Overview of the National Regulatory Infrastructure EMRC

Training “BPTC Program ”

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- Country Profile
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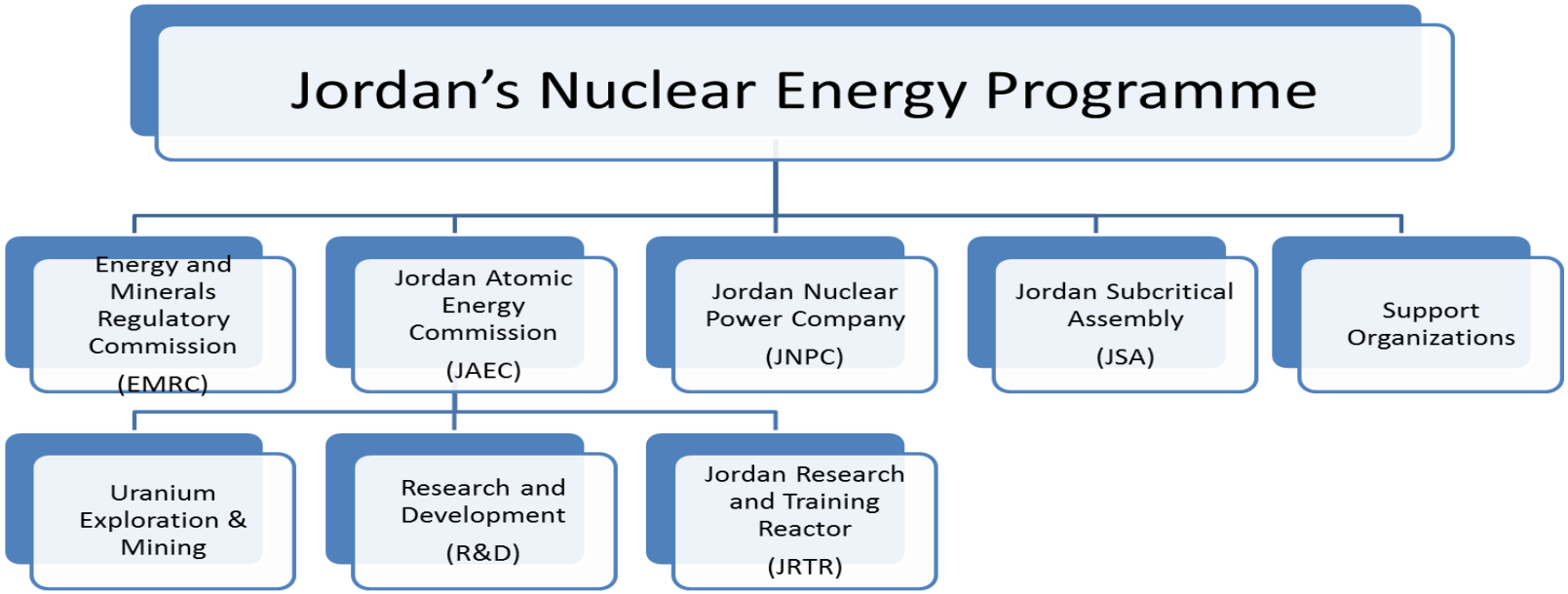
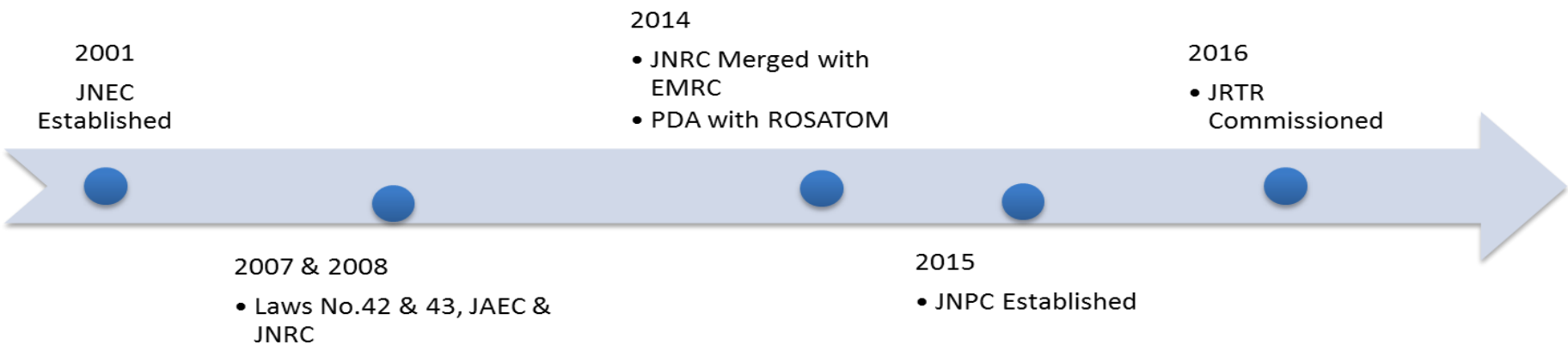
Jordan country profile

• Jordan's the official name of the Hashemite kingdom of Jordan

It's Located in the middle east and borders Syria , KSA, Palestine , and Iraq.

