gen.Mgr./Chief Executive

John Maree
I. C. McRae

Function: Provide electricity for public use.

SPAIN

SPAIN

MAJOR PUBLIC HOLIDAYS (1988)

January 1	New Year
January 6	Epiphany
March 19	St. Joseph
March 31	Holy Thursday
April 1	Good Friday
May 1	Labor Day
June 5	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: 03/27 - 09/24/88

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\$ = 113.76 Peseta
per Wall Street Journal, 01/29/88. 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	Tel: 34-1-276-3600
Serrano 75	Fax:
Madrid, Spain	Tlx: 27-763
Science Attaché	Ismael Lara

ENERGY

Population	1985	38.7 million
Electric Power Plant Capacity	1985	39.5 GWe 14% nuclear
	1986	40.5 GWe 14% nuclear
	1990	44.1 GWe 17% nuclear
Electric Power Production	1985	127.2 TWh 44% coal 26% hydro/geoth. 22% nuclear 6% oil 2% gas
	1986	29% 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	1988	7.5 GWe
	1995	8.4 GWe
	2000	10.3 GWe
Reactor Mix	1988	GCR: 1 (1972)
		PWR: 5 (1969-85)
		2 (1988)
		BWR: 2 (1971-85)

INDUSTRIAL FUEL CYCLE

Policy: Once-through fuel cycle for LWR; no domestic reprocessing and no further contracts for foreign reprocessing, excepting GCR fuel (Vandellós I).

Waste Management Strategy: Store spent fuels at the reactor sites for 10 years, then transfer to AFR engineered (wet/dry) storage facility until geologic repository is ready to receive "high-level wastes" (spent fuels). Granite, salt and clay are being considered as host rock for repository. Shallow-land burial of LLW in trenches. Institutional radioactive wastes are currently placed in a worked-out uranium mine.

SPAIN

Cumulative Spent Fuel	1985	174 tU
Arising (LWR)	1990	820 tU
	2000	2,540 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: 3000 tU (1994).

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	Tel: 34-1-449-4400
Ciudad Universitaria	Fax:
28040 Madrid, Spain	Tlx: 23555 JUVIG E

President	Fernando Maravall Herrero
General Director	Jose Angel Azuara Solis
Director, Nuclear Technology	Manuel Montes
Waste Management	Armando Uriarte

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

Facility

- * Juan Vigon National Nuclear Energy Center, Madrid

CSN (Council of Nuclear Safety)

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

CSN (contd)

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

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

ENRESA (National Waste Management Company)

Empresa Nacional de Residuos Radiactivos S.A. (ENRESA)	Tel: 34-1-571-49-78
Paseo de la Castellana, 135	Fax: 34-1-279-24-86
28046 Madrid, Spain	TLx: 41-429 ENRES E

President	Juan M. Kindelán
	34-1-279-26-67
Director General	Alberto L. García
	34-1-279-28-58
Director, Engineering	Aurelio M. Ulibarri

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

Facility

- * LLW Surface Storage Facility, El Cabril, Cordoba

ENUSA (National Fuel Cycle Company)

Empresa Nacional del Uranio S.A.	Tel: 34-1-233-6207
Santiago Rusinol 12	Fax:
28040 Madrid, Spain	TLx: 43042 URAN E

President	José Manuel Jiménez Arana
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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.

SPAIN

ENUSA (contd)

- * IPES (Instalacion Piloto Experimental Subterraneo), planned URL for investigating techniques for spent fuel disposal in granite.
Proposed Location: Aldeadavilla de Ribera,
Province of Salamanca.

MINISTRY OF INDUSTRY AND ENERGY

Minister	Luis Carlos Croissier Batista
Director General, Energy	Víctor Perez Pita

SWEDEN

SWEDEN

MAJOR PUBLIC HOLIDAYS (1988)

January 1	New Year
January 6	Epiphany
April 1	Good Friday
April 3-4	Easter
May 1	Labor Day
May 12	Ascension Day
May 22-23	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: 03/27 - 09/24/88

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\$ = 6.02 Krona (SEK)
per Wall Street Journal, 01/29/88. 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	Tel: 46-8-783-5300
10000 Stockholm	Fax:
Sweden	Tlx: 12060 AMEMB S

ENERGY

Population	1985	8.3 million
Electric Power Plant Capacity	1985	33.2 GWe
		28.6% nuclear
	1986	33.1 GWe
		29% nuclear
	1990	33.6 GWe
		29.2% nuclear
Electric Power Production	1985	137.1 TWh
		52% hydro/geoth.
		43% nuclear
		3% oil
		2% coal
	1986	50% 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	1988	9.6 GWe
	2000	9.6 GWe
Reactor Mix	1988	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); 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	5,600 canisters
encapsulated -	TRU waste	6,000 m ³
ready for disposal)	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

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, EEC, Finland, France, Spain, Switzerland. Host country for NEA Stripa Project.

ORGANIZATION

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

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 Tel: 46-31-72-10-00
412 96 Goeteborg Fax: 46-31-16-84-94
Sweden Tlx: 2369 CHALBIB S

Nuclear Chemistry Jan Rydberg

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

KEMAKTA

Kemakta Konsult AB Tel: 46-8-54-06-80
Luntmakargatan 94 Fax: 46-8-52-16-07
113 51 Stockholm Tlx: 15660 KEMAKTA S
Sweden

Bertil Grundfelt

Computer calculations on hydrology and nuclide migration.

SWEDEN

KTH (Royal Institute of Technology)

KTH
100 44 Stockholm
Sweden
Tel: 46-8-790-60-00
Fax:
Tlx: 10389 KTHB S

Chemical Engineering
Inorganic Chemistry
Ivars Neretnieks
I. Grenthe
P. Wickberg

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

NUCLEAR SAFETY AND TRAINING CENTER

Kärnkraftssäkerhet och
Utbildning AB
Box 5864
102 48 Stockholm
Sweden
Tel: 46-8-665-28-00
Fax: 46-8-782-95-28
Tlx: 810-61-33

Director
Svante Nyman

Function: Promote coordination cooperation among the Swedish utilities in their nuclear power plant safety work; nuclear simulator training in Sweden.

SGAB (Swedish Geological Company)

Sveriges Geologiska AB (SGAB)
Vretgränd 18
Box 670
751 28 Uppsala
Sweden
Tel: 46-18-15-64-20
Fax: 46-18-14-02-10
Tlx: 80214 GEONORD S

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

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

SKB (Nuclear Fuel and Waste Management Company)

Svensk Kärnbränslehantering AB
 Box 5864
 102 48 Stockholm
 Sweden

Tel: 46-8-665-28-00
 Fax: 46-8-661-57-19
 Tlx: 13108 SKB S

President	Sten Bjurström
R&D, Director	Per-Eric Ahlström
R&D, Dep. Director/Safety Analysis	Tönis Papp
Geoscience/URL	Göran Bäckblom
Material Sciences	Lars Werme
Field Investigations	Olle Zellman
International Relations	Torsten Eng
	46-8-665-2833
Systems/Facilities, Director	Hans Forsström
Transport/Storage	Bo Gustafsson

Function: Coordinate and arrange for nuclear fuel supply and reprocessing services for all Swedish nuclear power reactors; manage and fund R&D for the back end of the fuel cycle. Responsible for design, construction and operation of all necessary storage and disposal facilities. Demonstrate that spent nuclear fuel and fuel reprocessing wastes can be disposed of safely and permanently.

Owners: Utilities.

Facilities

- * **CLAB** (Central Storage for Spent Fuel, located at Simpevarp adjacent to Oscarshamn Power Station)
Mission: AFR storage facility.
Design Capacity: Initially, 3000 t.
History: Startup construction, 5/80; startup operation, 1985.
 Bo Gustafsson Tel: 46-8-665-28-16

- * **SFR** (Subseabed Forsmark Repository for LL- and ILW, located in rock 50 m below seabed, 1 km outside Forsmark harbor on Gulf of Bothnia)
Design: Concrete silos inside cylindrical rock caverns isolated by layer of bentonite clay back-fill between silo and rock for ILW. Conventional tunnel rooms for LLW. 1 km-long tunnels leading to repository to be plugged with concrete.
Capacity: 90,000 m³.
History: Startup Phase 1 construction, 1983; startup operation, 1988; startup Phase 2 construction, late 1990s.
 Tommy Hedman Tel: 46-8-665-28-01

SWEDEN

SKB (contd)

* **Stripa Mine**
Stripa Mine Service AB Tel: 46-581-414-20
717 00 Stora Fax: 46-581-419-19
Sweden Tlx:

Stripa Project Manager Bengt Stillborg
Mine Operations Gunnar Ramqvist

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

Function: Research in realistic environment of
matters connected to disposal in crystalline rock.
Development of investigation methods and instru-
ments; measurement of radionuclide
migration/supporting studies.
Description: Granite body, about 350-400 m below
surface, at the Stripa iron mine.

