Jordan’s Nuclear Power Programme

IAEA-TM on Cost Estimation Methodologies for Spent Fuel Management

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Content

- Country profile
- Background
- Policies and strategies
- Jordan’s Nuclear Project
- SMRs under consideration
- Main Issues for HTR Deployment
- Bid invitation specifications (BIS)
- Status of the Nuclear Project
- Management of Spent Nuclear Fuel (SNF)
- Options of disposal cost estimates for RAW

Jordan’s Profile

Capital: Amman

Area: 89,341 km2

Population: 10,011,820

Sea Port: Aqaba

Coastline: 26 Km

Climate: Mediterranean & Arid Desert

Background

The Hashemite Kingdom of Jordan became a member state of the International Atomic Energy Agency (IAEA) on April 1966.

Jordan has signed the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, April 2016. The Convention has been ratified and entered into force on the 14th of July 2016.

Jordan presented its first national report in the sixth Review Meeting of the Convention in 2018.

Policies and strategies

Document	Status
NATIONAL **POLICY** FOR RADIOACTIVE WASTE & SPENT NUCLEAR FUEL MANAGEMENT	Approved and implemented (2015)
NATIONAL **STRATEGY** FOR RADIOACTIVE WASTE AND SPENT NUCLEAR FUEL MANAGEMENT	Drafted and waiting for final review and approval.

* For the front-end, RAW management and localization

Jordan's Nuclear Project

- **Jordan Research and Training Reactor (JRTR) (5 Mw)**

Operation license issued by EMRC in 2017

- Radioisotopes Production facility (RIPF), is one of the main facilities of the Jordan Research and Training Reactor (JRTR) poduces Iodine-131, Tc99m and Iridium-192

- **Uranium**

The quantity of the yellow cake in the mining locations is estimated to be 40,000 tones and building an automated pilot-factory for yellow-cake production in Jordan will be operational at the end of 2019.

- NPP project

RTA has been conducted for 6 SMR technologies.

SMRs under consideration

parameter	HTR-600	HTR-200	SMART	RITM	NuScale	Xe-100
Capacity Factor (%)	> 90	> 90	> 90	90	> 95	95
Seismicity (g)	0.3	0.3	0.3	0.3	0.5	0.3
Safety Approach\trains	Inherent Passive\3 trains	Inherent Passive\3 trains	Passive\ 4 trains	Passive \ 2 trains & Active\ 2 trains	Passive \ 2 trains	Inherent Passive \ 4 trains
CDF (per reactor year)	NEGL	NEGL	$< 10^{-6}$	$< 10^{-5}$	3×10^{-10}	NEGL
Fuel enrichment (%)	8.5	8.5	< 5	< 20	< 4.95	15.5
Fuel Burn up (GWd/ton)	98	98	54	166	62	160
Fuel Cycle (months)	On-line Refueling	On-line Refueling	30-36	48-72	24	On-line Refueling

Main Issues for HTR Deployment

- Transportation of heavy equipment and fuel (off-site infrastructure).
- Fuel supply and back-end FC:
  - There is only one production line for HTR-PM fuel, fuel cost is high. More HTRs are to be deployed to reduce fuel price
  - The only option for SNF management now is long term storage or disposal. Little experience is available

BIS - FC

The requirements for spent nuclear fuel management is both technology and country's policies dependent.

BIS requires that the design of SNF storage facility shall be able to fulfill the following:

- Provide a storage capacity enough for 20 years at least;
- The capability to expand the spent nuclear fuel storage facility at NPP sites;
- provide an adequate storage capacity for the failed fuel elements;
- To provide a of plans and procedures for spent fuel handling and storage activities and any other operations at the facility;
- Complete description of decommissioning plan of the spent fuel storage facilities;

* Sample of the requirements

Status of the Nuclear Project 1

RTA: Conducted and short listed the available SMR technologies.

Sitting: Specified potential sites.

BIS: Developed.

Feasibility studies: Undergoing for the short listed technologies.

