

Progress in each project from the second Research Coordination Meeting

INVAP/Argentina

- Evaluation of Nuclear Desalination Coupled Systems
- Based on a wide agreement on shifting the effort from the modelling and analysis of specific transients to the extension of the modelling capabilities of DESNU on different desalination technologies and different simulating codes, the task “Analysis with different codes and different Desalination Process” has been newly initiated, replacing the tasks “Transients modelling”, “Transients Analysis” and “Optimised transients”.
- At a Consultancy Meeting in December 2000 in Bariloche new workplans were concluded for upgrading the capabilities of the modelling tool, DESNU spreadsheet for the analytical evaluation of migration of radioactive substances to the desalination system in the coupled configuration. The extended work plans to produce input files including models for a nuclear plant (NSSS and BOP) and MED, MSF and RO, for the RETRAN simulating tool. The work is underway.

CANDESAL/Canada (presented through material)

- Optimized Nuclear Desalination/Cogeneration Using Reverse Osmosis with Feedwater Preheat
- After completion of Task1 in the first year the second year placed focus on Task2 - Test Facility Design & Review, and Task 3 - Test Program Monitoring & Data Evaluation. Although some difficulty in procurement delayed the original schedule, the construction of the test facility has been completed and the first phase of the experimental program has been carried out successfully.
- The data has been of very good quality, extremely consistent over the full range of pressure and temperature conditions, and highly repeatable. The results have shown that the performance improvements being anticipated in the earlier analytical projections are achievable in practice. A typical graph of permeate flow as a function of pressure and temperature, with fixed feed flow into the system, has been presented through distributed material.
- It was also notified that the contract renewal would not be sought due to internal reasons.

INET/China

- Preliminary Optimization Analysis on Coupling of Nuclear Heating Reactor with selected Seawater Desalination Processes
- Work progressed essentially as planned. Following the comparative analyses of a coupling configuration of the NHR-200 and the MED processes (low temperature/horizontal tube, high temperature/vertical tube), the research work has shifted in the third year and onward its focus on the coupling scheme of NHR-200 and VTE-MED. The analysis shows that this coupling scheme has a capability to produce more water.
- A computer program has been developed for investigating thermal hydraulic performance of the coupling scheme. Preliminary analysis results of thermal hydraulic performance of the VTE-MED system were reported.
- A thermal hydraulic test facility using electric heaters as the heat source has been designed and its construction work is now completed. The test facility will be used for verifying the developed computer program, which will be used to analyse the performance of the coupled system within the extended CRP timeframe.

NPPA/Egypt

- Investigation of Feedwater Preheating Effect on RO Performance

- Planned construction of the experimental facility at El-Dabaa has been delayed due to multiple reasons including technical and institutional matters, which were unforeseen and/or uncontrollable. An example of technical reasons was the unexpected depth of the well for the feedwater. Due to these reasons the construction work is still ongoing. The overall plan of the research project will be delayed about one year. But still experimental date planned for the first two phases will be evaluated within the CRP.

BARC/India

- Performance Improvement of Hybrid Desalination Systems for Coupling to Nuclear Reactors

- Site work for the Nuclear Desalination Demonstration Project (NDDP) at Kalpakkam continued.
- The experiments of MSF, RO and the LTE pilot plant at Trombay continued and their data were presented.
- The Effect of Top Brine temperature (102 - 121°C) and seawater inlet temperature (30 - 36°C) on the performance of MSF plant were examined and presented.
- The efficacies of intermediate isolation heat exchangers on the HP & LP turbines were evaluated.
- The effect of heating water temperature (50 - 63°C) on the LTE pilot plant performance was studied and reported.
- The effect of elevated feed water temperatures (26 - 40°C) on the RO membrane performance was studied with 2512 and 4040 spiral elements at different pressures. The specific observation of increase in the solute passage (or decrease in salt rejection) after about 32°C in the experimental finding was explained.
- India also provided relevant data upgrading the modelling tool DESNU for the analytical evaluation of migration of radioactive substances to the desalination system.
- Future plans of CRP studies at BARC for the next period, i.e., up until Feb. 2002 consists of the LTE plant performance study at the Cirus research reactor and experiments at elevated temperature effect on commercial membranes. The last part of the study, i.e., for the period from Mar. 2002 to Dec. 2003 consists of mainly combined MSF - RO pilot plant study & membrane based pre-filtration in the RO plant. The work plan on the bar chart including the preparation of TEC-DOC was revised accordingly.

NAEA/Indonesia

- Feasibility Study of Co-production Plant for Electricity and Water by Using Nuclear Energy

- The project has been partly redefined based on the evaluation and recommendation at the second RCM in February 2000. The third year focused on optimal coupling of a heat source and desalination processes.
- Based on the revised objective some experimental work has been done on bio-fouling and scaling effects in the desalination process performance. The evaluation of the experimental results is continuing.
- In view of the limited time frame available in the CRP it was recommended to further limit the project plan. (This recommendation was made in connection with the progress report for the contract renewal.)

KAERI/Korea, Rep. of

- Optimal Coupling of SMART and Desalination Plant
- Based on the selection of MED for coupling with SMART, its detailed configuration and performance analyses have been continued. Major coupling and performance parameters such as GOR, motive steam to load ratio and recovery ratio of the MED-TVC unit were determined for the target water production capacity of 40,000 m³/day and electricity generation of 90MW. The standard design of MED-TVC (unit capacity of 10,000 m³/ day) is currently under development based on these data. Sensitivity analysis on water production cost was performed for the capacity factor, discount rate, and construction cost, indicating that a SMART desalination complex can be considered as a competitive choice.
- In the meantime collaboration was made with other participants regarding the upgrading of the modelling tool DESNU for the analytical evaluation of migration of radioactive substances to the desalination system.

CNESTEN/Morocco (newly joined)

- Optimization of the Coupling of Nuclear Reactors and Desalination Systems in Morocco
- The need of water in the country and the expectation of nuclear desalination were elaborated. The information collection on desalination and nuclear reactors is underway and site conditions are being identified. Possible international collaboration is foreseen. The project plan in the CRP was discussed. This project may provide the decision maker with additional information regarding the possibility of another choice than the earlier completed feasibility study of an 8000m³/d demonstration plant using a heating reactor.

IPPE/Russian Federation

- Utilization of Russian Small-sized Nuclear Reactors as an Energy Source for Nuclear Desalination Complexes: Optimization of Coupling Design, Performance and Economic Characteristics
- RUTA design has been changed to improve the performance of its coupled nuclear desalination complex. The reactor power has been increased to 70 MW(th). It now uses forced circulation to enable higher temperature water to the desalination system. Application of DEEP foresees significant reduction of the water production cost against the basic concept of using the former RUTA-55.
- Various possible coupling configurations have been developed using KLT-40C aboard the floating power unit in collaboration with Canada. Evaluation is underway.
- No progress was made on the application of NIKA-70.
- Upgrading of DEEP to meet the Russian needs has been in progress and the revised version has been used in the preliminary analysis. The results are to be analysed.
- In the meantime collaboration was made with other participants regarding the upgrading of the modelling tool DESNU for the analytical evaluation of migration of radioactive substances to the desalination system.

CNSTN/Tunisia (not reported)

- Optimization of Hybrid Desalination Systems with a Nuclear Reactor

TNRC/Libya (not reported)

- Assessment of potential nuclear desalination coupling schemes in Libya