

## Advanced Simulation and Computing for Sandia's Nuclear Weapons Program

The Nuclear Weapons Program Management Unit at Sandia takes advantage of DOE's exascale computing initiative to further enhance stockpile stewardship. Sandia currently meets the challenges of its stockpile stewardship mission by using newly developed modeling and simulation capabilities to assess and monitor the stockpile through advanced experimental design, and enhanced validation and verification..

Modeling and simulation capabilities developed by the National Nuclear Security Administration (NNSA) Advanced Simulation and Computing Program (ASC) provide a computational basis for assessing the current and future nuclear weapons stockpile. Uses include design and qualification for weapon systems, as well as the annual assessment of the current stockpile systems.

The capabilities developed by ASC include the Sierra and RAMSES code suites that are used to simulate a wide range of mechanical, electrical, and radiation environments and a variety of other software that is used to support verification and validation, model development, foundational algorithms for computational simulation and pre- and post-processing. These capabilities enable the exploration of a wide range of technical and scientific issues including materials aging, fracture, failure, friction, and response in extreme environments.

The DOE's new initiative to deploy exascale computing by the year 2023 presents opportunities to advance the engineering process based on a fully predictive modeling capability. With exascale computing, NW engineers will be able to simulate the re-entry environment and evaluate a weapon's response in wide range of abnormal and hostile environments.

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