

2003

Spent Fuel Management Options The Brazilian perspective for the next 10 years



II Regional Workshop on Options for
Storage of Spent Fuel from Research
Reactors

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Spent Fuel Management Options The Brazilian perspective for the next 10 years

Brazilian signed the Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management in 11 October 1997. The Convention has not yet been approved by the National Congress.

Brazil has not yet defined a policy regarding spent fuel or high level waste disposal. However, given that the Brazilian Legal Framework regarding waste disposal is being defined (a national low and medium level waste disposal will be constructed), this issue will be discussed at the national level.

The policy adopt with regard to spent fuel from research reactors is to keep the fuel in safe storage until an international consensus is reached about reprocessing and recycling of the fuel, or a final disposal as such.

Brazilian Research Reactors (RR)



IEA-R1

Located @ IPEN in São Paulo City. The first RR constructed in the South Hemisphere (1956-1957)

MTR pool type reactor
Operation @ 2 MW
8 hrs / day - 5 days/week until 1995
Continuously 64 hrs/week after 1995

Modified to operate @ 5 MW in 1997
Operation at 5 MW - 64 hrs/week in 2003
127 SFE were returned to USA in 1999

IPR-R1

Located @ CDTN in Belo Horizonte city
Criticality: 1960

TRIGA - MARK 1 (GA)

Operation @ 100kW
4 hrs / day - 5 days/week

It was modified to operate @ 200 kW

ARGONAUTA

Located @ IEN in Rio de Janeiro City
Criticality: 1965

Argonauta Type RR

Operation @ 200W
4 hrs / day - 5 days/week

10296

IPEN/MB-01

Located @ IPEN in São Paulo
 Criticality: 1998

Critical Assembly (tank type) used to study reactor physics of small PWRs

Operation @ 100 W as necessary

Result of a joint project CNEN + Brazilian Navy

Brazilian RRs Fuel Characteristics

	Type of fuel element	Fuel elements per assembly	# of fuel assemblies in core
IPR-R1	UOX rods	1 each rods per assembly	69
ARGONAUTA	UOX rods	Standard: 17 Control: 7	Standard: 6 Control: 2
IPEN/MB-01	UOX pellets within SS tubes	11 each tubes per assembly	600

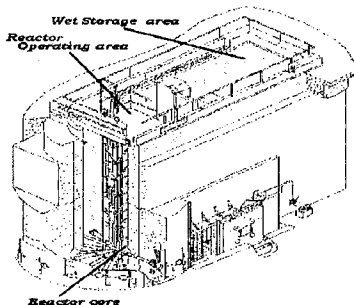
Accumulated Fuel Burn-up

IPEN/MB-01	0.1 MW/Day accumulated since 1988
Argonauta	0.25 MW/Day accumulated since 1955
IPR-R1	130 MW/Day accumulated since 1960
IEA-R1	

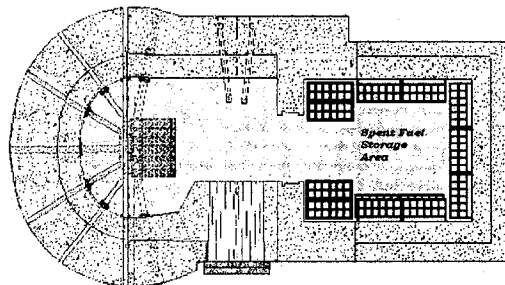
Spent Fuel Storage Capacity

IPEN/MB-01	3500 dry storage positions
Argonauta	12 dry storage positions
IPR-R1	60 wet positions first refueling around 2010

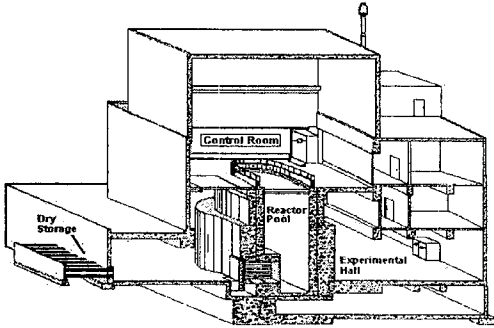
IEA-R1 Reactor Pool



Top view of Reactor Pool



IEA-R1 REACTOR BUILDING



OPERATION SCHEDULE FOR IEA-R1 AFTER 2003

- Operation at 5 MW, 64 hrs/week.
- Refueling frequency: 12-14 fuel assemblies per year.
- ~25 positions of the Spent Fuel Storage Area occupied with spent fuels.
- Spent Fuel Storage Facility has to be constructed in 2010.
- It will be necessary circa of 250-300 positions for spent fuels in case of IEA-R1 operation at 5 MW until 2020.

IPEN-CNEN/SP PROPOSALS FOR 2003/2004 IAEA RLA/4/018

Conceptual design for a "long term interim storage" located near IEA-R1 Reactor Facility (possibly a spent fuel dry storage with a minimum spent fuel decay period of 5 years).

Conceptual design of transfer/transport casks to transfer spent fuels from reactor pool to the dry storage facility. Possibility of spent fuel drying at a drying station.

Conceptual design of a hot cell for spent fuel canning.

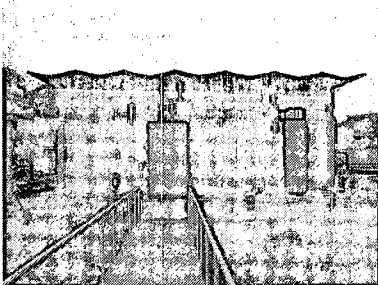
Electrochemical separation of aluminum from irradiated uranium silicide fuels for storage purposes.

Preparation of a Preliminary Safety Analysis Report (May 2003 – December 2004).

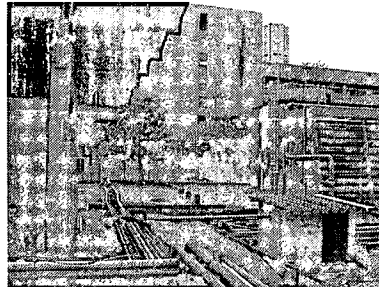
IEA-R1 INTERIM DRY STORAGE CHARACTERISTICS

Description	IPEN facility
Storage type	Dry (type to be defined)
Fuel type	MTR
Enrichment	~20%
Pool decay period before handling	5 years
Total capacity	250 dry channels
Dimension	10 m x 10 m

FRONT VIEW OF VAN DE GRAAFF BUILDING



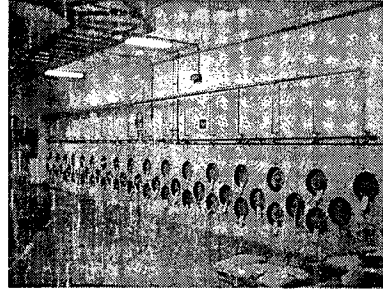
REAR VIEW OF VAN DE GRAAFF BUILDING



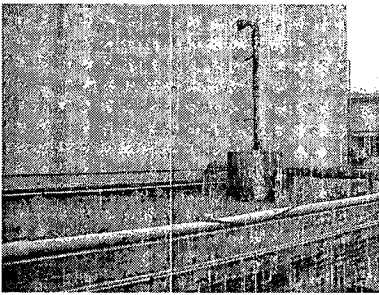
VAN DE GRAAFF BUILDING MAIN ENTRANCE



IEA-R1 SPENT FUEL DRY STORAGE FACILITY



TOP VIEW OF IEA-R1 SPENT FUEL DRY STORAGE FACILITY



TOP VIEW OF IEA-R1 SPENT FUEL DRY STORAGE FACILITY

