The Arab Atomic Energy Agency (AAEA)

The Contribution of the AAEA in Desalination Projects in Arab Countries

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League Of Arab States

(22 Countries)

Gulf Countries:

UAE
KSA
Qatar
Oman
Bahrain
Kuwait

African Countries :

Algeria
Morocco
Tunisia
Libya
Egypt
Sudan
Somalia
Djibouti
Comoros
Mauritania

Other Arab Countries :

Lebanon
Syria
Jordan
Palestine
Yemen
Iraq

Population **312 Million**

Most of these countries lie in arid and semi-arid regions

Scarce of water is a major problem

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The AAEA

- It is a specialized organization of The Arab league system. Established in 1989
- Promotes peaceful application of atomic energy through many activities; training, CRPs, meetings and conferences…..

The need for water and electricity in the region

- Arab countries are very poor in water resources
- The population will be doubled (650 million) in 2030
- The Domestic and industrial water demand will be 360 million m^3/day
- Electrical power consumption will be 4.5 trillion kwh/day

The desalination

- The Arab world contributes of about 60% of desalinated water production
- Most desalination today uses fossil fuels, which are decaying ➢ greenhouse gases
- The technologies used are MSF, RO, MED
- The desalination processes is highly power intensive
- RO needs 6kwh per cubic meter of water
- MSF and MED require heat at 70-130C° and use 25-200 kwh/m^3

The nuclear desalination

- SMRs are proven to be suitable for desalination, often with cogeneration of electricity
- The feasibility of nuclear desalination plants has been proven in many countries; Kazakhstan, Japan, India..
- IAEA fostering a CRP on coupling of nuclear reactor and desalination systems with participation of 9 states 3 are Arab countries
- The AAEA launched its CRP on nuclear desalination with conjunction of IAEA CRP

The AAEA Project of Nuclear desalination

- 9 countries participated in this project; Egypt, Libya, Tunisia, Lebanon, Jordon, Syria, Saudi Arabia, Morocco and Iraq
- The objective was to define and develop the steps and methods to establish a nuclear desalination plant in the Arab region
- A principal committee and many technical groups have been formed

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The Tasks of the Technical Groups

- Selecting a reference site which will be suitable for construction of the plant.
- Identification of the reactor type, size and characteristics.
- Identification of the desalination process which goes along with the model plant.
- Defining the infrastructure requirements for the reference site.
- Feasibility study.
- Safety and licensing

Siting Studies Group

- The parameters of a different available qualified sites have been studied, a model site with specific characteristics has been adopted
- The selection criteria included geological, meteorological, cooling water supply, transport infrastructure, population, electric grid, water network, environmental impact, airport movement.
- The specification and characteristics of a virtual site has been determined and given a name, ARAFRA
- ARAFRA is a virtual city located somewhere in coastal area in north Africa with population of 600000 and the average consumption of water is 0.33 m3/day.person
- Some qualified sites are already studied such as: Dabaa-Egypt, TanTan-Morocco, Rabigh-Saudi Arabia, Oran-Algeri , Ganush-Tunisia and Sirt-Libya

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Reactor Technology Group

- investigates and selects the type and characteristics of the reactor to be considered
- The technical group relied on the IAEA Options Identification Program (OIP) and other documents i.e. Site requirements Document (SRD) and User Requirements Document (URD).
- The reactors which have been studied by the group are: PWRs; AP-600 and QP-300, HWRs; CANDU-6 and PWR-220, GCRs; PBMR, and other designs; SIR, ISIS and ATS-150.
- The group outlined in details the specifications of these reactor types; their safety, performance, design, fuel cycle, waste management and national requirements
- A special emphasis was given to the electricity demands considering both the used desalination system and electrical energy that the site area need.

Safety and Licensing Group

- The status of the regulatory structure available in the Arab states has been reviewed
- Proceeds with the development of proposals for establishing a model approach for: safety - regulatory and licensing rules - regulations and procedure to be applied for nuclear desalination
- This should be consistent with international standards and practices

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Desalination Technology and Coupling Schemes

- All available desalination processes and technologies including those mentioned in IAEA- North African Study Report have been considered and studied
- All coupling methodology has been considered as to determine the appropriate coupling scheme.
- The group suggested that the plant should produce 300-450 MWe electricity and 100000-150000 m3/day water.
- It suggested also that the MSF-RO process are most convenient because of low energy consumption and low cost.
- The high capacity MSF process may be considered depending on the circumstances or the two processes can be used together.

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Feasibility study group

- The group assessed the economics of the model plant
- IAEA documents are always used as a reference guide.
- The study included: the capital cost, operation and maintenance costs, energy supply cost and costs of storage, transportation and distribution of water

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conclusion

- The outcome of the studies carried out by the different technical groups has been submitted to the principal committee and thus to the directorate of the AAEA.
- The principal committee also has reviewed the IAEA desalination activities carried out for North African countries under RAF TC project.
- Many meetings and activities were held namely:
  - Periodical meeting of different technical groups
  - Workshop on computer program DEEP
  - Workshop on Integrated Reactor Evaluation program
  - Continuing the cooperation with IAEA