

Assessing Technology Readiness for Critical Technical Elements in the Conceptual Design of the ITER Tokamak Exhaust Processing System

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The Tokamak Exhaust Process (TEP) System is part of the Tokamak Fuel Cycle Systems (TFCS) and is located in the Tritium Plant, which is essential for the operation of ITER. The TEP is primarily a gas handling/processing system, although tritiated water vapor handling and processing is also performed. The TEP system is completing the conceptual design review process for the ITER Tritium Plant. As part of the conceptual design efforts, a technology readiness assessment of the critical technical elements was performed by the project team at the Savannah River National Laboratory and the Los Alamos National Laboratory.

Technology Readiness Levels (TRLs) are a means to categorize the relative technical maturity of components, sub-systems, or systems. Technological or technical maturity is a measure of performance, reliability, durability, and operating experience, and more technologically mature components (better performing, more reliable, more durable, greater operating experience) are rated higher than experimental or prototype components or systems. Various government agencies and research programs are now using TRLs to assess the technological maturity of components and systems in order to drive the technology development process. Department of Energy process guides were utilized to evaluate critical technical elements for the TEP system. It was determined this approach was not optimal for evaluation of TEP's tritium process components or systems. An alternate approach, utilizing technology evaluation based on the risk analysis and tritium operating experience, provided a more accurate assessment of the relative technical maturities of the proposed TEP system components in their process application. This paper describes methods used to evaluate the technology readiness of the TEP critical technical elements during its conceptual design.