

## **Transforming nuclear core manufacturing: application of advanced manufacturing and process monitoring**

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### **Abstract:**

The transformational challenge reactor (TCR) program has taken on the goal of reducing the cost and deployment timelines for advanced nuclear energy systems by applying advanced manufacturing for their production. The program integrates this activity with advances in materials and computational sciences to deliver impactful outcomes in the following four areas: i) enabling high-performance designs with complex geometry , ii) accelerating application of high-performance materials, iii) delivering a framework for component performance prediction via manufacturing process monitoring, and iv) codifying methods for integration of sensors into reactor core structures that allow for close system monitoring during operation. At its inception, the program is rapidly iterating on design, manufacturing, analysis, and testing across a range of advanced manufacturing technologies applied to a number of material systems. All of these manufacturing processes undergo continuous monitoring with the aim of relating processing signatures to final component properties and behavior. This paper summarizes the technical outcome from these activities that will ultimately lead to a down-selection of materials and manufacturing techniques to be used for production of a demonstration reactor core.