

Nuclear Development

**Accelerator-driven Systems (ADS)
and Fast Reactors (FR) in
Advanced Nuclear Fuel Cycles**

A Comparative Study

NUCLEAR ENERGY AGENCY
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Annex B

ACRONYMS

ADS	Accelerator-driven system (sub-critical)
ADTF	Accelerator-driven test facility
AGR	Advanced gas-cooled reactor, developed from the Magnox type (UK)
ALMR	Advanced Liquid Metal (-cooled) Reactor
AMSB	Accelerator molten-salt breeder (conceptual)
AMSTER	Actinide molten-salt transmuter
amu	Atomic mass unit
An	Actinide, i.e. U, Pu, Np, Am or Cm. “Actinides” stands for any combination of U, Pu, Np, Am and Cm.
ANL	Argonne National Laboratory (US)
ATW	Accelerator Transmutation of Waste, US programme of partition and transmutation
ATWS	Anticipated transients without scram
BDB	Beyond design basis (of an accident needing emergency measures)
BOEC	Begin of equilibrium cycle
BOL	Begin of life
BOP	Balance of plant (e.g. electric generating equipment)
BU	Burn-up
BWR	Boiling water reactor
CANDU	Canadian reactor type cooled and moderated by heavy water
CAPRA	Fast reactor operated to burn rather than breed plutonium
CCDTL	Continuous current drift-tube linear accelerator
CDB	Cost database
CEA	Commissariat à l'énergie atomique (France)
CER	Cost-estimating relationships
CER-CER	Ceramic in ceramic
CIEMAT	Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas
CIRCE	Circuito Eutettico
CNRS	Centre National de la recherche scientifique
COE	Cost of energy
CONFIRM	Collaboration on Oxide & Nitride Fuel Irradiation & Modelling
CRBR	Clinch River Breeder Reactor
CRIEPI	Combined Research Institute of the Electric Power Industries (Japan)
CRS4	Center for Advanced Studies, Research and Development
CSMSR	Cascade sub-critical molten-salt reactor (with two-stage neutron amplification)
CW	Continuous wave (distinction from pulsed mode)
D&D	Decommissioning and dismantling
DC	Direct (continuous unidirectional) current
DF	Driver fuel
DFR	Dounreay (experimental) fast reactor (UK)
DOE	Department of Energy (US)
DTL	Drift-tube linear accelerator

EBR	Experimental breeder reactor
EdF	Electricité de France
EFFTRA	Experimental Feasibility of Targets for Transmutation (EC)
EFR	European fast reactor concept
ENEA	Ente per le Nuove tecnologie, l'Energia e l'Ambiente
EOEC	End of equilibrium cycle
ETGCFR	Gas-cooled fast reactor
FCA	Fast Critical Assembly (Japan)
FCF	Fuel conditioning facility
FCR	Fixed charge rate
FFTF	Fast flux test facility
FR	Fast reactor (operating at criticality)
FZJ	Forschungszentrum (research centre) Jülich (Germany)
FZK	Forschungszentrum Karlsruhe (Germany)
GeV	Giga-electron-volt (10^9 electron volts)
GWd	Gigawatt-day (usually thermal, i.e. without allowance for conversion losses)
GWe	Gigawatt (electrical)
HCDA	Hypothetical core-disruptive accident
HLW	High-level waste (fission products etc.)
HM	Heavy metal (uranium, plutonium etc), usually as before irradiation
IBA	Ion Beam Applications
IFR	Integral Fast Reactor, directly associated with reprocessing facilities
INFCE	International Nuclear Fuel Cycle Evaluation
INFN	Istituto Nazionale di Fisica Nucleare
IPHI	Injecteur de protons de haute intensité
IPPE	Institute for Physics & Power Engineering
ISTC	International Center for Technical Co-operation (Russia)
JAERI	Japan Atomic Energy Research Institute
JNC	Japan Nuclear Cycle Development Institute
KAERI	Korea Atomic Energy Research Institute
KALLA	Karlsruhe lead laboratory (Germany)
KCR	Known conventional resources
KEK	High Energy Accelerator Research Organization (Japan)
LANL	Los Alamos National Laboratory (US)
LANSCE	Los Alamos Neutron Science Centre
LBE	Lead-bismuth eutectic mixture
LEDA	Low energy demonstration accelerator
LiSOR	Liquid Solid Reaction experiment
LLFP	Long-lived fission product(s)
LMFBR	Liquid metal (cooled) fast breeder reactor
Ln	Lanthanide
LOD	Line of defence
LOFWS	Loss of flow without scram
LOHSWS	Loss of heat sink without scram
LWR	Light water reactor (either pressurised or boiling)
MA	Minor actinides, principally neptunium, americium and curium

