



Contribution ID: 347

Type: Poster

HELICAL COIL STEAM GENERATOR THERMAL HYDRAULIC PERFORMANCE

CAREM25 operates with an innovative helical-coiled steam generator (SG) integrated within the reactor pressure vessel, envisioned to provide superheated steam while presenting a low hydraulic resistance that allows for the primary coolant natural circulation. For this reason, the secondary coolant flows inside the SG's pipes distributed across six annular arrangements named as "jackets", and the primary coolant by the shell side.

The one-dimensional lumped parameters formulation is suitable for a first order assessment of the SG's heat transfer capacity and dynamic simulations; whilst it fails to provide intermediate fidelity information regarding temperature profiles across the axial axis for each jacket, secondary side quality distribution and other sensitivity analysis. On the other hand, a detailed CFD model, even when the primary side is modeled as porous media, requires extensive computational effort and several assumptions regarding the secondary side single- and two-phase flow.

A steady state, 2D lumped parameter, MATLAB code named "MIGV" was developed to assess the thermal hydraulic performance of the CAREM25's SG at different operational points. It is based on validated correlations for both the primary and secondary flows, particularly for the heat transfer calculation and the pressure loss coefficient of the secondary side. Thermal properties are evaluated at local conditions and the heat transfer area, flow passage sections and other relevant geometrical parameters are considered consistently with the actual manufactured SG. Results were compared against a RELAP plant model and OpenFOAM(R) CFD models, exhibiting consistent outputs. The code MIGV proved to be a versatile and agile tool for thermal-hydraulic assessment.

Country OR International Organization

Argentina

Email address

egimenez@cab.cnea.gov.ar

Confirm that the work is original and has not been published anywhere else

YES

Author: Dr GIMENEZ, Emanuel (Comisión Nacional de Energía Atómica)

Co-authors: Dr RAMAJO, Damián Enrique (CIMEC - CONICET); Dr GODINO, Darío (CIMEC - CONICET); Dr CORZO, Santiago Francisco (CIMEC - CONICET)

Presenter: Dr GIMENEZ, Emanuel (Comisión Nacional de Energía Atómica)

Track Classification: Topical Group A: SMR Design, Technology and Fuel Cycle: Track 1: Design and Technology Development of SMRs