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Updated design and integration of the ancillary circuits for the European Test Blanket Systems

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The validation of the key technologies relevant for a DEMO Breeding Blanket is one of the main objectives of the design and operation of the Test Blanket Systems (TBS) in ITER. . In compliance with the main features and technical requirements of the parent breeding blanket concepts, the European TBM Project is developing the HCLL (Helium Cooled Lithium Lead) and HCPB (Helium Cooled Pebble Bed)-TBS, focusing in this phase on the design life cycle and on R&D activities in support of the design.

In this context, a sound design of the TBS ancillary systems is mandatory for the reliable operation of the two TBS in ITER. This is the basis for the success of the TBM Project, with the full scientific exploitation of the experimental results and return on experience in view of the DEMO Breeding Blanket development. .

The TBS ancillary systems are mainly circuits devoted to the removal of thermal power and to the extraction and recovery of the tritium generated in the Test Blanket Modules. They are:

- The Helium Cooling System (HCS);
- The Coolant Purification System (CPS);
- The Tritium Extraction System (HCLL-TRS, HCPB-TES);
- The Lead Lithium Loop.

Their conceptual design was deeply analyzed during the ITER Conceptual Design Review in 2015. The present design takes into account the main CDR recommendations as well as the implementation of the requirements related to ITER operation, safety principles and physical space constrains. The CPSs were redesigned to fulfill the requirements of tritium concentration in the coolant, and CPSs and HCSs were moved from CVCS to TCWS area with integration activities very complex to comply with ITER physical interfaces.

Finally yet importantly, the preliminary design and integration of TAS (Tritium Accountancy Station), which implements the fundamental function of the tritium accountancy for TBS, is presented and discussed.

Co-author: AIELLO, Antonio (FSN-ING ENEA)

Presenter: AIELLO, Antonio (FSN-ING ENEA)

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