

Detailed Justification

(dollars in thousands)

FY 2003	FY 2004	FY 2005
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Advanced Applications Development **139,380** **144,226** **150,793**

Develops enhanced three-dimensional (3-D) computer codes that provide an unprecedented level of physics and geometric fidelity for full-system, component, and scenario weapons simulations. Delivers these weapons performance, safety, and engineering simulation tools for validation and subsequent use by weapons designers and experimentalists to support the Stockpile Stewardship Program (SSP). Improves, not only the code capabilities, but also the performance and efficiency of the codes on the massively parallel platforms procured by ASCI. FY 2005 activities include initial Directed Stockpile Work (DSW) secondary baseline development and 3-D ASCI simulations supporting a Dual-Axis Radiography Hydrodynamic Test (DARHT) certification experiment, as well as enhanced 3-D primary simulation capability to support Life Extension Programs (LEPs) and demonstration of full-system weapon simulation capability. Also, in FY 2005, applications will deliver new code capabilities for aerodynamics Micro-systems and new algorithms for scalable multi-level solvers are planned.

Verification and Validation (V&V)..... **40,116** **47,675** **49,780**

Develops and Implements tools to rigorously assess accuracy in physics modeling and computational simulations in order to establish confidence in the simulation used for nuclear weapon certification and for resolving high consequence nuclear stockpile problems. Activities in FY 2005 include: assess the accuracy of improved fidelity engineering shock response calculations; deliver complete end-to-end calculations of a nuclear weapon test for at least two stockpile systems, with the emphasis on validation of the secondary modeling; complete a focused quantitative V&V assessment of the physics and simulation capability used for Enhanced Primary and Complex Safety calculations; support the stockpile life extension program by assessing the computational capabilities supporting development of the W80 system and emphasize capabilities to evaluate two required safety themes. Focus on providing a complete analysis of a primary implosion and burn calculation for at least one stockpile system. Support the W76-1 LEP by conducting validation for blast/impulse in hostile environment.

Materials and Physics Modeling (M&PM)..... **66,304** **69,291** **72,062**

Develops models for physics, material properties and transport processes, which are essential to the simulation of weapons under all conditions relevant to their life cycle. This activity provides the theory, analysis, and modeling necessary to develop such models for integration into advanced application codes. In FY 2005, implementation into ASCI codes of improved failure models validated for several specific materials is planned.

Problem Solving Environment (PSE)..... **38,170** **43,982** **45,072**

Develops a computational infrastructure to allow ASCI applications to execute efficiently on ASCI computing platforms and allows accessibility to these platforms from the scientists' desktops. This computational infrastructure includes local-area networks, wide-area networks, advanced storage facilities, and software development tools. In FY 2005, there will be intensive development, deployment and testing of equipment and systems to enable user environments for the ASCI Red Storm, Purple, Blue Gene (G/L) and Linux clusters.