

VERSATILE TEST REACTOR: CORE SYSTEM DESIGN REQUIREMENTS TO SUPPORT ADVANCED REACTOR DEVELOPMENT

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The Versatile Test Reactor (VTR) is a reactor under development in the United States of America to provide a very high-flux fast neutron source. This reactor will accelerate the testing of advanced nuclear fuels, materials, and other potentially irradiated components. As this reactor design effort is underway to support eventual construction and operation, a necessary step is the development of design requirements and objectives for all components and systems of the VTR. Such requirements are necessary in any engineering project to ensure the delivered product can perform its mission safely, while providing a means for integration of the various design teams working on interfacing systems, and providing a basis for successful project execution.

Many of the VTR nuclear core requirements are consistent with those found for typical reactor designs. For example, inherently safe feedback behavior is required as a part of the design, various fuel material performance limits shall be met during certain scenarios, and the occupational and public dose limits must be below site and regulatory limits. However, some requirements are unique to VTR due to the reactor being a test reactor that can support the needs of experimenters. For example, to support the needs of experimenters the reactor shall be designed to allow the use of any non-control/safety assembly position in the core as an un-instrumented experiment position. The reactor also must be able to accommodate multiple different materials and/or fuels under irradiations experiment campaigns at a time. This paper will present and discuss these reactor core system design requirements with the goal of disseminating these requirements to potential experimenters as early as possible and providing an example of design requirements application to a modern large engineering project.

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