SKI (Nuclear Power Inspectorate)

Statens Kärnkraftinspektion
Box 27106 Tel: 46-8-663-55-60
102 52 Stockholm Fax: 46-8-661-90-86
Sweden Tlx: 11961 SWEATOM S

Director Olof Hörmander
Waste Management Soeren Norrby
Function: Responsible for licensing of nuclear facilities.

SKN (National Board for Spent Nuclear Fuel)

Statens Kärnbränslenämnd
Box 2045 Tel: 46-8-667-98-20
103 11 Stockholm Fax: 46-8-661-67-35
Sweden Tlx: 11961 ATTN: SKN

Director Olof Söderberg
Chief Engineer Nils Rydell

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

SSI (National Institute of Radiation Protection)

Statens Straalskyddsinstitut	Tel: 46-8-729-71-00
Box 60204	Fax: 46-8-733-08-31
104 01 Stockholm	TLX: 11771 SAFERAD
Sweden	

Director	Gunnar Bengtsson
Radwaste Group	Ragnar Boge

Function: Responsible for enforcing radiation protection regulations.

STUDSVIK (Energy Technology Company)

Studsvik Energiteknik AB	Tel: 46-155-210-00
611 82 Nyköping	Fax: 46-155-630-44
Sweden	TLX: 64013 STUDS S

Director, Nuclear Division	Stig Bergstroem
Waste Technology	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 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	Tel: 46-8-739-50-00
162 87 Vaellingby	Fax: 46-8-737-01-70
Sweden	TLX: 19653 SVTELVXS S

President	Carl-Eric Nyquist
Vice President, Production	Lars Gustafsson
Nuclear Power	Stig Sandklef
Low- and Medium-Level Wastes	Stig Pettersson

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

Owner: Government (Ministry of Industry).

SWITZERLAND

SWITZERLAND

MAJOR PUBLIC HOLIDAYS (1988)

January 1	New Year
April 1	Good Friday
April 3-4	Easter
May 12	Ascension
May 22-23	Pentecost
August 1	Independence Day
December 25-26	Christmas

TIME

Standard Time Washington D.C.: + 6 hours
Daylight Saving Time period: 03/27 - 09/25/88

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\$ = 1.36 Franc
per Wall Street Journal, 01/29/88. 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	Tel: 41-31-43-70-11
3005 Bern	Fax:
Switzerland	Tlx: 845-912-603 USEM

SWITZERLAND

ENERGY

Population	1985	6.5 million
Electric Power Plant Capacity	1985	15.2 GWe 19% nuclear
	1986	15.2 GWe 19% nuclear
	1990	15.4 GWe 20% nuclear
Electric Power Production	1985	56.4 TWh 58% hydro/geoth. 40% nuclear 1% coal 1% oil/gas
	1986	39% nuclear
	1990	39% nuclear

NUCLEAR POWER

Policy: Government is pro-nuclear.

Nuclear Power Plant Capacity	1988	2.9 GWe
	1998	3.8 GWe
	2000	3.8 GWe
Reactor Mix	1988	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 and alpha wastes. Sea-dumping of LLW discontinued 1982.

SWITZERLAND

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

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

Major Milestones

- * Initial receipt of HLW glass from
COGEMA (France) 1992
- * Intermediate-depth storage facility for
ultimate repository for reactor wastes 1998/2000
- * Geologic repository for HLW
or spent fuels and alpha wastes After 2020

INTERNATIONAL FUEL CYCLE RELATIONSHIPS

DOE/NAGRA Umbrella Agreement for Cooperation in Radioactive Waste Management

- Term: 4-19-85 to 4-19-90.
- Scope: Preparation and packaging of wastes; field and laboratory testing; storage; geologic disposal; environment and safety; design and operational issues; transportation requirements; public acceptance issues.
- Emphasis: Information exchange 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. Cooperation agreements with SKB (Sweden), CEA (France) and Euratom (EEC).

ORGANIZATION

- * NAGRA--National Cooperative for the Disposal of Radioactive Waste--formed by utilities/government to handle fuel cycle/waste management activities.
- * PSI--Paul Scherrer Institute--newly formed (1987) through merger of EIR (Federal Institute for Reactor Research) and SIN (Swiss Institute for Nuclear Research).
- * Federal Energy Office--sets criteria for waste management practices, including geologic disposal.

BEW (Federal Office for Energy)

Bundesamt für Energiewirtschaft
Nuclear Safety Inspectorate (HSK) Tel: 41-56-98-28-53
5303 Würenlingen Fax: 41-56-99-39-07
Switzerland Tlx: 827-427 HSK CH

Waste Management Dr. U. Niederer

Function: Licensing and inspection of nuclear installations.

NAGRA/CEDRA (National Cooperative
for the Disposal of Radioactive Waste)

Nationale Genossenschaft
für die Lagerung
Radioaktiver Abfälle (NAGRA)

or

Société Coopérative Nationale
pour l'Entreposage de
Déchets Radioactifs (CEDRA)

Parkstrasse 23 Tel: 41-56-20-55-11
5401 Baden Fax: 41-56-20-52-01
Switzerland Tlx: 82-8204

President	Dr. Rudolf Rometsch
Managing Director	Dr. Hans Issler
Science/Technology Division	Dr. Charles McCombie
Geology	Dr. Marc F. Thury
Field Operations/Testing	Dr. Ch. Sprecher
Engineering	Andreas L. Nold
Nuclear Technology	Dr. Charles McCombie
Repository Projects	Dr. E. Kowalski

SWITZERLAND

NAGRA/CEDRA (contd)

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.)

PSI (Paul Scherrer Institute)

Paul Scherrer Institute	Tel: 41-56-99-2111
5303 Würenlingen	Fax: 41-56-98-2327
Switzerland	Tlx: 827-417 PSI CH

Director	Prof.-Dr. J. P. Blaser
----------	------------------------

(Formerly EIR and SIN; no staff details available due to reorganization.)

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, natural analogues, hydrological studies, sorption constants on different rocks, immobilization of LLW and ILW in cements, leaching rates on LLW and ILW forms, and long-term corrosion tests on waste package materials.

Facilities

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

TAIWAN

TAIWAN

MAJOR PUBLIC HOLIDAYS (1988)

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.: + 13 hours

PASSPORT/VISA

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

CURRENCY EXCHANGE RATE

1 US\$ = 28.56 Taiwan Dollar
per Wall Street Journal, 01/29/88. 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.

AIT - TAIPEI

American Institute in Taiwan	Tel: 886-2-709-2000
7 Lane 134	Fax:
Hsin Yi Road, Sec. 3	Tlx: 78523890
Taipei	
Republic of China	

TAIWAN

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	1988	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/HLM interim storage options; may reprocess (in other countries); LLW going to 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	Tel: 886-2-392-4180
65, Lane 144	Fax: 886-2-341-5377
Keelung Road, Section 4	886-2-321-5448
Taipei 107, Taiwan	Tlx: 26554 SINOATOM
Republic of China	
Secretary General	Prof. Yu-Hao Lee
Director, Radwaste Admin.	Dr. Chao-Ming Tsai
	886-2-396-4324
Director, Planning Division	Chao-Chin Tung
Director, Rad. Protection Div.	Dr. Yi-Ching Yang
Director, Nuc. Regulatory Div.	Yi-Ching Yang

INER

Institute of Nuclear Energy	
Research	
P.O. Box 3	Tel: 886-2-381-4014
Lung-Tan, Taiwan 325	Fax:
Republic of China	Tlx: 34154 CAEC
Deputy Directors	Sung-Ling Ho
	886-2-381-2300
	Sen-I Chang
	886-2-381-2302
Radwaste Mgmt. Tech. Program	Dr. Tise-Sheng Chou
	886-2-381-2525
Radwaste Mgmt. Division	Dr. Chia-Pao Tung
	886-2-381-2524
Nuc. Materials Res. Division	Dr. Yaw-Nan Chen
	886-2-381-2422
Fuel Engineering Division	Chung-Jyi Wu
	886-2-381-2418
Health Physics Division	Dr. Wei-Li Chen

