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ASTRID French SFR: Progress in Sodium Gas Heat Exchanger development

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Within the framework of the French 600MWe Advanced Sodium Technological Reactor for Industrial Demonstration project (ASTRID), a Gas Power Conversion System (PCS) based on a Brayton cycle is studied. This innovative option has never been implemented in any Sodium Fast Reactor and is mainly justified by safety and acceptance considerations in inherently eliminating the sodium-water and sodium-water-air reaction risk existing in Steam Generators with a Rankine cycle.
The present work describes the current status of the design of an innovative compact Sodium Gas Heat Exchanger (SGHE) and highlights the industrial challenges this technology raises.
This paper presents the details of the design of the SGHE which allows a high thermal compactness. The main studies supporting the development are described whether on the external pressure vessel or on the compact internal heat exchanger modules; the thermal hydraulic program demonstrates the potential of the technology used whereas the thermo mechanical analyses show the good behavior of this exchanger under the ASTRID operating conditions.
The manufacturing welding process optimization for the heat exchanger modules is ongoing in order to produce a component with nuclear specifications. Specific sensors and control techniques are also being developed in order to assess the manufacturing process quality and to allow future in-service inspections.
At last, the qualification program is presented and the results obtained on an operating small scale SGHE mock up (DIADEMO) working under ASTRID conditions are described.

Country/Int. Organization

CEA CADARACHE / FRANCE

Author: Mr PLANCQ, david (CEA)

Co-authors: Mr DIRAT, jean-francois (AREVA NP); Mr CACHON, lionel (cea)

Presenter: Mr PLANCQ, david (CEA)

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