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PLAN FOR PRODUCING POTABLE WATER ECONOMICALLY:**THE NUCLEAR DESALINATION OF SEAWATER AND
SMALL AND MEDIUM REACTOR DEVELOPMENT****I. Introduction**

1. Resolution GC(41)/RES/14 requests the Director General to report on the progress made in the implementation of the resolution to the Board of Governors and the General Conference at its forty-second session. This document provides an overview of actions on nuclear desalination and Small and Medium Sized Reactors implemented in the Secretariat since the last General Conference.

2. In order to assist Member States in their planning and implementation of nuclear desalination programmes and projects, preparation of a Guidebook on "Introduction of Nuclear Desalination" is underway. The Guidebook will comprise three major parts, namely, (1) Overview of nuclear desalination, (2) Special aspects and considerations relevant to the introduction of nuclear desalination, and (3) Steps to introduce nuclear desalination. The first draft will be reviewed by the International Nuclear Desalination Advisory Group (INDAG) at their next meeting in June 1998.

II. International Nuclear Desalination Advisory Group (INDAG)

3. INDAG had its first meeting in September 1997. In the course of the meeting national programmes and projects in Member States were reviewed and discussed. Highlights of these activities in Member States presented at the meeting include the following.

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Delegates are kindly requested to bring their copies of documents to meetings.

4. In Argentina a small reactor is under design (CAREM), which is planned to be coupled to a desalination process. In Canada activities on nuclear desalination comprise desalination technology development and studies for coupling to CANDU reactors and, in cooperation with the Russian Federation, to a small reactor formerly used for ship propulsion. In China a feasibility study has been initiated for a heating reactor combined with a desalination unit that could produce 150,000 m³/d of potable water. In India an existing PHWR will be coupled to a desalination unit; India offers this demonstration project for international cooperation. The status of operating nuclear seawater desalination facilities in Japan was presented; ten units are in operation and have accumulated about 80 reactor years of operational experience. In the Republic of Korea the development of a small reactor planned to be coupled to a desalination unit continues; the Republic of Korea offers this project for international cooperation. In Morocco the feasibility study for the introduction of a nuclear desalination plant will be finalized in the second half of 1998. In the Russian Federation a small floating nuclear desalination plant is under development; this project is offered for international cooperation.

5. Based on these reports, INDAG recommended the Agency to strengthen its role in providing a forum for information exchange on nuclear desalination, to initiate some new activities as described below, and to facilitate coordination among various demonstration programmes currently planned or underway in Member States.

III. New Activities

6. Preparatory work for establishing an information system of nuclear heat applications has been initiated. The new database is being designed to comprehensively encompass plant design specifications, performance data, operating and outage statistics and other relevant information on nuclear plants for non-electrical applications, which include nuclear desalination, district heating, heavy water production and others. The new database will be a set of new tables to be integrated into the existing Power Reactor Information System (PRIS) database.

7. A new Coordinated Research Programme (CRP) on "Optimization of the Coupling of Nuclear Reactors and Desalination Systems" is being implemented. The CRP will address the review of reactor designs intended for coupling with desalination systems, optimization of this coupling, the performance improvements of desalination systems and a review of advanced desalination technologies for nuclear desalination. The first Research Coordination Meeting is scheduled for November 1998.

8. The computer programme Cogeneration and Desalination Economic Evaluation (CDEE) is being validated to perform economic assessments of nuclear desalination plants in comparison with fossil fueled desalination options.

9. Work has been initiated on safety aspects of desalination using nuclear energy. The aim of this activity is to study safety implications of coupling nuclear power plants with desalination units, to ensure that all safety measures have been taken to avoid any possible contamination of product water and to review operational and transient issues of nuclear desalination plants. The applicability of current IAEA safety publications and the need for additional guidance in this area are being investigated.

IV. Small and Medium Sized Reactors

10. Small and Medium Sized Reactors (SMRs) are of particular interest for non-electrical applications of nuclear energy, such as desalination of seawater and district heating. But SMRs are also a suitable option for electricity generation in countries with small electricity grids or for remotely located areas. The Agency is drafting guidelines to assist developing countries in establishing and harmonizing user requirements. These requirements will provide the general frame for SMR development.

11. The Agency has prepared an educational simulator (a software package) for universities and research centers, which would operate on a personal computer and simulate responses of a number of reactor types in the SMR size range to operating and accident conditions. This simulator is very useful in providing training for students and junior engineers in their nuclear engineering courses. The computer code can simulate selected BWRs, PWRs, PHWRs and PWRs with passive safety features such as the AP600. A Technical Committee Meeting and TC regional training course were held in November 1997, in Vienna and Cairo respectively, on the utilization of this simulator. Expansion of this programme has also been initiated to include nuclear heating reactors with passive safety features (NHR-5).

12. To perform an economic design optimization of integral type SMRs, i.e. reactors where the steam generators are included in the pressure vessel, the Agency has initiated the development of a computer code for interested organizations in Member States. The code will be available in mid-1998.

13. Studies have been initiated to review technical and economic feasibility of SMRs which would not require on-site refueling. These reactors, such as barge mounted concepts, would be returned to the vendor for maintenance and refueling.

V. Financial Requirements

14. The draft budget for 1999-2000 includes nuclear desalination activities under Project A.2.06, SMR activities under Project A.2.01, and safety-related aspects under Project H.2.01. For full implementation of all activities in projects A.2.06 and A.2.01 extra-budgetary resources are required and the Secretariat has sent letters to potential donor countries asking for financial and technical support.

RECOMMENDED ACTION BY THE BOARD

15. It is recommended that the Board take note of this report and authorize the Director General to submit it to the General Conference at its forthcoming regular session further to Resolution GC(41) RES/14 with any necessary updating of activities undertaken by the Secretariat in the time between the March Board and the General Conference.