

Current Key Players in the Nuclear Field (1/3)



National Atomic Energy Commission (CENA) :

- Headed by the **Minister of Higher Education and Scientific Research** and composed by members from different ministries and national institutions.
- It was created in 1990. It has the following tasks:
 - To develop, **promote and implement nuclear technologies**, methods and instruments in the country in fields of agriculture, industry, power energy, environment and medicine;
 - To implement basic and **applied research programs** in sciences related to nuclear technology;
 - To oversee the **technical cooperation programs** specially with the IAEA

National Centre for Radiation Protection (CNRP) :

- Established in 1981
- acts as the regulatory authority at the national level for all issues concerning the use of radioactive sources in the context of radiation protection, except nuclear installations.

and the National Center of Nuclear Sciences and Technologies

Created in 1993

Public research institution under the auspices of the Ministry of Higher Education and Scientific Research.



Peaceful Applications of Nuclear Sciences and Technologies in Industrial, Medical, Environmental, and Agricultural fields, through:

- Research and Development
- Specific Applications
- Collection and Diffusion of Information
- Technical support to various industrial and research institutions
- Advising on issues related to nuclear safety and radiation protection

More on CNSTN

Dates and Numbers

- **1993** : Creation
- **1999** : Gamma Irradiator
- **2002** : CNSTN became part of Sidi Thabet Technopark
- **2010** : Electron beam Accelerator
- **2011** : D-D Neutron Generator

2010

- **135** employee (**24** researcher, **55** engineers/technicians)
- **84** Students (**24** PhDs, **15** Master)
- **> 140** Scientific publications (2004-2010)
- **9** specialized technical labs
- Cooperation projects (**CEA**, **AAEA**, **AIEA**, ...)

FIELDS OF ACTIVITY

- **Radiation Processing**
- **Radiation measurements**
- **Isotopic and elemental analysis**

DREM

- **Nuclear Safety**
- **Radiation protection**
- **Maintenance and repair of Electronic Equipments**

DSIN

- **Isotopic Hydrology**
- **Radio-pharmaceuticals**
- **Microbiology**
- **Sterile Insect Technique**

DREV

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Foreseen projects

→ Subcritical Assembly

Efficient tool in education and training for nuclear scientists and engineers

→ Ion Beam Accelerator

Provides a reliable source of ion beams to support many research areas and offer modern analytical techniques in different fields

→ Nuclear Research Reactor

Research Reactor would enhance the country's preparedness for the first NPP introduction

RESEARCH REACTOR

- ✓ The Research Reactor (RR) would serve as an integral part of the nuclear technology infrastructure.
- ✓ It will become the focal point for the National Center for Nuclear Sciences and Technologies (CNSTN).
- ✓ Play the primary role in educating and training the upcoming generations of nuclear engineers and scientists.
- ✓ Provide irradiation services in support of the Tunisian industrial, agricultural and health/medical infrastructure.



