U.S. DEPARTMENT OF ENERGY
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DOE/ROK

ABSTRACT

Investigation of Heat Transfer in Supercritical Fluids for Application to the Generation-IV Supercritical

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Because of the lack of phase change in the core, SCWRs, unlike LWRs, cannot use design criteria based on the critical heat flux concept. The commonly accepted practice is to specify cladding temperature limits that must be met during different events. This makes it very important to predict the heat transfer coefficient to the supercritical water coolant with great accuracy. However, while considerable information exists on heat transfer to supercritical water in round tubes for fossil boilers, little is known about the effect of the geometry and fluid conditions typical of the SCWR core.

This project addresses the critical issue of measuring heat transfer to supercritical water at prototypical SCWR conditions and to develop the tools to predict the SCWR thermal behavior. In addition to actual supercritical water surrogate fluids at supercritical conditions will be used because (i) valuable insight of the physical phenomena can be gained with these fluids, and (ii) some existing facilities already use such fluids, which in general have lower critical pressure and temperature, thus affording significant cost and time savings in constructing and operating the experimental facilities.

The GIF SCWR Steering Committee believes that the above objectives can be achieved by means of an integrated international project involving multiple GIF countries. This U.S.-R.O.K. I-NERI project is intended to be only a portion of that GIF project, which could eventually involve also Euratom, Japan and Canada. This mini-proposal does not cover the full scope of the GIF project.