DESALINATION OF SEA WATER, WATER CHEMISTRY AND THERMOPHYSICAL PROPERTIES OF WATER

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Introduction: Most of the nuclear reactors in operation use water as the cooling media. High temperature water becomes an aggressive substance when in contact with the different materials of the nuclear reactor systems. Then, the reliability and safe operation of nuclear energy systems are directly related with the water and steam chemistry. Another need related with the water, for reactor and thermal power plants design, is its chemical and thermophysical properties. There is also a different side to see the water; its need for the live organisms, which include the humans. It is well known that the water is a resource becoming scarce and the desalination of sea water is one of the most promising solutions, with nuclear reactors being the source of energy to produce this water.

Desalination: During the year of 2003 we conceived a project to perform a social, economic and environmental assessment of the use of IRIS Reactor for electricity generation and water desalination in the driest region of Brazil, the Polygon of Drought. The project was submitted and approved by the Fund of Energy of the Brazilian Council on Research and Development (CNPq) of the Brazilian Ministry of Science and Technology (MCT). This project joint the research line of advanced reactors with the water research line. The project will be performed in cooperation with the Federal University of Pernambuco (UFPe) and the Regional Nuclear Sciences Center (CRCN) of the Brazilian Nuclear Energy Commission (CNEN). The objective is to make comparisons between the nuclear and gas options. The final goal is to offer effective evaluations considering the total costs of the different energy options and also the social and environmental aspects associated with them. At this moment we are collecting data and starting the activities at IPEN, UFPE and CRCN.

Water properties: Since 2001 Brazil, in composition with Argentina, is a full member of "The International Association for the Properties of Water and Steam - IAPWS" (www.iapws.org). IAPWS is an international non-profit association of national organizations concerned with the properties of water and steam, particularly thermophysical properties and other aspects of high-temperature steam, water and aqueous mixtures that are relevant to thermal power cycles and other industrial applications. IAPWS objectives are: to provide internationally accepted formulations for the properties of light and heavy steam, water and selected aqueous solutions for scientific and industrial applications; to define research needs and promote and coordinate research on steam, water and selected aqueous systems important in thermal power cycles; to collect and evaluate the resulting data, and to communicate and promulgate the findings; to provide an international forum for exchange of experiences, ideas and results of research on high-temperature aqueous media. In the biennium 2002/2003 we have developed the software to compute the thermo-physical properties of water and steam in accordance with the industrial formulation IAPWS-97. This software was used to prepare the tables necessary to edit a book. This book is being edited in cooperation with the Argentine Nuclear Energy Commission (CNEA).

Water quality control: This is an important issue with respect to any kind of water respect. IEA-R1 is a pool type research reactor, moderated and cooled with low temperature light water and is an important laboratory to study water quality control. The experience accumulated during several years of IEA-R1 operation, allowed the development of expertise to provide the following services: design and specification of water treatment systems; design and specification of laboratories for water quality control of cooling circuits; specifications and implementation of Water Quality Control Programs.