TUNISIA'S STEPS TOWARDS THE ACQUISITION OF RESEARCH REACTOR

1996

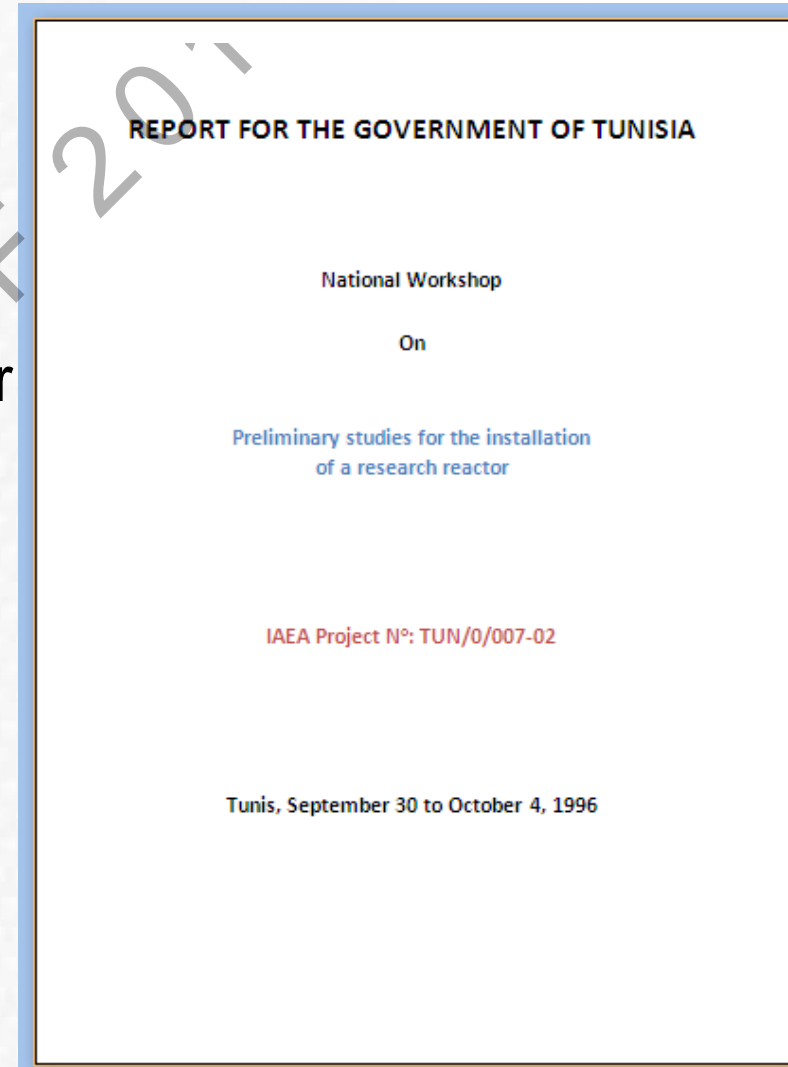
Preliminary study for the installation of a research reactor

➔ Utilization of the research reactor

- Neutron activation analysis
- Radioisotope production
- Training and education

➔ Specifications

2 MW

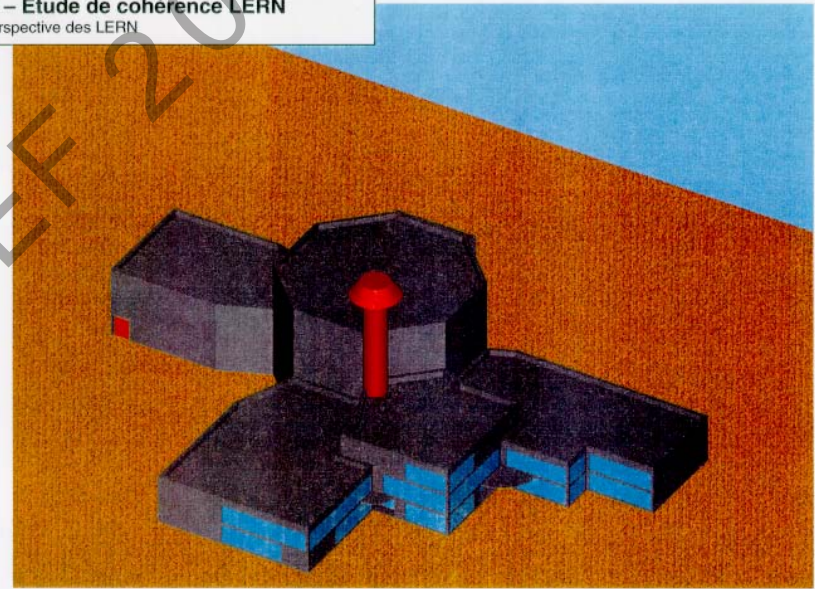


TUNISIA'S STEPS TOWARDS THE ACQUISITION OF RESEARCH REACTOR

2000

A comprehensive study of Research Reactor along with associated laboratories was carried out

