An Overview of the US DCLL ITER TBM Program

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Under the US Fusion Nuclear Science and Technology Development program, we have selected the Dual Coolant Lead Lithium concept (DCLL) as our primary Test Blanket Module (TBM) for testing in ITER. The DCLL blanket concept has the potential to be a high-performance DEMO blanket design with a projected thermal efficiency of >40%. Reduced activation ferritic/martensitic (RAF/M) steel is used as the structural material. Helium is used to cool the first wall and blanket structure, and the self-cooled breeder Pb-17Li is circulated for power conversion and for tritium breeding. A SiC-based flow channel insert is used as a means for magnetohydrodynamic pressure drop reduction from the circulating liquid Pb-17Li and as a thermal insulator to separate the high-temperature Pb-17Li (~650°C to 700°C) from the RAF/M structure. The RAF/M material must operate at a temperatures above 350°C but less than 550°C. We have been developing the mechanical design and performing neutronics, structural and thermal hydraulics analyses of the DCLL TBM module. We are also making progress on related R&D needs to address critical issues. To prepare for the testing in ITER, an estimate of the necessary ancillary equipment that will be needed at the ITER site has also been made. This paper will be a summary report on the progress and results of recent work.

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