• Covering 89,342 sq. Km , with a population of 9.6 million (2016), 6.6 million are Jordanian .


Jordan's Nuclear Energy Programme
Energy and Minerals Regulatory Commission (EMRC)
Jordan Atomic Energy Commission (JAEC)
Jordan Nuclear Power Company (JNPC)
Jordan Subcritical Assembly (JSA)
Support Organizations
Uranium Exploration & Mining
Research and Development (R&D)
Jordan Research and Training Reactor (JRTR)

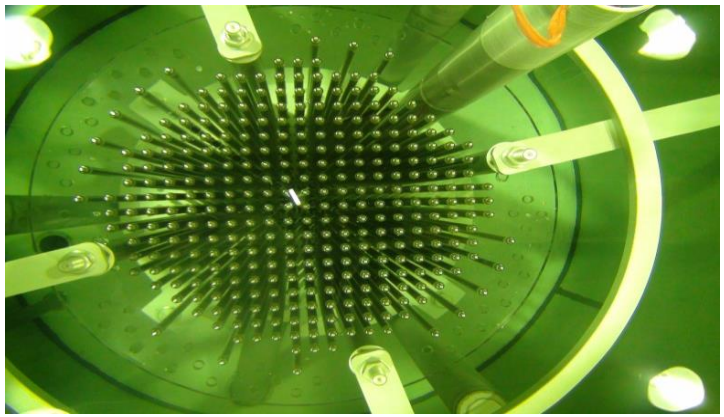

2001
JNEC Established
2007 & 2008
• Laws No.42 & 43, JAEC & JNRC
2014
• JNRC Merged with EMRC
• PDA with ROSATOM
2015
• JNPC Established
2016
• JRTR Commissioned

Country Projects

- Subcritical Assembly (JSA)
- Jordan Research and training reactor (JRTR)
- Jordan Ores exploration
- Jordan Nuclear Power Plant (JNPP).

Jordan Subcritical Assembly Licensing

- Jordan's first Nuclear facility.
- Designed and constructed for the purpose of education, training, and experimental research.
- Inherently safe
- Design Specifications:
  - Uranium Fuel(3.4% U-235)
  - Uranium Oxide (UO_2) with Zr-4 cladding
  - Light Water Moderated
  - Sub-critical State ($k_{eff} \cong 0.95$)
- Commissioned in June 2013



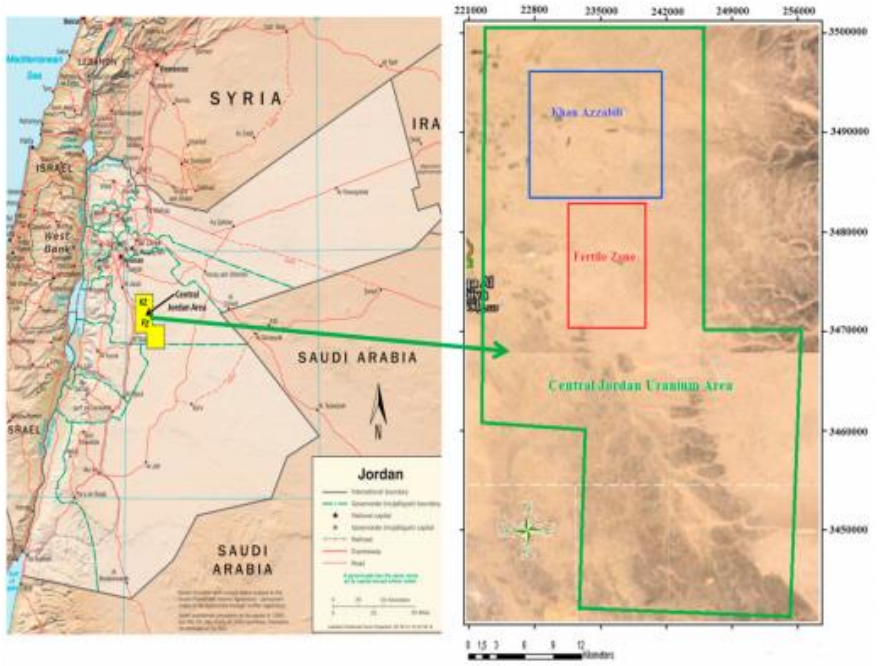
Jordan Research and Training Reactor (JRTR)

