

PROGRAMME AND ACTIVITIES ON NUCLEAR DESALINATION IN MOROCCO
*Pre-project study on demonstration plant for seawater desalination
using nuclear heating reactor in Morocco*



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Abstract

The first part of this paper gives the general information on the pre-project study of a demonstration plant for seawater desalination using a heating reactor being assessed jointly by MOROCCO and CHINA. The progress of the pre-project study is elaborated in the second part.

1. INTRODUCTION

Knowing that prior studies carried out by IAEA have revealed that the use of nuclear energy for the desalination of sea water is technically feasible and may compete with fossil energy, Morocco has planned to carry out a specific study for the Tan-Tan site, which will require 8 000 m³/d of desalinated water by the year 2000.

To that end, Morocco and China decided, with the assistance of IAEA, to perform jointly a pre-project study concerning an MED (Multi-Effect Distillation) plant coupled to a 10 MW (th) (Mega-Watt thermal) heating reactor. Such a project has been recommended as one of options for demonstration in the IAEA's Options Identification Programme.

2. MAIN CHARACTERISTICS OF PRE-PROJECT-STUDY

In order to perform this project, the following two documents have been established:

1. Agreement between the Moroccan Ministry of Energy and Mines and the China State Science and Technology Commission for the cooperation in the pre-project study.
2. Proposal for the pre-project study.

The agreement was signed by authorities of both sides on the 20th September, 1996 in Rabat, Morocco.

2.1 The objectives of a demonstration plant

The objectives of a demonstration plant are:

- To build up technical confidence in the utilization of a nuclear heating reactor for desalination of seawater; and
- To establish a data base for reliable extrapolation of water production costs to a commercial nuclear desalination plant of the same combination using a 200 MW (th) heating reactor to produce 140 000 m³/day of desalted water.

2.2 The capacity and the cost for produced potable water

Considering the above-mentioned objectives of demonstration, the capacity and the water production cost have been proposed to meet the following features.

