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## NuScale SMR Materials Irradiation and Testing

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**Program:** NSUF-2.1: Core and Structural Materials

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### *Abstract*

NuScale Power, LLC is executing a First-of-A-Kind nuclear deployment readiness program to advance its factory-built Small Modular Reactor (SMR) technology and obtain U.S. Nuclear Regulatory Commission design certification on a timetable that supports deployment of the NuScale SMR by 2026. As part of this development program, NuScale is evaluating first-of-a-kind use of higher strength vessel steels for the NuScale Power Module™ that have the potential to dramatically reduce manufacturing cost and production timelines.

### *Objectives and Approach*

The objective of the NuScale SMR Materials Irradiation and Testing program is the evaluation of materials for use in reactor containment vessels. The project will obtain irradiation embrittlement testing data from SA-508 Grade 3 Class 2 weldments and Code Case N-774 Grade F6NM weldments to obtain low temperature irradiation embrittlement data for these materials. The scope includes the procurement and delivery of the testing specimens (not funded under this proposal); the design of the testing capsule; development of irradiation parameters, loading plans, and temperature and fluence monitoring methods; irradiation of the samples; and post-irradiation examination (PIE) that will include tension and Charpy testing. The primary deliverables from this effort will be the PIE test reports with archived irradiation parameters and M&TE calibration records. Independent of this project, baseline testing will also be performed to provide a basis for comparison for the irradiated samples.

### *Benefits and Outcomes*

The outcome of the testing will be characterization of the material properties of the two steels of interest under relevant conditions for the NuScale design. If the program is successful, qualification of this material for use will reduce manufacturing cost and schedule for NuScale module production, which is slated to begin in 2022. The data that this program generates will also be available for other reactor component designers, benefitting the industry by promoting the adoption of higher strength steels with improved thermal efficiency for other nuclear vessel applications.