- **Overview**:
  - Location Jordan University for science and technology JUST (Northern part of Jordan)
  - 5-MW upgradeable to 10-MW
  - Open pool
  - Plate type fuel (<20% U^{235})
  - H_2O cooled
  - D_2O + Be reflected

- **Applications**
  - Neutron Beam Applications
  - Radioisotope Production
  - Neutron Transmutation Doping
  - Neutron Activation Analysis
  - Plays the primary role in educating and training the upcoming generations of nuclear engineers and scientists
  - Irradiation in support of industrial, agricultural and health/medical infrastructure
- **Operation License Granted Nov 2017**

URANIUM ORES EXPLORATION

- **Jordan undergo uranium exploration activities in the central and eastern regions of Jordan.**
- **Jordan plans to build uranium extraction plant.**

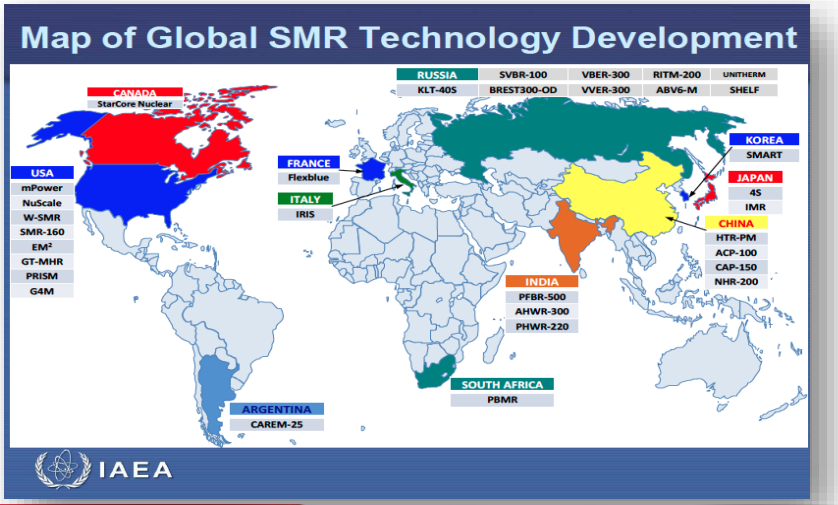


Jordan Nuclear Power Plant

- **In October 2013 RosAtom was selected to be the preferred bidder for Jordan nuclear power plant (as both investor and vendor)**

- **The NPP will comprise of two 1,000 MW Pressurized Water Reactors, based on the VVER 1000–AES 92 design.**