Fuel Cycle R&D: Solvent extraction technology; yellowcake conversion to UO₂; production of Zr, 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	Tel: 886-2-396-7777
Taipei 107, Taiwan	Fax:
Republic of China	Tlx: 2564 TPCAPD
President	J. H. Chen
Director, Nuc. Engineering Dept.	Eng Lin
	886-2-396-2521
Deputy Dir., Nuc. Eng. Dept.	Peng-Chang Chen

UNITED KINGDOM

UNITED KINGDOM

MAJOR PUBLIC HOLIDAYS (1988)

January 1	New Year
April 1	Good Friday
April 3-4	Easter
May 2	May Day
May 30	Spring Holiday
August 29	Summer Holiday
December 25-26	Christmas

TIME

Standard Time Washington D.C.: + 5 hours
Daylight Saving Time period: 03/27 - 10/22/88

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\$ = .5663 Pound
per Wall Street Journal, 01/29/88. 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	Tel: 44-1-499-9000
West 1A 1AE London	Fax:
United Kingdom	Tlx: 26-6777
Science Counselor	James Devine

UNITED KINGDOM

ENERGY

Population	1985	56 million
Electric Power Plant Capacity	1985	67.3 GWe 11% nuclear
	1986	66.5 GWe 15% nuclear
	1990	65.6 GWe 19% nuclear
Electric Power Production	1985	297.5 TWh 60% coal 16% oil 21% nuclear 2% hydro 1% gas
	1986	18% 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	1988	11.4 GWe
	1990	12.6 GWe
	2000	10.8 GWe
Reactor Mix	1988	GCR: 26 (1956-72)
		AGR: 10 (1976-86)
		4 (1988)
		PWR: 1 (1994)
		FBR: 1 (1976)
		HWR: 1 (1968)
Reactor Development	Major LMFBR development program, incl. fuel cycle; future additional PWRs.	

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.

UNITED KINGDOM

Waste Management Strategy: Reprocess spent magnox fuels as rapidly as plant capacity permits; reprocess other thermal reactor fuel after several years cooling; vitrify HLW (French technology); long-term interim storage of HLW glass for at least fifty years before disposal; shallow-land burial of LLW currently; future deep land disposal of LLW and ILW. Sea disposal of other LLW/ILW considered another option.

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/d
- * HLW vitrification
 - Sellafield Vitrification Plant (1988)

INTERNATIONAL RELATIONSHIPS

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

- Term: 10-30-86 to 10-29-91.
- Scope: LL/ILW, TRU waste 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.

UNITED KINGDOM

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.

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 (government-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

UNITED KINGDOM

NUCLEAR FUEL CYCLE RESPONSIBILITIES

National Government

- Department of Environment (DOE)
 - Rad. Waste Mgmt. Advisory Committee (RMWAC)
 - Building Research Establishment (BRE)
 - H.M. Inspectorate of Pollution (HMIP)
- 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, Fisheries and Food (MAFF)
 - Fisheries Laboratories

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
- National Nuclear Corporation (NNC)
 - * Power Plant Construction
- UK Atomic Energy Authority (UKAEA)
 - Safety and Reliability Directorate
 - 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

AWRE

Atomic Weapons Research Establishment Aldermaston, Reading RG7 4PR United Kingdom	Tel: 44-73-56-4111 Fax: Tlx: 848104/5
Waste Management	E. Whitehead

BGS

British Geological Survey Nicker Hill, Keyworth Nottingham, NG12 5GG United Kingdom	Tel: 44-60-77-6111 Fax: 44-60-77-4811 Tlx: 378173 BSGKEY G
Director	G. I. Lumsden
British Geological Survey Harwell Laboratory Building 151 Harwell, Oxon OX11 0RA United Kingdom	Tel: 44-235-2-4141 Fax: Tlx: 83135 ATOMHA G

BNFL: RISLEY

British Nuclear Fuels plc Risley, Warrington Cheshire WA3 6AS United Kingdom	Tel: 44-925-83-5953 Fax: Tlx: 627581
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[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, Spent Fuel Management Services	Dr. Bill Wilkinson

BNFL: SELLAFIELD

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

Tel: 44-9402-8333
 Fax:
 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.
 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. AVH 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.

UNITED KINGDOM

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: Startup, 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
Fax:
Tlx: 67526/7

Director, Fuels

Anthony Stephens

BNT (Reprocessing/Waste Management Technology Consortium)

British Nuclear Technology
Risley, Warrington
Cheshire WA3 6AS
United Kingdom

Tel: 44-925-83-2000
Fax: 44-925-81-7625
Tlx: 627-581

Chairman
General Manager

Dr. Bill Wilkinson
David R. Knowles
44-925-83-3255

Function: Merge/exploit experience in reprocessing and waste technology of consortium members.

BNFL: SELLAFIELD

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

Tel: 44-9402-8333
 Fax:
 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.]

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UNITED KINGDOM

BNFL: SELLAFIELD (contd)

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History: Startup, 1983.
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Mission: Solidify Sellafield HLW.
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Mission: Prepare non-HLW for disposal.
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BNFL: SPRINGFIELDS

British Nuclear Fuels plc
Springfields Works
Salwick, Preston
Lancashire PR4 0XJ
United Kingdom

Tel: 44-772-72-8262
Fax:
Tlx: 67526/7

Director, Fuels Anthony Stephens

BNT (Reprocessing/Waste Management Technology Consortium)

British Nuclear Technology
Risley, Warrington
Cheshire WA3 6AS
United Kingdom

Tel: 44-925-83-2000
Fax: 44-925-81-7625
Tlx: 627-581

Chairman Dr. Bill Wilkinson
General Manager David R. Knowles
 44-925-83-3255

Function: Merge/exploit experience in reprocessing and waste technology of consortium members.

BNI (contd)

Member Companies:

British Nuclear Fuels plc	Davy McKee Nuclear Ltd
Babcock Woodall-Duckham Ltd	Humphreys & Glasgow Ltd
Costain Petrocarbon Ltd	John Brown Engineers and Constructors Ltd

BRE

Building Research Establishment	
Department of the Environment	
Building Research Station	Tel: 44-9273-74040
Garston, Watford WD2 7JR	Fax:
United Kingdom	Tlx: 92-3220

Asst. Director, Geotechnics/ Structural Engineering	Dr. J. B. Menzies
Geotechnics Division	J. B. Boden
Seabed Disposal	T. Freeman
Continental Disposal	Ms. C. M. Cooling

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

CEGB

Central Electricity Generating Board	
Sudbury House	
15 Newgate Street	Tel: 44-1-634-5111
London, EC1A 7AU	Fax:
United Kingdom	Tlx: 88-3141

Chairman	Sir Walter Marshall
Director, Plant Engineering	P. M. Billman
Director, Nuclear Operations	Dr. B. Edmonson

Function: Production of electricity for public use.

UNITED KINGDOM

DOE

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

Tel: 44-1-212-8673
Fax: 44-1-212-8707
Tlx: 22-221

Director

Brian D. Ponsford
44-1-212-6506

Chief, Radioactive Substances

Dr. Frank Feates
44-1-212-8804

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
Fax:
Tlx: 85-8833

Director

Dr. Anthony S. Laughton
Dr. T. J. G. Francis

Nuclear Waste

Function: Modelling radionuclide transport in the ocean.

MAFF

Ministry of Agriculture,
Fisheries and Food
Fisheries Laboratories
Pakefield Road
Lowestoft, Suffolk NR33 0HT
United Kingdom

Tel: 44-502-62244
Fax:
Tlx: 97470

Director, Fisheries Research
Aquatic Environment Protection

Alan Preston
Harry Hill

Function: Regulation of waste management.

NII

Nuclear Installations Inspectorate

Baynards House
1 Chepstow Place
London W2 4TF
United Kingdom

Tel: 44-1-229-3456
Fax:
Tlx: 25-683

Chief Inspector/Nuc. Installations
Overseas Liaison

E. A. Ryder
J. S. MacLeod

NIREX

UK Nirex Ltd.
Curie Avenue, Harwell
Didcot, Oxon OX11 0RA
United Kingdom

Tel: 44-235-83-5153
Fax:
Tlx: 83-7567 UKNIRX G

Chairman
Managing Director
Technical Program

John Baker
P. Tom McInerney
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
Fax: 44-235-83-3891
Tlx: 83-7124

Director
Secretary
Asst. Director, Operations

Dr. Roger Clarke
Dr. R. H. Clarke
G. A. M. Webb

Function: Responsible for all radiological protection services; environmental R&D.