CNSTN – Etude de cohérence LERN
Vue en perspective des LERN



TUNISIA'S STEPS TOWARDS THE ACQUISITION OF RESEARCH REACTOR

2010

Need to update studies

- ➔ RR type and technical specifications
- ➔ Future RR site re-evaluation
- ➔ Definition of Technical and Safety Infrastructure for building a RR in a Country
- ➔ Identification of required human resources for the establishment, the operation and maintenance of RR
- ➔ Evaluation of investment, operation and maintenance costs

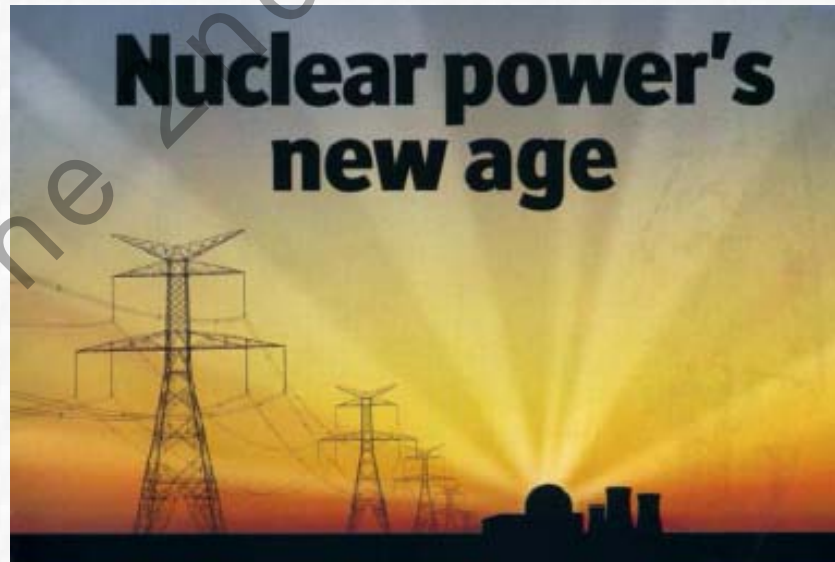
Research reactors are crucial to improving human health, growing more food and manufacturing better industrial products.

THE INTRODUCTION OF THE FIRST NPP IN TUNISIA : PROJECT STATUS

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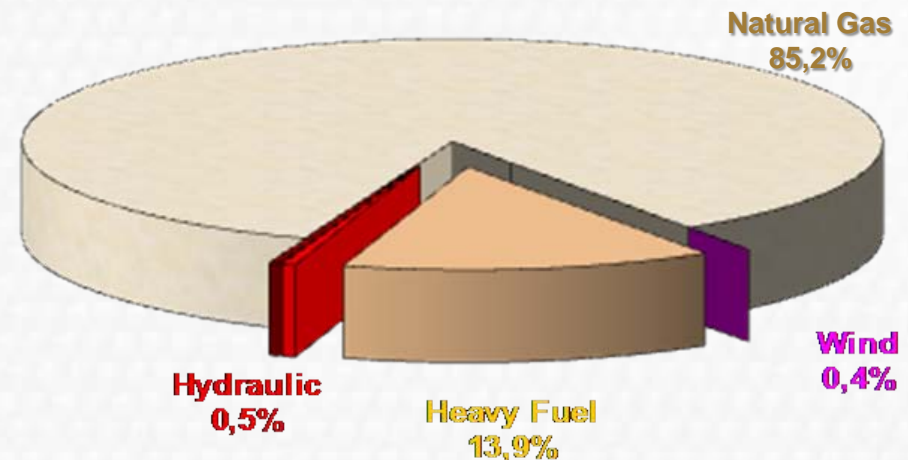
GOVERNMENT COMMITMENT

On November 3rd, 2006, the President of the Republic ordered the Electricity Utility (STEG) to **conduct the preliminary studies for NPP introduction** in collaboration with the Ministry of Higher Education and Scientific Research