- **Site selected to be around 100 km South-East of capital Amman.**

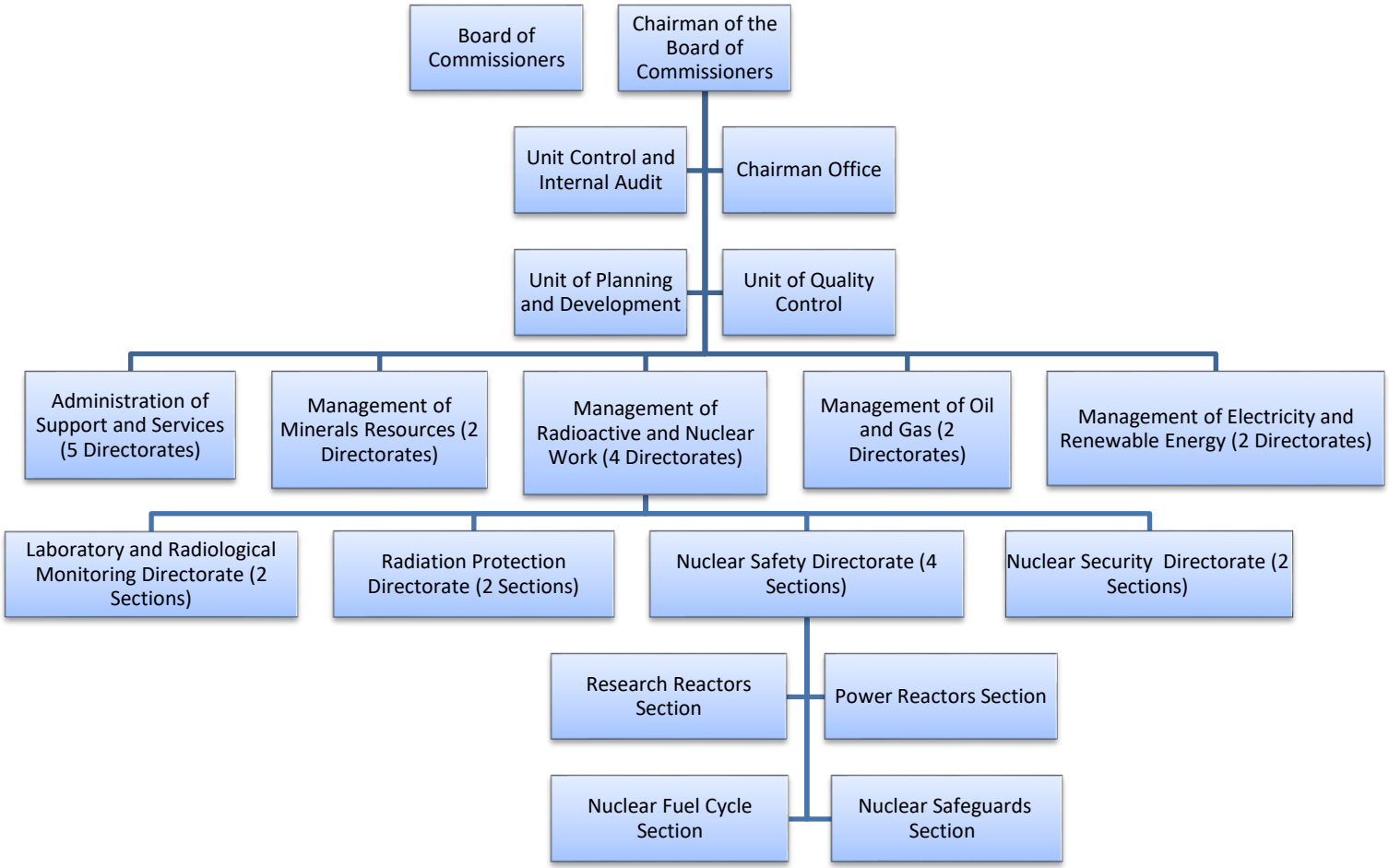


- Conducting prefeasibility studies on SMRs[12] (HTGR)

Legal Framework

- Energy and Mineral Regulatory Commission (EMRC), was established in 2014 as successor to Jordan Nuclear Regulatory Commission (JNRC), in accordance to the Merging Law number (17) for the year 2014.
- EMRC is an independent Regulatory Authority that reports directly to the Prime Minister.
- The current enforced law for Radiation and Nuclear Materials, Facilities and Activities, Radiation Protection, and Nuclear Safety and Security is Law no. (43) for the year 2007 and was revised (a number of Articles was added to accommodate nuclear power program)
- The Government of Jordan prepared a Law "Energy and Minerals Law". By the new Law, EMRC is to be responsible for the roles of the three sectors i.e. Radiation & Nuclear, Mineral Resources, and Electricity regulation.