UNITED KINGDOM

SRD

Safety and Reliability
Directorate
Wigshaw Lane, Culcheth
Warrington WA3 6AT
United Kingdom

Tel: 44-925-31244
Fax:
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 SW1Y 4QP
United Kingdom

Tel: 44-1-930-5454
Fax: 44-1-930-5454 x. 274
Tlx: 22 565

Chairman

John G. Collier

Government-owned nuclear research agency, since April 1986 operating on a fully commercial basis.

UKAEA: DOUNREAY

Dounreay Nuclear Power
Development Establishment
UKAEA (Northern Division)
Thurso, Caithness KW14 7TZ
Scotland
United Kingdom

Tel: 44-847-6-2121
Fax:
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
Asst. Director, Fuels

Gerry M. Jordan
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.

UKAEA: DOUNREAY (contd)

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 \$8.84 million)
- * **Marshall Laboratory**
Fuel processing research, opened in 1986.

UKAEA: HARWELL

Atomic Energy Research
Establishment

AERE, Harwell
Didcot, Oxon OX11 0RA
United Kingdom

Tel: 44-235-2-4141

Fax:

Tlx: 83-135

Director

Dr. P. Iredale

Director, Fuel Processing

Dr. Ron H. Flowers
(ext. 2323)

Director, Underlying Research

Dr. A. E. Hughes

Director, Nuc. Power Research

Dr. R. L. Nelson

Activities: Development/application of new technologies in nuclear energy. Active and inactive work at laboratory and pilot scale on all aspects of fuel reprocessing, waste management, active handling and decontamination. Wide range of facilities, including research/experimental reactors.

Facility

- * **Harwell Ceramic Melter Test Unit (nonradioactive)**
Mission: Develop ceramic melter capability for UKAEA.
Design Basis: Liquid-fed ceramic melter; capacity, 700 kg/d glass; product, borosilicate glass.
History: Initial studies in 1/3 (linear) scale unit 1982-84. Startup, (full scale) 1986.

UNITED KINGDOM

UKAEA: RISLEY

Risley Nuclear Power
Development Establishment
UKAEA (Northern Division)
Risley, Warrington
Cheshire WA 3 6AT
United Kingdom

Tel: 44-925-31244
Fax:
Tlx: 629301

Director, Process Technology and Safety
Waste Management (General)

R. Harry Allardice
(ext. 2181)
H. Barton
(ext. 2451)

Activities: Fast reactor technology development;
technical/safety studies on all aspects of nuclear fuel
cycle.

UKAEA: SPRINGFIELDS

Springfields Nuclear Power
Development Laboratories
Salwick, Preston
Lancashire PR4 0RR
United Kingdom

Tel: 44-772-72-8262
Fax:
Tlx: 67545

Laboratory
Chem. Plant Development
Process Eng. Technology
Head-End/Solid Waste Mgmt.

John V. Shennan
P. Laurie Allen
Cliff Etherington
Brian E. Meredith

Activities: Fuel development; evaluation of fuel element
designs; prediction of fuel behavior.

UKAEA: WINDSCALE

Windscale Nuclear Power
Development Laboratories
Sellafield, Windscale
Cumbria CA20 1PG
United Kingdom

Tel: 44-940-2-8333
Fax:
Tlx: 64-140

Director

Dr. V. V. Eldred
44-940-2-1947

Activities: Long-term theoretical and experimental reactor
fuel studies, also on treatment of ILW.

UNITED KINGDOM

UKAEA: WINFRITH

Atomic Energy Establishment
Winfrith, Dorchester
Dorset, DT2 8DH
United Kingdom

Tel: 44-305-6-3111
Fax:
Tlx: 41-231

Director

Dr. J. E. R. Holmes
44-305-6-3450

Activities: Primarily R&D on performance assessment of all types of reactors. Site of several experimental and prototype reactors, including the OECD HTR project (closed 1976). Integrated R&D program. Covers all aspects of nuclear fuel cycle except fabrication/reprocessing of nuclear fuel.

USSR
(Union of Soviet Socialist Republics)

USSR

MAJOR PUBLIC HOLIDAYS (1988)

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: 03/27 - 09/24/88

PASSPORT/VISA

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

CURRENCY

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

DIRECT DIALING

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

US EMBASSY - MOSCOW

American Embassy	
Ulitsa Chaykovskogo 19/21/23	Tel: 7-096-252-2451
Moscow	Fax:
USSR	TLX: 41-3160 USGSO SU
Science Attaché	Dr. John Ward

ENERGY

Population	1986	283 million
Electric Power Plant Capacity	1986	327 GWe
Electric Power Production	1986	1600 TWh
		-10% nuclear
	1991	21% nuclear

NUCLEAR POWER

Policy: Major program to develop nuclear power, to avoid transport of fossil fuels from east of the Ural Mountains to European Russia.

Nuclear Power Plant Capacity	1985	25 GWe
	1992	90-100 GWe
Reactor Mix	1988	LGR: 22 (1958-86)
		7 (1987-90)
		PWR: 21 (1964-86)
		20 (1987-90)
		BWR: 1 (1966)
		FBR: 2 (1973/80)
Reactor Development	LMFBRs, 1500-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. Shift to future LWRs since Chernobyl accident in 1986.

Waste Management Strategy: Vitrify HLW, provide terminal storage in geologic repository.

USSR

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

SCUA

State Committee on the Utilization
of Atomic Energy
Staromonetny Pereulok 26
109180 Moscow
USSR

TLx: 41 1888 MEZON

Deputy Chairman
International Relations

Prof. I.D. Morokhov
Boris Semenov

Waste Management R&D: Develop process for treating spent fuel (cladding, thermal decladding, meltdown of hulls), improved partitioning of TRU wastes, handling off-gases, and storing ⁸⁵Kr.

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/d 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.
- * **Spent Fuel Repository at Novorzhev**

(a) Because there is only limited information available, it is not always known for which nuclear agency a facility is operated and where it is located.

UNITED STATES

UNITED STATES

MAJOR PUBLIC HOLIDAYS (1988)

January 1	New Year
January 18	M. Luther King Day
February 15	Presidents Day
May 30	Memorial Day
July 4	Independence Day
September 5	Labor Day
October 10	Columbus Day
November 11	Veterans Day
November 24	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	NB-Nebraska	UT-Utah
HI-Hawaii	NV-Nevada	VT-Vermont
ID-Idaho	NH-New Hampshire	VA-Virginia
IL-Illinois	NJ-New Jersey	WA-Washington
IN-Indiana	NM-New Mexico	WV-West Virginia
IA-Iowa	NY-New York	WI-Wisconsin
KS-Kansas	NC-North Carolina	WY-Wyoming
KY-Kentucky	ND-North Dakota	

FOREIGN NATIONAL VISITS TO 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 30 days before the proposed visit. The itinerary should be based on prior arrangement with appropriate DOE or DOE contractor staff.

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

UNITED STATES

ENERGY

Population	1985	235 million
Electric Power Plant Capacity	1985	687 GWe 12% nuclear
	1986	663 GWe 13% nuclear
	1990	684 GWe 15% nuclear
Electric Power Production	1985	2,622 TWh 57% coal 16% nuclear 11% hydro/geoth. 12% gas 4% 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	1988	100.7 GWe
	1995	106.6 GWe
	2000	109.8 GWe
Reactor Mix	1988	PWR: 70 (1961-87)
		11 (1988-1996)
		BWR: 34 (1960-87)
		4 (1988-90)
		LGR: 1 (1966)
		HTR: 1 (1979)

NUCLEAR FUEL CYCLE

Policy: Current US commercial nuclear fuel cycle activities include all phases: uranium mining, milling, and enrichment; fuel fabrication; interim spent fuel and waste storage; transportation, conditioning, and disposal of radioactive waste; except spent fuel reprocessing. Mining, milling, fabrication of UO₂ fuel, and LLW disposal is done predominantly by private firms; enrichment and HLW/spent fuel disposal are the responsibilities of the federal government. While permitted by law, commercial reprocessing is not envisioned in the near future because of economic considerations.

UNITED STATES

Waste Management Strategy: Disposal of US spent fuel in geologic repository is planned, possibly after consolidation and packaging in a Monitored Retrievable Storage (MRS) Facility. The Nuclear Waste Policy Act (NWPA) of 1982 and its 1987 amendments mandate start of spent fuel and high-level waste acceptance in 1998 by US Government. Short-lived LLW is disposed of by near-surface disposal facilities. Alternative concepts are being evaluated.

