

## Utilisation of the exergy method for the cost evaluation of integrated nuclear desalination systems

S. Nisan

*NDS International, 194, Rue F. Mistral, F-84120 Pertuis, France*  
*Tel. +33 6 27 14 24 66; email: simon.nisan@wanadoo.fr*

Received 2 April 2009; Accepted 4 August 2009

---

### ABSTRACT

At present, the DEEP code, developed by the IAEA is being used internationally for the cost evaluation of integrated nuclear desalination systems. However, economic models in DEEP are often criticised because they are based on the power credit method in which the allocation of the benefits from the sale of one product (electricity) are arbitrarily attributed to the second product (desalted water). To determine the costs of the two products in an integrated nuclear desalination system, we thus used the exergy method which determines the useful work done by the two products in a more equitable manner, using the second and the third laws of thermodynamics. This paper summarises the first results of an economic evaluation of three integrated systems based on the utilisation of the French PWR900, the AP-600 (Westinghouse) and the gas turbine, combined cycle plant (CC900), all coupled to an MED process, and operating in a co-generation mode, producing about 288,000 m<sup>3</sup>/d of desalted water. These results are compared with those obtained with the help of the modified IAEA code, DEEP3.1, based on the power credit method. It is observed that the application of the exergy principle leads to water and electricity costs which are at most within about 27% of those obtained by the power credit method. Since this error is about the same order of magnitude as that in the economic data and the models used in DEEP, the comparison allows to have reasonable confidence in DEEP results.

*Keywords:* Nuclear desalination; Economics of desalination

---