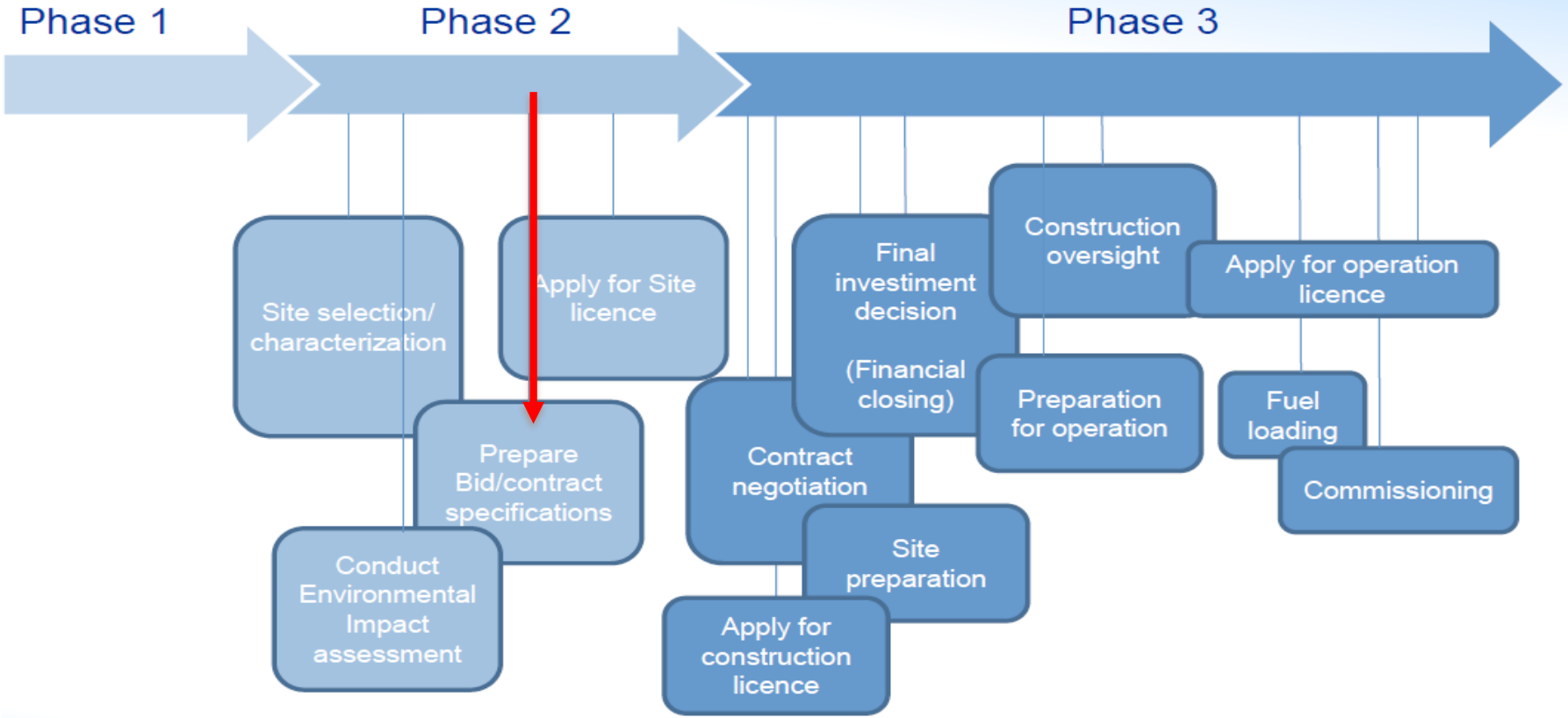
Select the preferred technology: Not selected yet.

Funding: Not decided yet.

Licensing: Not started yet.

Staffing: HRD programme has started since 2008.

Status of the Nuclear Project 2



Status of the Nuclear Project 3

- Priority is given to SMR technologies (HTGRs and PWRs)
- For the most viable options:

– HTGR:

- Large dry storage capacity (expandable); **(+)**
- Less requirements during interim storage; **(+)**
- Limited experience in spent nuclear fuel (SNF) management; **(-)**
- Larger quantities of SNF compared with PWR's SNF; **(-)**

• The available options for SNF management now are long term storage or disposal.

– iPWR: Existing experience accumulated from PWR operation.

Management of Spent Nuclear Fuel / National policy

- To store the SNF on an interim basis at the nuclear research reactor or nuclear power plant site until it decayed to sufficient levels to allow for safe storage;
- Establishing storage facilities near the nuclear research reactor or nuclear power plant for further cooling;
- To decide on the possibility of returning the SNF to the country of origin for final disposal or interim storage or to keep it in Jordan;
- To consider the fuel leasing option if viable and feasible.
- Establishing the national facilities for disposal of low and intermediate level waste (LILW);
- To take timely decisions for the disposal of SNF and high level waste (HLW).


هيئة الطاقة الذرية الأردنية
Jordan Atomic Energy Commission

Thank you !