

Abstracts for Poster Presentations

Tuesday, May 17

Design Features of ITER Cooling Water Systems to Minimize Environmental Impacts

Babulal Gopalapillai¹, Warren Curd¹, Giovanni Dell'Orco¹, Steve Ployhar¹, Keun-Pack Chang¹, Fan Li¹, Fabio Somboli¹, Jan Berry², Andrei Petrov², Dinesh Gupta³, Ajith Kumar³

¹ITER Organization, Route de Vinon sur Verdon, 13115 St Paul Lez Durance, France
babulal.gopalapillai@iter.org, warren.curd@iter.org, giovanni.dellOrco@iter.org,
steve.ployhar@iter.org, keunpack.chang@iter.org, fan.li@iter.org, fabio.somboli@iter.org

²US-ITER, Oak Ridge National Laboratory, P.O. Box 2008, Oak Ridge, TN 37831, USA
berryjb@ornl.gov, petrovay@ornl.gov

³ITER-INDIA, Institute for Plasma Research, Gandhinagar, Gujarat 382 428, India
dinesh.gupta@iter-india.org, ajith.kumar@iter-india.org

ITER is a joint international fusion facility which is being built in France to demonstrate the scientific and technological feasibility of fusion power. ITER will pave the way for the commercial exploitation of nuclear fusion to meet the ever increasing energy needs of mankind. Fusion power at ITER is generated using a Tokamak machine in which burning plasma inside the vacuum vessel at temperatures in excess of 150 million °C is confined by magnetic fields. The enormous amount of heat energy generated from the Tokamak and the auxiliary systems are removed by the Cooling Water System (CWS). The ITER Cooling Water System consists of the Tokamak Cooling Water System (TCWS), the Component Cooling Water System (CCWS), the Chilled Water System (CHWS), and the Heat Rejection System (HRS). All these are closed loop systems, except HRS which is an open loop system. Cooling water system is designed to remove the total peak heat load of about 1100 MW to the atmosphere by circulating approximately 25,000 m³ of water of diverse chemical specifications in multiple loops.

TCWS removes heat from Tokamak Primary Heat Transfer systems (PHTSs) during plasma operations and transmits this heat to the component cooling water system (CCWS). The TCWS provides the primary confinement for the radioactive substances contained in the cooling water. The secondary confinement is provided by the Tokamak complex buildings wherein the TCWS is located. The main sources of radioactive contamination in TCWS include Tritium, Activated Corrosion Products (ACP), ¹⁴C, ¹⁶N and ¹⁷N isotopes. The CCWS and CHWS transfers heat from their client systems to the Heat Rejection System (HRS) from where the heat is rejected to the atmosphere through the evaporative HRS Cooling Towers. The design of the cooling water systems considers occupational health and safety, nuclear safety, radiation protection, and environmental protection requirements. Minimizing environmental impact is a major factor in demonstrating the viability of fusion energy as future energy source. This paper presents the features in the design of CWS for making it environmentally benign.

“The views and opinions expressed herein do not necessarily reflect those of the ITER Organization”

