

Coordinated Research Programme on:

New Technologies for Seawater Desalination Using Nuclear Energy

This CRP will focus on the introduction of innovative technologies which may help making nuclear desalination more safe and economical.

The new technologies are expected to enhance the harvesting of waste heat available in nuclear reactors (i.e. waste heat from the condenser of water cooled reactors, or from the precooler and intercooler of High Temperature Gas Reactors HTGR) and utilize it for seawater desalination. New technologies may involve technologies related to the desalination processes such as Low Temperature-Horizontal Tube Multi Effect Distillation **LT-HT MED**, others related to the efficient and maximising heat recovery systems such as **heat pipes**, or the optimization of **coupling configuration** between nuclear reactors and desalination systems. Additional dimensions of the CRP are to analyze the **economics** of cogeneration systems (i.e. for electricity and water production), and improve the IAEA **DEEP** software.

The CRP will help support R&D in nuclear desalination technologies with the aim of producing large amounts of desalted water at the lowest possible cost and in a sustainable manner, and assist developing countries interested in nuclear programmes to master applications of nuclear energy for seawater desalination and cogeneration option.

Overall Objective of the CRP: is to address new innovative technologies which enables seawater nuclear desalination to be more viable and attractive.

Specific Research Objectives:

The specific research objectives of the proposed CRP are:

- Analysis of innovative technologies suitable for harvesting waste heat available in nuclear reactors for seawater desalination using different technologies (Heat Pipes as heat exchangers, LT-HT MED, and recovery of heat from High Temperature Reactors (HTR), others),
- Analyze of economics of cogeneration systems (i.e. for electricity and water production),
- Analysis of optimized coupling schemes including waste heat recovery systems and performing thermodynamics and economics aspects of such couplings.
- Development of a decision support system (DSS), based on improved DEEP models, for integrated system design and cost performance assessment.
- Development of innovative or improved integrated desalination systems, with the lowest possible costs and a high potential for sustainability
- Furnishing important economic data to decision makers for the choice of technical and economical options; economic assessment results for various desalination systems chosen for specific sites in the Mediterranean; evaluation of the sustainability of most promising solutions

Expected Research Outputs:

- Coherent and validated decision support system enabling decision makers to make a choice of techno-economic options for integrated desalination systems.
- Identifications of potential technologies for the harvesting of waste heat of nuclear power reactors.
- Reports on Technically and economically optimised coupling schemes for the implementation of nuclear desalination projects in selected countries.
- Reports on nuclear desalination competitiveness and sustainability for selected sites and countries
- Release of upgraded version of DEEP.