Establishment

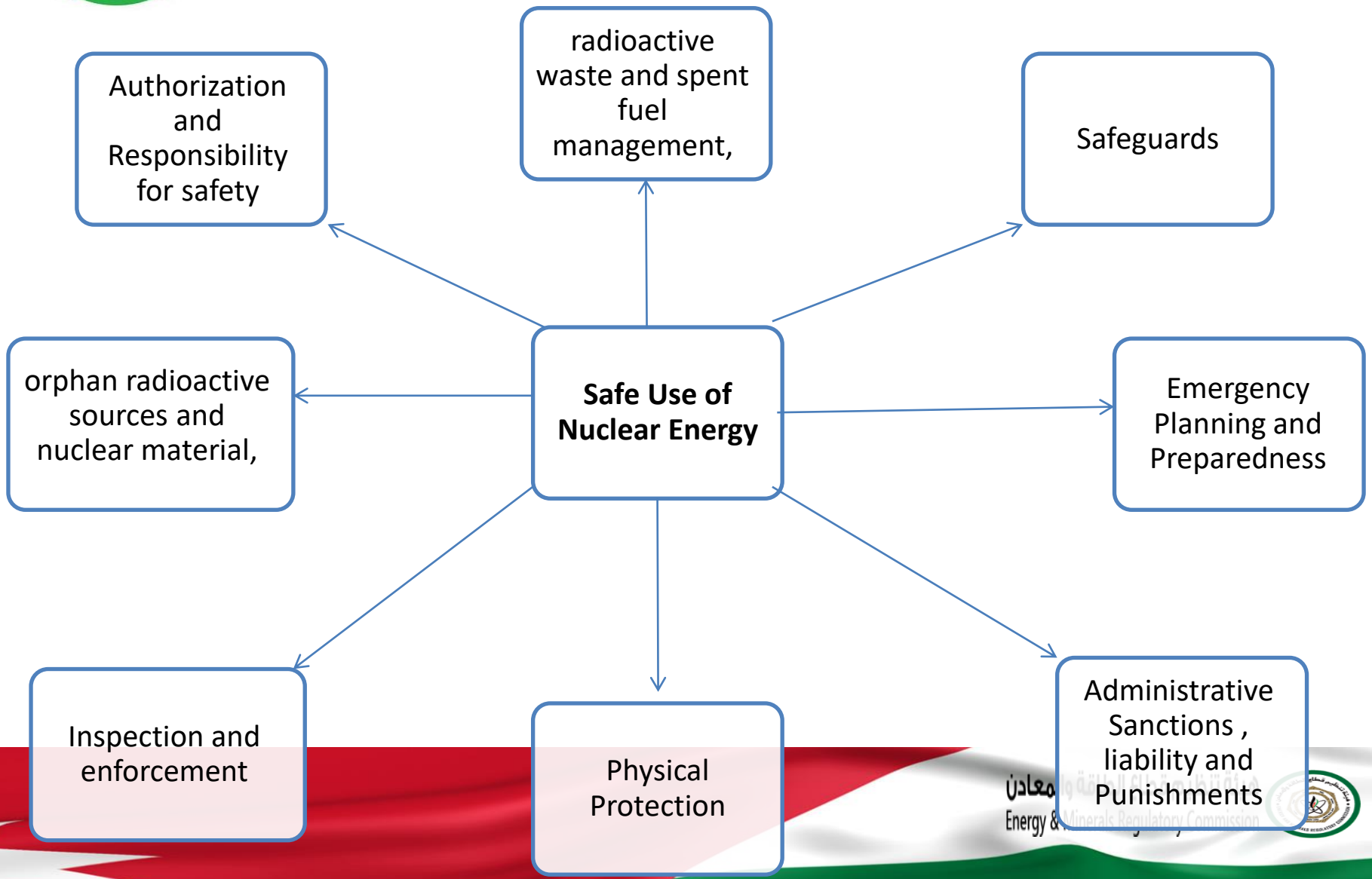


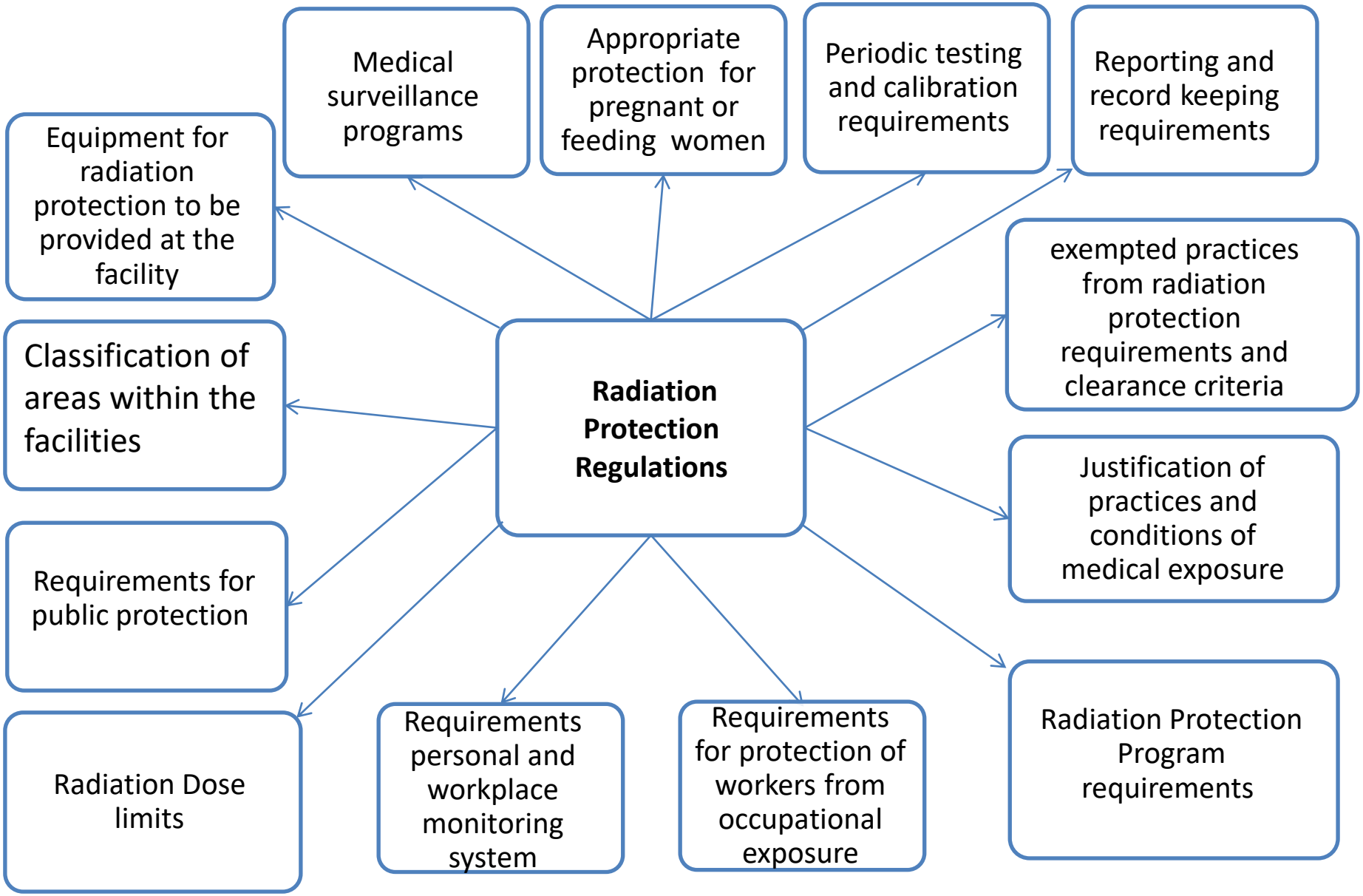
Legal Framework

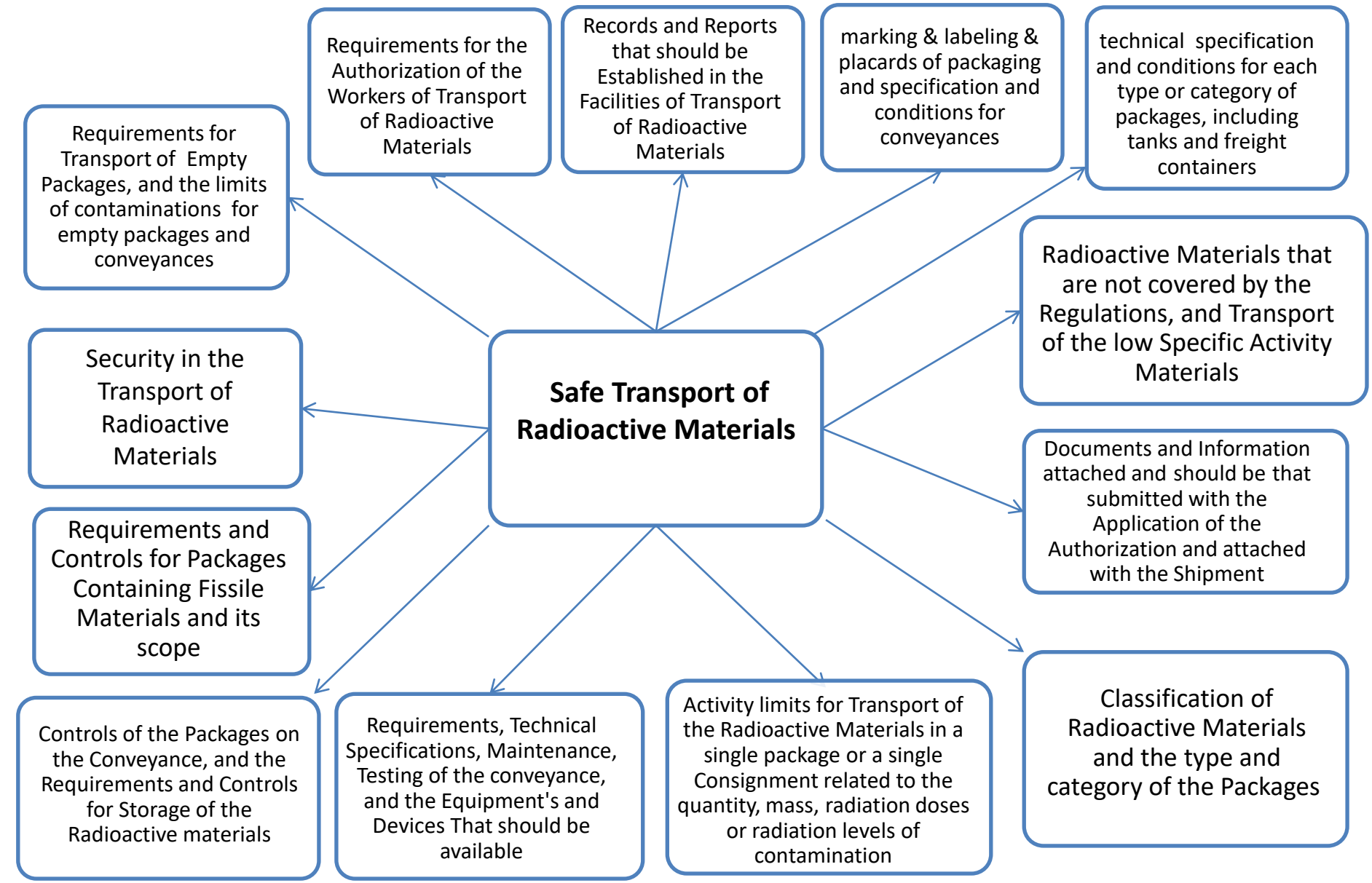
- More than 70 instructions have been officially issued
- All Regulations & Instructions are in compliance with the IAEA Safety Standards.
- All Regulations & Instruction have been reviewed by the IAEA & EC Experts, and local legal experts.
- EMRC will additionally issue guidelines, where necessary.