Cumulative Spent Fuel Arisings	1987	15,700 tHM
	1990	20,900 tHM
	2000	40,100 tHM

Major Milestones

* Start Demonstration Project at Waste Isolation Pilot Plant (Defense TRU waste)	1988
* Site selection for MRS facility	1994
* Startup of MRS Facility	1998
* Start of construction for geologic repository	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.

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 spent fuel, TRU waste, and Greater-Than-Class-C LLW. Responsible also for ensuring availability of adequate technology for safe and efficient management of nuclear waste from both civilian and federal activities.

UNITED STATES

ENERGY

Population	1985	235 million
Electric Power Plant Capacity	1985	687 GWe 12% nuclear
	1986	663 GWe 13% nuclear
	1990	684 GWe 15% nuclear
Electric Power Production	1985	2,622 TWh 57% coal 16% nuclear 11% hydro/geoth. 12% gas 4% 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	1988	100.7 GWe
	1995	106.6 GWe
	2000	109.8 GWe
Reactor Mix	1988	PWR: 70 (1961-87)
		11 (1988-1996)
		BWR: 34 (1960-87)
		4 (1988-90)
		LGR: 1 (1966)
		HTR: 1 (1979)

NUCLEAR FUEL CYCLE

Policy: Current US commercial nuclear fuel cycle activities include all phases: uranium mining, milling, and enrichment; fuel fabrication; interim spent fuel and waste storage; transportation, conditioning, and disposal of radioactive waste; except spent fuel reprocessing. Mining, milling, fabrication of UO₂ fuel, and LLW disposal is done predominantly by private firms; enrichment and HLW/spent fuel disposal are the responsibilities of the federal government. While permitted by law, commercial reprocessing is not envisioned in the near future because of economic considerations.

UNITED STATES

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UNITED STATES

- 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 DOE and civilian low-level radioactive waste; remedial action to treat or stabilize DOE radioactive waste; D&D demonstrations of selected facilities.

- 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.

- * DOT (Department of Transportation) - Development, issuance and enforcement of safety standards, governing aspects of radioactive and hazardous materials transport.

- * EPA (Environmental Protection Agency) - Establishment and enforcement of standards for the protection of the general environment.

UNITED STATES

- * NRC (Nuclear Regulatory Commission) - Issuance of regulations and licenses for commercial nuclear activities and for disposal of DOE HLW, in compliance with the general environmental standards issued by the EPA.

DOE (DEPARTMENT OF ENERGY) PARTIAL ORGANIZATION

Secretary

Deputy Secretary
Under Secretary

- 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 -- SNL -- WIPP
 - * CH - Chicago
 - ANL -- BNL -- BPMD
 - * ID - Idaho
 - INEL -- WV -- WINCO -- TMI
 - * NV - Nevada
 -
 - * OR - Oak Ridge
 - ORNL
 - * RL - Richland
 - PNL -- WNC
 - * SAN - San Francisco
 - EPRI -- GAT -- LLNL -- ROCKETDYNE
 - * SR - Savannah River
 - SRL -- SRP

UNITED STATES

NRC (NUCLEAR REGULATORY COMMISSION) PARTIAL ORGANIZATION

Chairman
Commissioners

-- Executive Director for Operations

-- NMSS - Nuclear Material Safety and Safeguards

-- RES - Nuclear Regulatory Research

-- NRR - Nuclear Reactor Regulation

-- GPA - Governmental and Public Affairs

-- Regional Offices

* Region I (Philadelphia)

* Region II (Atlanta)

* Region III (Chicago)

* Region IV (Dallas)

* Region V (San Francisco)

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
Secretary	John S. Herrington	

Civilian Radioactive Waste Management

RW-1	Director	Charles E. Kay	586-6850
RW-10	Resource Management	Samuel Rousso	586-9116
	Dep. Associate Dir.	James C. Bresee	586-1116
RW-20	Facility Siting/Dev.	Stephen H. Kale	586-9694
	Dep. Associate Dir.	Jerome Saltzman	586-9692
RW-30	Systems/Licensing	Ralph Stein	586-5355
	Dep. Associate Dir.	Keith Klein	586-9433
RW-40	Policy Coordination	Thomas K. Isaacs	586-2277
	Dep. Associate Dir.	Lake Barrett	586-6046
	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

AREA CODES: 202 for prefix 586
 301 for prefix 353

US-7

UNITED STATES

Nuclear Energy

NE-1	Assistant Secretary	Theodore Garrish	586-6450
NE-2	Deputy Asst. Secretary	Delbert Bunch	353-6630
NE-14	Internatl. Programs	Sol Rosen	353-3218
NE-20	Remedial Action/ Waste Technology	John E. Baublitz	353-5272
NE-22	Mill Tailings	James A. Turi	353-2585
NE-23	Site Decommissioning	James J. Fiore	353-4716
NE-24	Waste Treatment	Joseph Coleman	353-4728
NE-40	Dep. Asst. Sec./Reactor Syst. Devel./Technol.	Jerry D. Griffith	353-3950
NE-47	Facilities/Fuel Cycle	Ray A. Hunter	353-2915
-471	Fuel/Reprocessing	David E. Bailey	353-4078

Defense Programs

DP-1	Assistant Secretary	Troy E. Wade	586-2177
DP-10	Dep. Assistant Sec. Nuclear Materials	Jill E. Lytle	586-2185
DP-12	Defense Waste/Transp. Deputy	Thomas B. Hindman	353-3641
-121	Transportation Mgmt.	Stephen P. Cowan	353-3956
-122	Operations & Projects	Lawrence H. Harmon	353-3506
-123	Waste R&D	Walter A. Frankhauser	353-5292
		Gerald H. Daly	353-3031
-124	Haz. Waste/Rem. Action	Roger R. Heusser	586-8446
		Critz H. George	353-3031
		Anthony F. Klug	353-4971
DP-13	Nuc. Mtls. Production Deputy	Jill E. Lytle	353-2402
-132	Projects	Charles G. Halsted	353-2400
DP-14	Nuclear Materials Resource Managemt.	John J. Jicha	353-2255
		James E. Dieckhoner	353-3982

AREA CODES: 202 for prefix 586
301 for prefix 353

DOE OPERATIONS OFFICESALBUQUERQUE OPERATIONS (AL)

US Department of Energy	TEL:	505-846-3118
Albuquerque Operations Office	FTS:	846-3118
PO Box 5400	FAX:	844-2152
Albuquerque, NM 87115	or	844-4197
	VERIF:	844-7560

Manager	Bruce G. Twining	844-7231
Energy Tech./Waste Mgmt.	C. E. Garcia	846-5201
Waste Isolation Pilot Plant	Jack B. Tillman	505-887-2101
Uranium Mill Tailings	W. J. Arthur III	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
		972-2206
	VERIF:	972-2209

Manager	Hilary J. Rauch	-2110
Repository Technology/ Trans. Development (RTTD)	Sally A. Mann	-2257
Repos. Tech. Program (RTP)	Richard C. Baker	-2071
Transportation Program (TPO)	Jeffrey B. Roberts	-2228
Waste Operations-Materials Integration Office (MIO)	Joel C. Haugen	-2093

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	Donald Ofte	-1322
Nuclear Programs, Asst. Mgr.	J. Phillip Hamric	-1395
Fuel Process/Waste Mgmt.	James Solecki	-1989
Waste Management	Brenda J. Mikkola	
Fuel Processing	Jerry L. Lyle	-1148
TMI Project	Willis R. Young	-1415
/Site		FTS 590-1011
West Valley Proj. (Site)	Willis W. Bixby	716-942-4312
	Eli 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 98518	FAX:	575-1370
Las Vegas, NV 89193-8518	-1371, -1372	
	VERIF:	575-1369

Manager	Nick Aquilina	-3211
Repository Project	Carl Gertz	-8920
Low-Level Waste Project	Pete Fitzsimmons	-0953

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 La Grone	-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
Storage/Transportation	Michael S. Karol	-7305
Commercial Spent Fuel/MRS		
Asst.Mgr., Operations	Alfred D. Rizzo	-7219
Defense Production Operations	David P. Simonson	-1710
Waste Management	Ronald D. Izatt	-7334
Testing/Development	John R. Hunter	-5471
Asst.Mgr.,Facilities/Lab.	Jack L. Rhoades	-7434
Surplus Facilities Mgmt.	Clarence E. Miller	-7473
Shippingport Station		
Decommissioning Project		
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	Jo Ann Elferink	-7111
Nuclear Materials	David G. McIntosh	-4153

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	P.W. (Bill) Kaspar	-2277
Defense Waste Process Facility (DWPF)	Donald C. Fulmer	-3915

UNITED STATES

DOE CONTRACTORS

ANL

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	Alan Schriesheim	-3872
Waste Management	Stanley S. Borys	-6677
Materials Review Board	Martin J. Steindler	-4314
Natl. Energy Software Center	M. K. Butler	-1721
Intl. Energy Dev. Programs	Charles E. Klotz	-6386
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.