NATIONAL REASONS FOR NPP INTRODUCTION

- Diversification of Energy Resources for a better energetic independence
(In 2007, about 85% of the produced electric energy came from natural gas).
- Secure stable and affordable power supply
- National production of fossil fuel is limited and will be in deficit from 2015
(for a pessimistic scenario without considering eventually the discoveries of new fields).
- Develop the country's industry
- Preserve the natural environment
- Meet high living standards

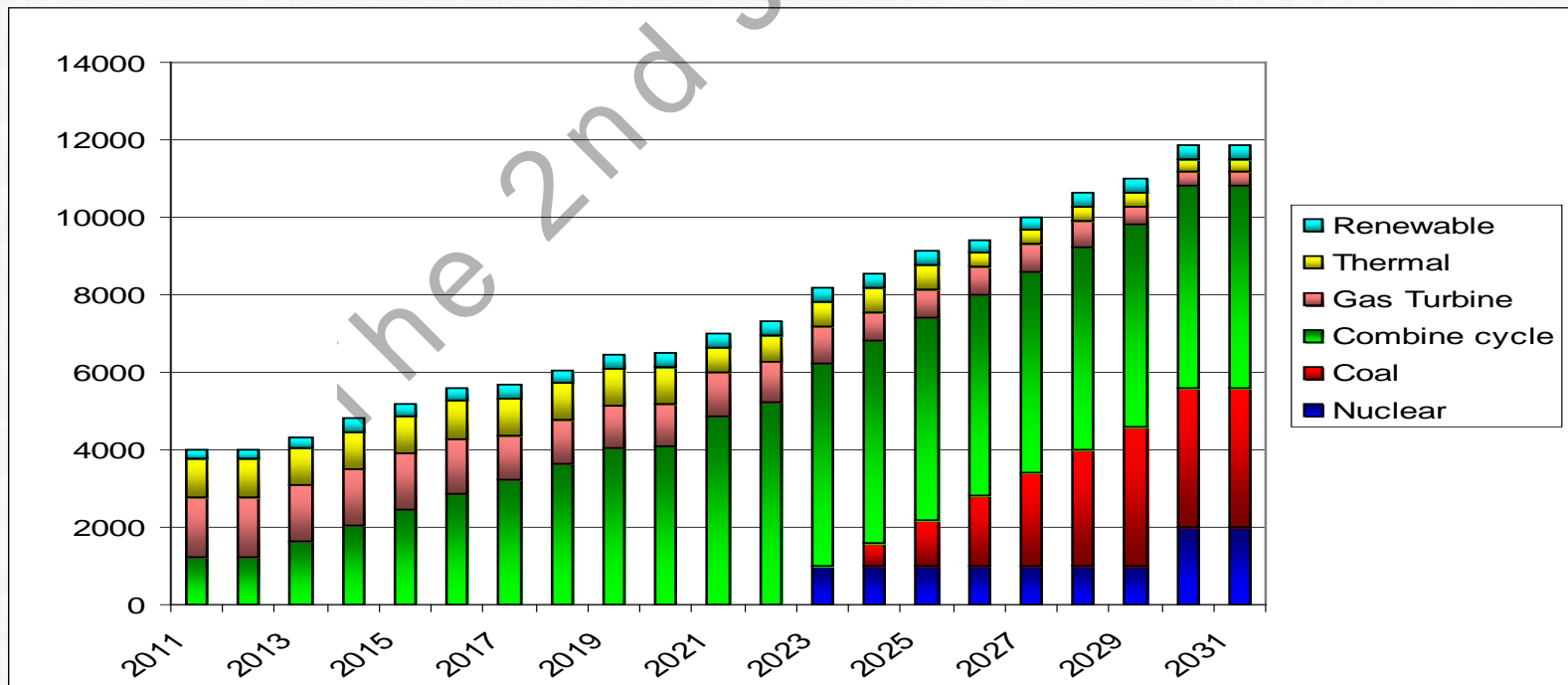


Electricity production by fuel type

POWER SYSTEM PLANNING

- 400 MWe combined cycle from 2011 to 2022
- First 1000 MWe NPP by 2023
- Second 1000 MWe NPP by 2030