Legal Framework

EMRC




Medical surveillance programs
Appropriate protection for pregnant or feeding women
Periodic testing and calibration requirements
Reporting and record keeping requirements
Equipment for radiation protection to be provided at the facility
exempted practices from radiation protection requirements and clearance criteria
Classification of areas within the facilities
Radiation Protection Regulations
Justification of practices and conditions of medical exposure
Requirements for public protection
Radiation Protection Program requirements
Radiation Dose limits
Requirements personal and workplace monitoring system
Requirements for protection of workers from occupational exposure

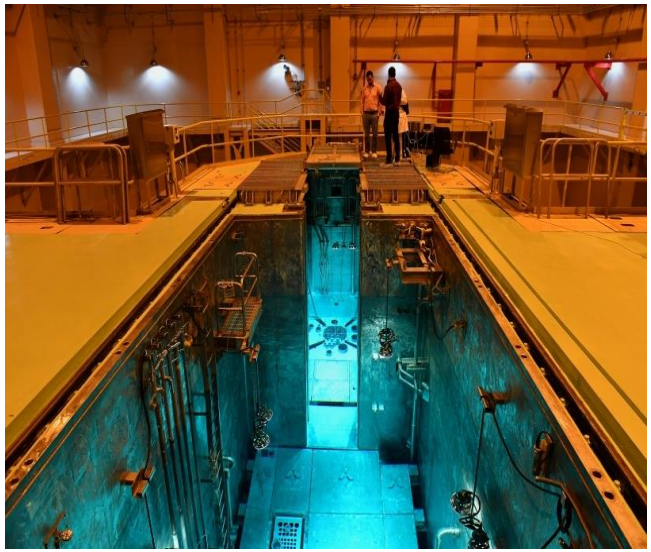

Safe Transport of Radioactive Materials
Requirements for the Authorization of the Workers of Transport of Radioactive Materials
Records and Reports that should be Established in the Facilities of Transport of Radioactive Materials
marking & labeling & placards of packaging and specification and conditions for conveyances
technical specification and conditions for each type or category of packages, including tanks and freight containers
Requirements for Transport of Empty Packages, and the limits of contaminations for empty packages and conveyances
Radioactive Materials that are not covered by the Regulations, and Transport of the low Specific Activity Materials
Security in the Transport of Radioactive Materials
Documents and Information attached and should be that submitted with the Application of the Authorization and attached with the Shipment
Requirements and Controls for Packages Containing Fissile Materials and its scope
Classification of Radioactive Materials and the type and category of the Packages
Controls of the Packages on the Conveyance, and the Requirements and Controls for Storage of the Radioactive materials
Requirements, Technical Specifications, Maintenance, Testing of the conveyance, and the Equipment's and Devices That should be available
Activity limits for Transport of the Radioactive Materials in a single package or a single Consignment related to the quantity, mass, radiation doses or radiation levels of contamination

