

## The ORNL Modeling and Simulation Group's **Fracture Analysis of Vessels: Oak Ridge (FAVOR) Software Code**

The ORNL Modeling and Simulation Group (MSG) develops sophisticated numerical solutions for a wide range of scientific, engineering, and operational applications. MSG's core competency is computational physics and engineering, and within this context we have developed the Fracture Analysis of Vessels: Oak Ridge (**FAVOR**) software suite. Originally developed for the U. S. Nuclear Regulatory Commission, **FAVOR** is designed to conduct structural integrity analyses of aging and embrittled nuclear reactor pressure vessels subjected to transient loading conditions.

**FAVOR** uses the finite-element method to generate one-dimensional time-dependent thermal and stress distributions through the wall thickness of an axisymmetric structure subjected to complex time-varying boundary conditions. **FAVOR** contains a comprehensive library of weight functions, thus providing the capability to generate stress-intensity factors for a range of realistic three-dimensional finite-length flaw geometries as required for performing fracture mechanics analyses. **FAVOR** thermal, stress, and stress intensity factor solutions have been successfully validated against ABAQUS, a NQA-1 certified multidimensional finite-element code. **FAVOR** probabilistic fracture mechanics analyses are based on Monte Carlo techniques (i.e., many deterministic analyses are performed on stochastically generated structures to determine if each structure will fail when subjected to a defined loading condition at a particular time in the operating life of the structure). The probability of failure for a specified loading condition is simply the number of failed structures divided by the total number of simulated structures.

**FAVOR's** robust highly integrated capabilities make it the ideal analysis tool for a broad range of R&D, industrial, homeland defense, and military applications. We welcome the opportunity to discuss your potential applications and ways **FAVOR** can contribute to a solution.

### FAVOR PROVIDES EFFICIENT AND LOW-COST VALIDATED THREE-DIMENSIONAL DETERMINISTIC AND PROBABILISTIC FRACTURE MECHANICS SOLUTIONS