BPMD

Battelle Project Management Division	TEL:	614-424-4295
505 King Avenue	FTS:	976-4295
Columbus, OH 43201	TLX:	24-5454
	FAX:	976-4874
	VERIF:	976-5600

UNITED STATES

BPMI (contd)

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	TEL:	312-655-8600
7000 S. Adams Street	FAX:	312-655-8610
Willowbrook, IL 60521	VERIF:	312-655-8618

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.

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	-2152
HTGR Spent Fuel Technology	Robert Burgoyne	-4122
Transportation Systems	Robert C. Noran	-3217

UNITED STATES

GAI (contd)

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	John H. Nelson	-6213
National LLW Technology	J. T. Case	-1910
TMI-2 Program (TMI Site)	Bill Franz	FTS 590-1052

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) - Stored Waste Examination
Pilot Plant (SWEPP) - Test Area North/Spent Fuel Storage
Area (TAN).

LANL

Los Alamos National Laboratory	TEL:	505-667-5061
University of California	FTS:	843-5060
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).

LANL (contd)**Major Facilities:**

Waste Disposal Field Experimental Facility - Controlled
 Air Incinerator Demonstration Facility - Glove Box
 Reduction Facility - TRU Waste Assay Systems.

LLNL

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 Tuff repository performance assessment.

Major Facilities:

CLIMAX Spent Fuel Test Facility at NTS.

MRC

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	Thomas K. Mills	-4708
D&D	Ralph R. Jaeger	-3275

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).

UNITED STATES**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 W. Wade 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

Fuel Cycle and Waste Management Activities:

Waste systems integration (economic/contract analyses
and implementation) - Commercial spent fuel management -
Civilian nuclear waste treatment (HLW/TRU) - Monitored
retrievable storage (MRS) - Materials characterization
center (MCC) - International program support - NRC envi-
ronmental studies on LLW and uranium mill tailing sites
- Tuff repository (NNWSI) and Performance Assessment
Scientific Support (PASS) studies - HLW technology (SR,

PHL (contd)

WV, Hanford) - TRU technology (TWSO, Hanford) - LLW technology (LLWMP, Hanford) - Remedial action planning and technology - Byproduct utilization - Transportation technology.

Major Facilities:

Hot and Cold Development Laboratories - Hot cells for Development and Pilot Scale Programs and Spent Fuel Characterization.

REP

Rocky Flats Plant	TEL:	303-966-7000
Rockwell International Corporation	FTS:	320-7000
North American Space Operations	TWX:	910-940-5898
PO Box 464	FAX:	320-4092
Golden, CO 80402-0464	VERIF:	320-2719

President	D. J. Sanchini	-4361
Waste Operations	Ed R. Naimon	-7900

Fuel Cycle and Waste Management Activities:

Defense TRU waste technology - Low-level waste technology development - Operate waste treatment facilities.

Major Facilities:

Solid Waste Reduction Facility - LLW Incinerators
- TRU Waste Assay - Liquid Waste Treatment and Fixation Facilities.

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	J. R. Rohlf	-4270
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	Wendell D. Weart	-4855
Subseabed Disposal	D. R. Anderson	-6553

Fuel Cycle and Waste Management Activities:
Radioactive material transportation technology - Tuff
repository support (NMWSI) - Salt repository scientific
support (WIPP) - Safety assessment of facilities for NRC
- Advances in reactor technology.

Major Facilities:
Research Reactors and numerous Test Facilities.

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	Harry D. Harmon	-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 development.

Major Facilities:
HLW Vitrification Pilot Plant - 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	Lucien M. Papouchado	-3320

Fuel Cycle and Waste Management Activities:

Operate fuel reprocessing facilities - Operate associated spent fuel storage, HLLW tank storage and 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)

WHC

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

President	William M. Jacobi	-7803
Executive Vice President	John E. Nolan	-5107
Defense Programs, VP	S. A. (Les) Weber	3-1277
Chemical Processing	J. Roger Knight	3-5049
Defense Waste Management	Ronald E. Lerch	3-2044
Engineering/Development, VP	W. Howard Arnold	-9992
Surplus Facilities Mgmt.	Hugh F. Daugherty	3-1599
Civilian Waste Management	D. Clark Gibbs	6-8733

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 - TMI support - TRU waste assay - Hanford waste disposal - D&D Hanford reactors and fuel cycle facilities - Breeder fuel development and fabrication - Spent fuel integrity in storage - Surplus facilities program - solid waste disposal operations.

UNITED STATES

WHC (contd)

Major Facilities:

PUREX Reprocessing Plant - Plutonium Finishing Plant -
Cs/Sr Encapsulation Plant - Fast Flux Test Facility
(FFTF) - Fuel Cycle Plant (FCP previously FMEF) - Fuel
Development Laboratories - N-Reactor - N-Reactor Fuel
Fabrication Facilities.

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	Roy A. Thomas	-4344
Vice President,		
Deputy Project Manager	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 83403	FAX:	583-5436
	VERIF:	583-5233

President	Ed W. Pottmeyer	-0998
Production	L. F. Ermold	-4628
Technology	Bert R. Wheeler	-3373

Fuel Cycle and Waste Management Activities:

Operate associated spent fuel storage, fuel
reprocessing, HLW tank storage, and HLLW calcining
facilities.

Major Facilities:

Idaho Chemical Processing Plant (ICPP) - Fuel
Reprocessing Uranium Recovery HLLW Storage. Waste
Calcining Facility (WCF) and Remote Mockup - Wet and
Dry Fuel Storage - Kr-85 Cryogenic Recovery.

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	William C. Moffitt	-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.

UNITED STATES

OTHER US ORGANIZATIONS

EPA

Environmental Protection Agency	TEL:	202-382-2090
401 M Street S.W.	FTS:	382-2090
Washington, DC 20460	TLX:	89-2758
	FAX:	382-7883
	VERIF:	382-2078

International Activities

Associate Administrator	Sheldon Meyers	382-7431
Multilateral Staff	Alan Sielen	382-4875

Radiation Programs

Director	Richard Guimond	
Waste Management Standards	Floyd L. Galpin	475-9633

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	Richard Balzhiser	-2141
VP, Director, Nuclear Power	John J. 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 - Demon-
stration of transportable spent fuel metal storage cask
- Fuel performance during load-following, high-tempera-
ture operation and extended burnup - Fuel performance
computer models.

NRC

US Nuclear Regulatory Commission	TEL:	301-492-7000
Washington, DC 20555	FTS:	492-7000
	TLX:	90-8142
	FAX:	492-7617
	VERIF:	492-7371

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NRC (contd)**Governmental and Public Affairs -GPA**

Director	Harold R. Denton	(202)634-3196
International Programs	James R. Shea	492-0347
International Security (Export/Import Regulations)	Marvin R. Peterson	492-0344
International Cooperation	Ronald D. Hauber	492-0336

Nuclear Material Safety and Safeguards -NMSS-

Director	Hugh L. Thompson	427-4063
Deputy Director	Robert M. Bernero	427-7406
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 Reactor Regulation -NRR-

Director	Thomas E. Murley	492-7691
Inspection/Tech. Assessment	Richd. W. Starostecki	492-4227
Reactor Projects	Frank Miraglia	492-7708
Reactor Projects I/II	Steven A. Varga	492-9595
Reactor Projects III/IV/V	Dennis M. Crutchfield	492-7373
Engineering/System Technology	Lawrence C. Shao	492-8791
Operational Events Assessment	C. E. Rossi	492-7492

Nuclear Regulatory Research -RES-

Director	Eric S. Beckjord	443-7991
Engineering	Guy A. Arlotto	443-7995
Reactor Accident Analysis	Wayne Houston	492-3900
Reactor/Plant Systems	Brian Sheron	443-7303
Regulatory Applications	Bill M. Morris	443-7970

Regional Offices

Philadelphia	- Region I	William T. Russel	215-337-5299
Atlanta	- Region II	J. Nelson Grace	404-331-5500
Chicago	- Region III	A. Bert Davis	312-790-5681
Dallas	- Region IV	Robert D. Martin	817-860-8225
San Francisco	- Region V	John B. Martin	415-943-3707

UNITED STATES

USGS

US Geological Survey
410 National Center
12201 Sunrise Valley Drive
Reston, VA 22092

TEL: 703-648-4000
FTS: 959-4000
TLX:
FAX: 648-5295
VERIF: 648-5236

Director	Dallas L. Peck	-7411
Nuclear Waste Hydrology/HLW	George A. Dinwiddie	-5719

INTERNATIONAL AGENCIES

INTERNATIONAL

CMEA

Council for Mutual Economic Assistance
Prospekt Kalinina 56
121205 Moscow
USSR

MEMBER STATES

Bulgaria	Hungary	USSR
Cuba	Mongolia	Yugoslavia
Czechoslovakia	Poland	Vietnam
Germany/DR	Rumania	

FUNCTION

Promote economic and industrial cooperation among the Member States with centrally-controlled economies.