The total installed capacity will be 11.8 GW by the 2031



PLANNING OF THE 1ST NPP IMPLEMENTATION

The implementation of the 1st NPP has been planned in 4 stages:

Phase 1
(2008 - 2013)

Undertaking siting activities and the techno-economic feasibility study necessary for the government decision

Phase 2
(2013 - 2017)

Launching the Call for Tender, bid evaluation and contract award

Phase 3
(2017 -2023)

Construction and Commissioning of the NPP

Phase 4
(2024 - 2084)

Operation of the NPP

NATIONAL STRATEGIC ACTION PLAN

- The Strategic Action Plan (SAP) was elaborated by following IAEA guidance documents and addressing the 19 infrastructure issues.
- The SAP defines the responsibilities of different actors for each objective to be achieved.

| No. | INFRASTRUCTURE ISSUES |
|-----|--------------------------------|
| 1. | National position |
| 2. | Nuclear Safety |
| 3. | Management |
| 4. | Funding and Financing |
| 5. | Legislative Framework |
| 6. | Safeguards |
| 7. | Regulatory Framework |
| 8. | Radiation protection |
| 9. | Electrical Grid |
| 10. | Human resources |
| 11. | Stakeholder involvement |
| 12. | Site and supporting facilities |
| 13. | Environmental protection |
| 14. | Emergency planning |
| 15. | Security |
| 16. | Nuclear fuel cycle |
| 17. | Radioactive waste |
| 18. | Industrial Involvement |
| 19. | Procurement |

LEGISLATIVE & INSTITUTIONAL FRAMEWORK

Creation of a Inter-ministerial Legislative Working Group under the responsibility of the National Atomic Energy Commission

- Law for the creation of the National Nuclear Safety Agency (NNSA) :
Regulatory Body
- Law for the creation of the National Nuclear Energy Agency (NNEA)
- Law for the creation of National Agency for Radioactive Waste and Spent Fuel Management

HUMAN RESOURCES ISSUES

The major challenge is to ...

- **guarantee the necessary staff for the project**
- **in both qualification and number.**



HUMAN RESOURCES PROGRAMME

- 2001, **CNSTN** initiated a Fellowship program in collaboration with the French institute **INSTN**: train 10 students per year in nuclear engineering.
- 2008, **STEG** restarted the program relaying on its proper financing.
- 2009, A **human resource development plan was** undertaken by a working group led by **CNSTN**: assessment of skills and competences needed throughout the project life of the planned NPP.
- the **Ministry of Higher Education and Scientific Research** set up a committee with the mandate to define a national **human resources development program** leading to higher Degrees (Technicians, engineers, PhD). The program is expected to start gradually beginning 2011.

The Goal is

... attaining and maintaining the level of personnel competence required for **NOT ONLY** the safe operation and maintenance of a nuclear power plant **BUT ALSO** to develop and maintain sustainable education and training programs for all the stakeholders.