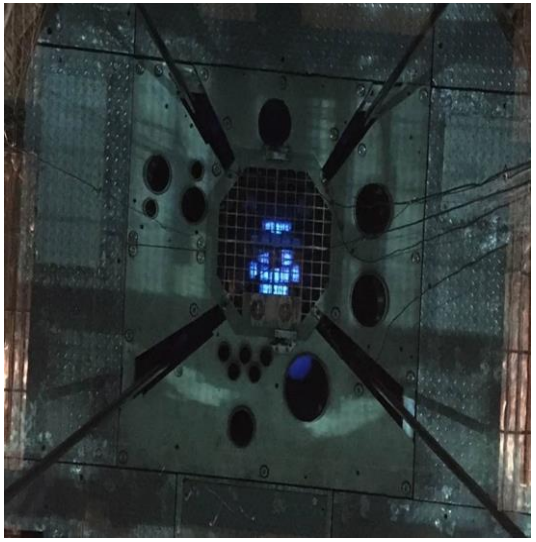
JRTR Licensing Steps

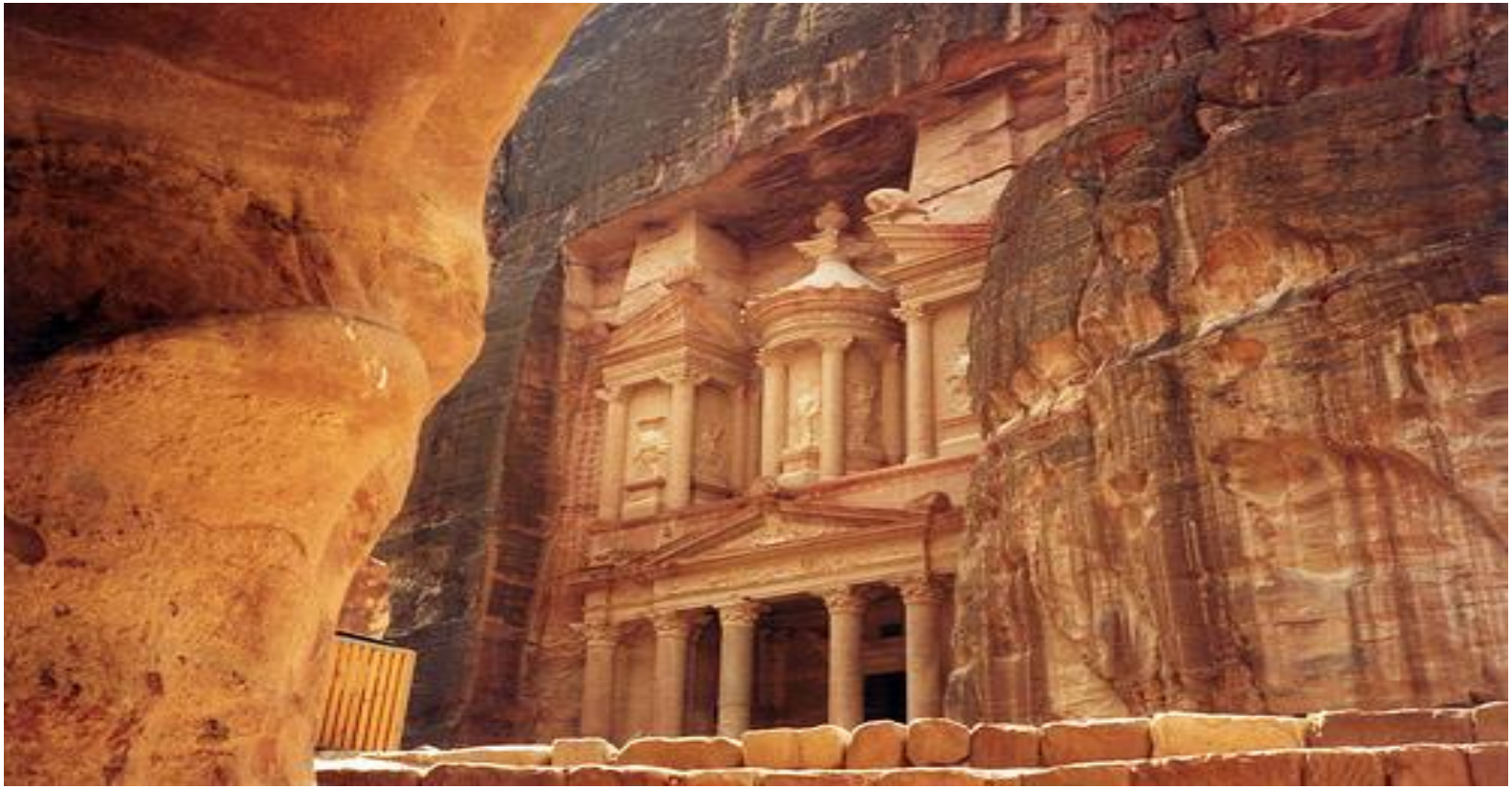
- The licensing of the JRTR was based followed the USNRC approach for non-power reactors two steps of licensing (Construction Permit CP and Operation License OL).
- As safety requirements:
  - Local legislative system.
  - IAEA safety standers (NS-R 4 at the time)
  - USNRC NUREG and Reg. Guides (NUREG 1537 part1 and part2).
  - Korean requirements were applied

- **Licensing Steps**:
  - The applicant submitted Preliminary Safety Analysis Report (PSAR) for review.
  - At the time (JNRC) along with cooperation with KINS had reviewed the PSAR and through rounds of requests of additional information.
  - After RAI's responses acceptance and fulfilling the safety requirements EMRC/KINS issued the Safety Evaluation Report (SER) showing the acceptance of the site, design, and SSCs.
  - During construction phase pre-operation inspections were conducted (covered structural, electrical, mechanical, I/C aspects along with nuclear components).
  - On site inspection, document review vendors inspections.
  - Pre-operation inspections also covered the commissioning phase of the facility (cold commissioning, and fuel loading (under special permit), criticality tests and power maneuvers).
  - After fulfilling the safety requirements EMRC issued the Operation license for the facility.

- **Licensing Steps**:
  - Along the licensing of the JRTR EMRC requested many IAEA expert missions for support it is decisions.
  - EMRC contracted a technical support origination USA AdStm.







Thank You

Energy and Minerals Regulatory Commission

www.emrc.gov.jo

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Energy & Minerals Regulatory Commission