MAB	Minor actinide burner
Magnox	A magnesium alloy used as fuel cladding, the fuel itself, or the reactor type using it (UK)
MASURCA	MAquette de SURgénérateur à Cadarache (France)
MCA	Multi-criteria analysis
MDT	Mean down time
MEGAPIE	MEGAWatt Pilot Experiment
MHA	Modular helium accelerator-driven transmuter
MHR	Modular helium (-cooled) reactor
MHz	Megahertz (million cycles per second)
MOX	Mixed oxide fuel, uranium and plutonium unless otherwise specified
MSBR	Molten salt breeder reactor
MSR	Molten salt (fuelled and cooled) reactor
MSRE	Molten Salt Reactor Experiment (US)
MTBF	Mean time before failure
MTR	Material-testing reactor
MUSE	Neutron-multiplying experiment (France)
MW	Megawatt (million watts)
MYRRHA	Prototype multi-purpose accelerator-driven neutron multiplier
NC	Normally conducting
NEA/NSC	Nuclear Energy Agency Nuclear Science Committee
NFC	Nuclear fuel cycle
nsc	Nuclear cycle scheme number in present report
O&M	Operation and maintenance
OFC	Open fuel cycle
OMEGA	Options Making Extra Gains from Actinides (Japanese initiative)
ORNL	Oak Ridge National Laboratory (US)
P&T	Partition and transmutation
PFR	Prototype fast reactor (UK)
POD	Point of departure
PRISM	Advanced fast reactor concept
PSA	Parametric systems analysis
PSI	Paul Scherrer Institute (Switzerland)
PUREX	Fuel reprocessing scheme based on solvent extraction and reduction of plutonium to an inextractable form for separation from uranium
PWR	Pressurised water (cooled and moderated) reactor
RAR	Reasonably assured resources (uranium)
RF	Radio frequency
RFQ	Radio frequency quadrupole
RIAR	Research Institute of Atomic Reactors (Russia)
RVACS	Reactor vessel auxiliary cooling system (?)
SA	Sub-assembly (composite fuel element)
SC	Superconducting
SCK•CEN	Nuclear Research Centre (Belgium)
SCNES	Self-contained nuclear energy system
SINQ	Swiss Spallation Neutron Source (Spallation Neutronen Quelle) (Switzerland)
SPIN	French programme on partition and transmutation

SPIRE	Spallation and Irradiation Effects (EC)
SSC	Separated sector cyclotron
Sv	Sievert (unit of radiation dose)
TASSE	Thorium-based accelerator-driven system with simplified fuel cycle for long-term energy production
TECLA	Technologies, Materials and Thermal-Hydraulic for Lead Alloys (EC)
TERM	Test experiment at the Riga mercury loop
TESLA	Superconducting electron-positron collider
TF	Transmutation fuel
TOPWS	Transient over-power without scram
TRISO	Triply-coated ceramic particle fuel
TRU	Transuranic elements, i.e. Pu, Np, Am and Cm.
TUI	Transuranium Institute (Germany)
TWhe	Terawatt-hour (electrical), i.e. 10^{12} watt-hours after conversion losses
UOX	Uranium oxide fuel
UREX	Reprocessing scheme designed to recover plutonium by solvent extraction and discard uranium as low-level waste
UTC	Unit total (capital) cost
VIPAC	Vibratory packing of fuel particles into cladding
VVER	Russian pressurised water reactor
XADS	Experimental accelerator-driven system