HUMAN RESOURCES PROGRAMME

Main Fields for Training

Nuclear Project Management

Nuclear Reactor Physics

Nuclear Power System

Nuclear Safety and Security

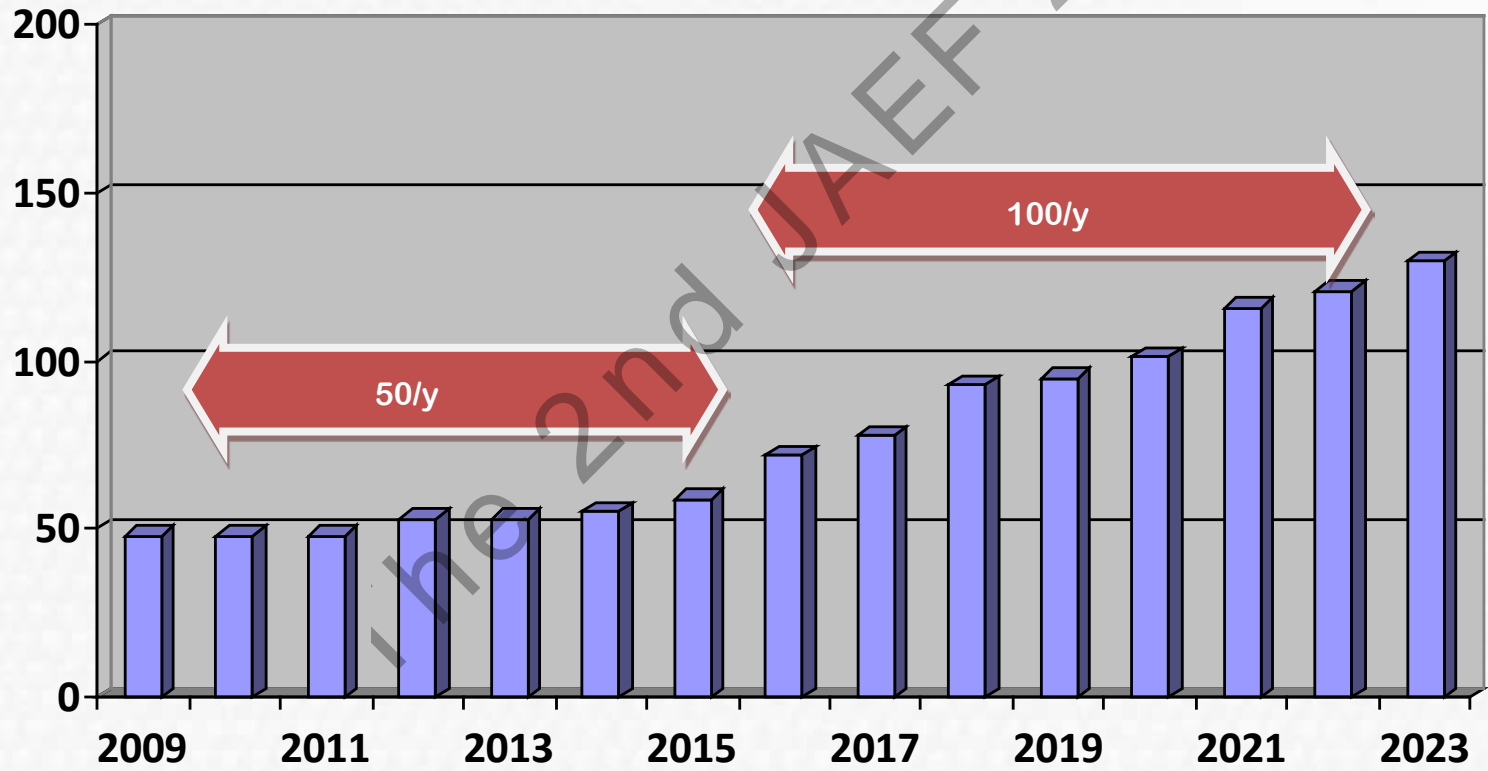
Nuclear Waste Management

Nuclear Research Reactor Utilization

Nuclear Fuel Cycle Management

Nuclear Law

Evaluation of national HR needs



Target groups

- Nuclear Power Plant Personnel,
- Responsible for the training of nuclear power plant personnel,
- Personnel of regulatory bodies,
- Nuclear power plant managers and supervisors.

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Specific goal : safety

- Promoting and strengthening quality culture and safety culture,
- safety requirements should be established and met in an objective manner.

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Challenges

Ever changing environment

- New technologies
- New forms of organizations

- Anticipate and adapt to future requirements,
- Training programs should be continually evaluated and improved.

CONCLUSION

- Tunisia has many years of experience related to the peaceful use of nuclear energy.
- Tunisia has an ambitious program for the development of peaceful use of nuclear energy
- Education and training is one of the key issues for the success of the program.
- International cooperation and support is important.

THANK YOU FOR YOUR ATTENTION

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