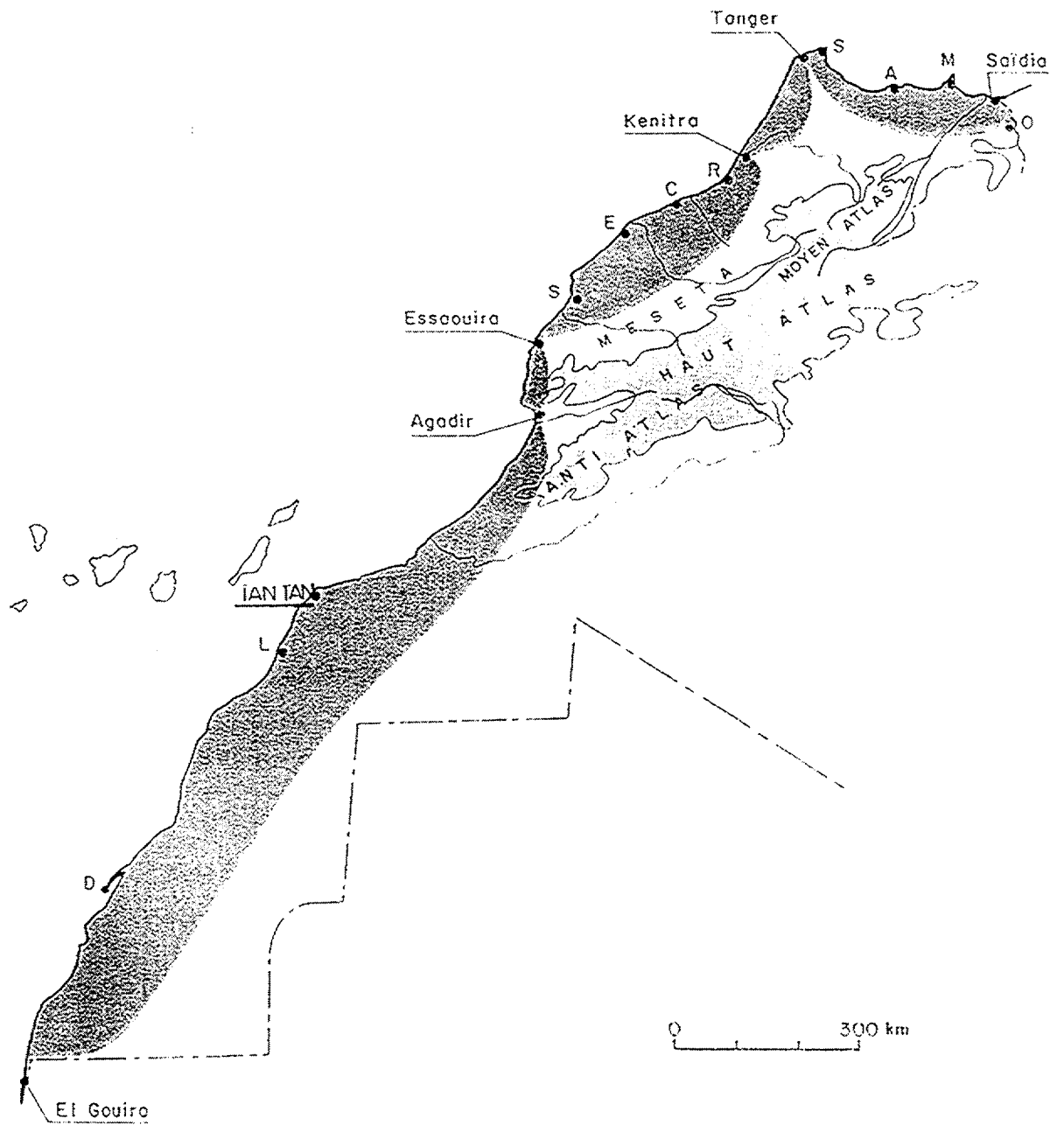


Figure 1

- the production capacity of the demonstration facility will be approximately 8 000 m³/day,
- the water production cost of the demonstration plant should be evaluated and extrapolated to a commercial scale nuclear desalination plant,
- the water production cost of a commercial nuclear desalination plant should be competitive with fossil options.

2.3 The technical and the economic aspects of demonstration

In the pre-project study, various technical and economic aspects of the proposed demonstration plant will be evaluated, in particular:

- The coupling scheme of a nuclear heating reactor with an MED desalination plant;
- Safety features of the nuclear desalination system;
- Facility maintainability of the plant; and
- Economic competitiveness of produced water and providing elements for economic analysis.

3. PERIOD OF THE PRE-PROJECT STUDY

The study was started upon signature of the agreement between Morocco and China for the scheduled period of 18 months starting from the 20th September 1996. The Moroccan side has organized one guiding committee composed of several Moroccan departments. At present, the studies are ongoing and the request of the Technical Assistance of the IAEA has been approved. This IAEA Technical Assistance includes both the experts mission and the scientific visits.

4. THE PROGRESS OF THE PRE-PROJECT STUDY

4.1 Siting

Two candidate sites have been chosen at the TAN-TAN beach county, located in the south of MOROCCO (see Fig. 1). Those coastal sites are located about 330 km south of the city AGADIR. The collection of data and information related to the technical, environmental, and economical aspects of the chosen sites are being studied. During the latest expert mission on siting, held in September 1997, those sites have been visited, and the mission report showed that both sites are suitable for locating the proposed demonstration plant of seawater desalination.

4.2 Reactor study

The MOROCCAN committee has undertaken calculations on the neutron physics and thermal hydraulics related to the 5 MW (th) reactor. As a result of this study, the committee has chosen the 10 MW(th) reactor. The design of the proposed 10 MW (th) heating reactor is based on the 5 MW (th) version which has been in operation in China. The features and design of the proposed reactor are still under going led by the China side.

4.3 Desalination system

The MED (Mulfi-Effect-Distillation) process has been adopted for the demonstration plant by both Moroccan and Chinese sides in consideration of its advantages. The call for cooperation partners for the pre-project study on the desalination process system has been launched. The bids must be evaluated later at an appropriate timing. The study is ongoing.

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