ORGANIZATION

- * Standing Commission on the Use of Atomic Energy for Peaceful Purposes. 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
1049 Brussels
Belgium

Tel: 32-2-235-1111
Fax:
Tlx: 21877 COMEU B

Vice-President for Industrial Affairs, Information Technologies, Research/Science, Joint Research Centres
Director General, Science/R&D
Director, Nuclear R&D
Division, Fuel Cycle
Division, Reactors/Technologies
Division, Nuclear Plant Safety
Division, Radiological Protection
Director General, JRCs

Karl-Heinz Narjes

Paolo Fasella
Sergio Finzi
Serge Orlowski

Jean-Pierre Contzen

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INTERNATIONAL

MEMBER STATES - EUROPEAN ECONOMIC COMMUNITY (EEC)

Belgium	Greece	Netherlands
Denmark	Italy	Portugal
France	Ireland	Spain
Germany/FR	Luxembourg	United Kingdom

FUNCTION

Executive body for the European Communities (combined Euratom, Coal and Steel, Common Market).

FUEL CYCLE PROGRAM ADMINISTRATION

R&D Programs

- * Direct action--fully funded by CEC (by a tax on Member States), conducted by Joint Research Centre Establishments at Ispra (Italy) and Karlsruhe (FRG).
- * Shared-cost action--coordinated by Division Fuel Cycle, Brussels, and partly funded by CEC under cost-sharing contracts, conducted by research centers, universities, and industries in the Member States.

Cooperation with US

DOE/CEC UMBRELLA AGREEMENT FOR WASTE MANAGEMENT EXCHANGE

- Term: 10-6-82 to 10-6-92.
- Scope: Characterization of waste forms; disposal in geologic formations.
- Emphasis: R&D

CEC-JRC: ISPRA

CEC Joint Research Center	Tel: 39-332-78-0131
Ispra Establishment	Tel: 39-332-78-0271
I-21020 Ispra (Varese)	Fax:
Italy	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.

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CEC-JRC: KARLSRUHE

Karlsruhe Establishment
(European Institute for
Transuranium Elements)
Postfach 2266
7500 Karlsruhe
Federal Republic of Germany

Tel: 49-7247-841
Fax:
Tlx: 7825483 EU D

Director Jacobus van Geel

Function: Basic research in the transuranium elements,
especially plutonium, reactor fuels development.

Fuel Cycle R&D: Plutonium conversion and plutonium fuels,
characterization of waste forms, notably spent fuel when
considered as a waste.

IAEA

International Atomic Energy Agency
P.O. Box 100
1400 Vienna
Austria

Tel: 43-22-22-3-60-0
Fax: 43-22-22-3-0184
Tlx: 1-12645

Director General Hans Blix
Director, Nuc. Energy/Safety Leonard V. Konstantinov
Director, Nuc. Fuel Cycle Jia-Luo Zhu
Waste Management Jozsef Hirling
Waste Mgmt. U.S. Staff Dave J. Squires
Nuc. Mtls./Fuel Cycle Tech. Alexander Nechaev
Director, Safeguards Jon Jennekens

MEMBER STATES

113 nations (UN members, including USA).

FUNCTION

Develop the peaceful use of atomic energy: safeguards,
nuclear safety and standards, information exchange, and
technical assistance.

Intergovernmental organization, established 1957, directed by
a Board of Governors (composed of representatives from 34
member states) and a General Conference (consisting of the
entire membership).

INTERNATIONAL

IAEA (contd)

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
 - assessment of environmental consequences due to effluent discharges and other releases of radionuclides.
- * Development of internationally acceptable guidelines, standards and codes of practice for use by national authorities.
- * Protection of the environment by fulfilling responsibilities under international conventions.
- * Promotion and sponsorship of research work and development of data and technology in promising areas.
- * Technical assistance and training to Member States upon request.

US Mission to IAEA (UNVIE)
Obersteingasse 11
1190 Vienna
Austria

Tel: 43-222-36-3152
Fax:
Tlx: 11-4634 USEMB

Waste Management

Dr. Maurice Katz

ICRP

International Commission
on Radiological Protection
Clifton Avenue
Sutton, Surrey SM2 5PU
United Kingdom

Tel: 44-1-642-4680
Fax:
Tlx: 895 1244 ICRPG

Chairman, Main Commission
Scientific Secretary
Committee Chairman,
Radiation Effects

Dr. B. Lindell
Dr. F. D. Sowby
Dr. A. C. Upton

ICRP (contd)**FUNCTION**

Provide principles of radiation protection as a basis for each country to use in establishing technical codes of practice.

OECD

Organisation for Economic
Co-Operation and Development
2, Rue André-Pascal
F-75775 Paris CEDEX 16
France

Tel: 33-1-45-24-82-00
Fax: 33-1-45-24-85-00
Tlx: 620160 F

Secretary General
Dep. Secretary General
Dep. Secretary General

Jean Claude Paye
Jacob M. Myerson
Pierre Vinde

OECD/NEA

OECD Nuclear Energy Agency (NEA)
38 Boulevard Suchet
75016 Paris
France

Tel: 33-1-45-24-82-00
Fax: 33-1-45-24-96-24
Tlx: 63-0668

Director General

Howard K. Shapar
33-1-45-24-96-60

Deputy Director General

Pierre Strohl
33-1-45-24-96-50

Deputy Dir., Safety/Regulation

Klaus Stadie
33-1-45-24-96-54

Waste Management

Jean-Pierre Olivier
33-1-45-24-96-95

Deputy Dir., Science/Development

Sumio Horiuchi
33-1-45-24-96-62

NEA Data Bank
Bâtiment 445
91191 Gif-sur-Yvette Cedex
France

Tel: 33-1-69-08-49-12
Fax: 33-1-69-41-39-65
Tlx: 690920 F NEADATA

MEMBER STATES

Australia	France	Japan	Sweden
Austria	Germany/FR	Luxembourg	Switzerland
Belgium	Greece	Netherlands	Turkey
Canada	Iceland	Norway	United Kingdom
Denmark	Ireland	Portugal	United States
Finland	Italy	Spain	

INTERNATIONAL

OECD/NEA (contd)

FUNCTION

Promote orderly development of peaceful uses of nuclear energy through cooperation among Member States. Initiate, encourage, and coordinate cooperative work in the following areas: reactor and nuclear fuel cycle studies, radiation protection and waste management, nuclear safety, regulatory matters, and nuclear data collection.

ACTIVITIES

- * Workshops, technical meetings, symposia, and publications.
- * Joint R&D programs.
- * Maintenance of the Multilateral Consultation and Surveillance Mechanism for Sea Disposal, which monitors sea dumping of LLW/ILW in the Northeast Atlantic (in abeyance).

US PARTICIPATION IN NEA JOINT WASTE MANAGEMENT ACTIVITIES

- * Radioactive Waste Management Committee (RWMC)
 - Performance Assessment Advisory Group (PAAG)
 - In-Situ Research/Investigations for Geological Disposal Advisory Group (ISAG)
 - Geochemical Modelling and Data Group
 - Seabed Working Group (SWG)
 - Participants: Belgium, Canada, CEC, France, FRG, Italy, Japan, Netherlands, Switzerland, UK, USA
 - 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.
 - Stripa Technical Committee (Stripa Mine test program)
 - Participants: Canada, Finland, France, Japan, Spain, Sweden, Switzerland, UK, USA
 - Term: 5-1-80 to 1-1-87 for Phases 1 & 2
7-1-86 to 7-1-91 for Phase 3.
 - Scope: In-situ investigations in fractured-granite host rock

INTERNATIONAL

* RWMC (contd)

- Liaison Committee for Decommissioning Project
Exchange
Participants: Canada, France, FRG, Italy, Japan,
Spain, Sweden, UK, US
Term: Not defined.
Scope: Exchange of scientific and technical information on large national decommissioning projects.

- Joint Technical Committee of the Alligator Rivers
Analogue Project
Participants: Australia, Japan, Sweden, UK, USA
Term: 9-1-87 to 9-1-90
Scope: Research on natural analogues in uranium ore bodies for long-term prediction of radionuclide transport.

* Committee on Radiation Protection and Public Health (CRPPH)

- Executive Group - Coordinated Research and
Environmental Surveillance
Programme related to sea disposal
of radioactive waste (CRESP)
Participants: Belgium, Canada, Denmark, France,
FRG, Italy, Japan, Netherlands,
Portugal, Spain, Sweden, Switzerland,
UK, USA, and the IAEA. IMO
is an associate member.
Term: 1981-1990.
Scope: Investigations into the oceanographic and biological characteristics of the northeast Atlantic disposal site and related scientific work. Extended to cover land-based discharges as of 1987.

US Mission to OECD
Nuclear Energy Agency
19 Rue Francville
75016 Paris
France

Tel: 23-1-45-24-74-77
Fax: 33-1-45-24-74-80
Tlx: 64-3964

DOE Representative

Frank A. Goldner
33-1-45-24-74-24

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INTERNATIONAL

NEA ORGANIZATION

Director General
Howard K. Shapar

Dep. Dir. General
Pierre Strohl

-- Legal Affairs

P. Reyners

-- Safety and Regulation

Klaus Stadie

-- Radiation Protection/Waste Management

Jean-Pierre Olivier

O. Ilari

B. Ruegger

Claes Thegerström

Larry Chamney

-- Nuclear Safety

W. Haussermann

Committees

* CRPPH - Radiation Protection/Public Health

* RMWC - Radioactive Waste Management

* CSNI - Safety of Nuclear Installations

-- Science and Development

S. Horiuchi

-- Nuclear Development Division

G. Stevens

FCC - Committee for Technical and Economic
Studies on Nuclear Energy Development
and the Fuel Cycle

-- Nuclear Science/Data Bank

Jonny Rosen

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NUCLEAR SOCIETIES

AUSTRALIA

Australian Nuclear Association
P.O. Box 445
Sutherland, N.S.W. 2232
Australia

BELGIUM

Forum Nucléaire Belge (ASBL)
Place du Champ de Mars
5 Bte 9
1050 Bruxelles
Belgium

Tel: 32-2-512-29-80

Belgian Nuclear Society (BNS)
Ravensteinstreet 3
1000 Brussels
Belgium

Tel: 32-2-513-97-00

CANADA

Canadian Nuclear Association (CNA)
111 Elizabeth Street
Toronto, Ontario M5G 1P7
Canada

Tel: 416-977-6152
Fax: 416-979-8356
Tlx: 06-23741

Canadian Nuclear Society (CNS)
111 Elizabeth Street
Toronto, Ontario M5G 1P7
Canada

Tel: 416-977-7620
Fax: 416-979-8356
Tlx: 06-23741

EUROPE

European Nuclear Society (ENS)
P.O. Box 2613
3001 Berne
Switzerland

Tel: 41-31-21-61-11
Fax: 41-31-22-92-03
Tlx: 912110

INTERNATIONAL

FINLAND

Finnish Nuclear Society (ATS)
Suomen Atmitekniillinen Seura-
Atomtekniska Sällskapet i Finland
r.y.
c/o Technical Research Centre of
Finland Nuclear Eng. Laboratory
Loennrotinkatu 37
00 180 Helsinki 18
Finland

Tel: 358-0-61-601

FRANCE

Forum Atomique Français
48 Rue de la Procession
75715 Paris
France

Tel: 33-1-45-67-07-70

Société Française d'Energie
Nucléaire (SFEN)
48 Rue de la Procession
75715 Paris
France

Tel: 33-1-45-67-07-70
Fax:
Tlx: 200565

GERMANY (FRG)

Deutsches Atomforum e.V. (DATF)
Heussallee 10
5300 Bonn
Federal Republic of Germany

Tel: 49-228-507-0
Fax:
Tlx: 8869444 DATFD

Kerntechnische Gesellschaft e.V. (KTG)
(Nuclear Society)
Heussallee 10
5300 Bonn
Federal Republic of Germany

Tel: 49-228-507-259
Fax:
Tlx: 8869444 DATFD

ITALY

Forum Italiano dell'Energia
Nucleare (FIEN)
Via Paisiello 26-28
00198 Rome
Italy

Tel: 39-6-844-2587

INTERNATIONAL

ITALY (contd)

Società Nucleare Italiana (SNI)
c/o Facoltà di Ingegneria
Viale Risorgimento 2
40136 Bologna
Italy

Tel: 39-6-844-1448

JAPAN

Atomic Energy Society of Japan
1-1-13, Shimbashi
Minato-ku, Tokyo
Japan 105

Tel: 81-3-508-1261

Japan Atomic Industrial Forum (JAIF)
6th Floor, Toshin Bldg.
1-1-13, Shimbashi
Minato-ku, Tokyo
Japan 105

Tel: 81-3-508-2411
Fax: 03-508-2094
Tlx: 2226623 JAIFRM J

KOREA

Korea Atomic Industrial Forum Inc
(KAIF)
21 Yeouido-dong
Yeongdeungpo-ku, Seoul 150
Yeouido P.O. Box 1021
Seoul, Korea

Tel: 82-2-785-2570
Fax: 82-2-785-3975
Tlx: KAIFRM K33870

Korean Nuclear Society (KNS)
170,2, Kongnung-dong
Tobong-gu, Seoul
Korea

Tel: 82-2-972-2081
x.309

NETHERLANDS

Netherlands Atoomforum
Sceveningse Weg 112
The Hague
Netherlands

Tel: 31-70-5145-81

Netherlands Nuclear Society
c/o N.V. Kema
Utrechtsweg 310
6812 AR Arnhem
Netherlands

Tel: 31-85-5624-91
Fax:
Tlx: 4-5016 KEMA NL

INTERNATIONAL

SPAIN

Forum Atomico Español Boix y Morer, 6 28003 Madrid Spain	Tel: 34-1-253-63-03 Fax: Tlx: 43420 FAE E
Sociedad Nuclear Española (Spanish Nuclear Society) Pinar, 6 bis 28006 Madrid Spain	Tel: 34-1-411-40-64 Fax: Tlx: 211634 INGB0

SWEDEN

Swedish Atomic Forum (SAFO) Box 1746 111 87 Stockholm Sweden	Tel: 46-8-790-0400 Fax: Tlx: 10859 ELATOM S
Föreningen Kärnteknik (Swedish Nuclear Society) Box 1419 111 84 Stockholm Sweden	Tel: 46-8-14-20-00

SWITZERLAND

Schweizerische Vereinigung für Atomenergie (SVA) (Swiss Association for Atomic Energy) Postfach 2613 3001 Bern Switzerland	Tel: 4-31-22-58-82 Fax: Tlx: 912110
Schweizerische Gesellschaft der Kernfachleute (Swiss Nuclear Society) c/o Paul Scherrer Institute 5503 Würenlingen Switzerland	Tel: 41-56-99-23-26 Fax: Tlx: 53714 EIR CH

INTERNATIONAL

UNITED KINGDOM

British Nuclear Energy Society (BNES)	
1-7 Great George Street	Tel: 44-1-630-0726
London SW1P 3AA	Fax:
United Kingdom	Tlx: 264476
British Nuclear Forum (BNF)	
1 St. Alban's Street	Tel: 44-1-930-6888
London SW1Y 4SL	Fax:
United Kingdom	Tlx: 264476

UNITED STATES

American Nuclear Society (ANS)	Tel: 312-352-6611
555 North Kensington Avenue	Fax: 312-352-0499
La Grange Park, Illinois 60525	Tlx: 4972673
US Council for Energy Awareness	
(Atomic Industrial Forum)	Tel: 301-654-0910
7101 Wisconsin Avenue	Fax:
Bethesda, MD 20814	Tlx: 710 824 9602

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G.P.O. 593-216 4/88