

Verification and Validation in the Dept. of Energy (view from the trenches)

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Outline of Presentation



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- **DOE's interest in verification and validation**
- **Accelerated Strategic Computing Initiative**
- **Approach to verification and validation**

Department of Energy's Interest in Verification and Validation



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- **Adherence to the Comprehensive Nuclear Test Ban Treaty announced by President Clinton in August 1995.**
- **US has had no nuclear-yield detonations since September 1992.**
- **Clinton administration and Congress asked the three nuclear weapon laboratories:**
 - **“Can the safety, reliability, and performance of the nuclear weapon stockpile be assured without nuclear-yield tests?”**
 - **“At the present time we are confident, but to insure confidence in the future, we must have significant investment in the **Science-Based Stockpile Stewardship Program.**”**

Accelerated Strategic Computing Initiative



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- A major element of Science Based Stockpile Stewardship is the **Accelerated Strategic Computing Initiative (ASCI)**:
 - Sandia, Los Alamos, and Lawrence laboratories are involved in ASCI at a funding level of roughly \$225M/yr. each
- Priorities of ASCI:
 - Build teraflop, massively parallel computers
 - Write and re-write computational physics/mechanics codes for massively parallel computers
 - Demonstrate the accuracy of complex modeling and simulation using verification and validation methodology
 - Fundamentally rely on modeling and simulation for the assessment of confidence in the safety, reliability, and performance of the nuclear weapon stockpile

Approach to Verification and Validation



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- **Determine the state-of-the-art in V&V**
 - **Preparation of the AIAA Guide**
- **Advance the state-of-the-art in V&V**
 - **Quantification of verification assessment**
 - **Quantification of validation assessment**
- **Determine the relationship between V&V and uncertainty estimation for predictions**
 - **Quantify the impact of V&V on uncertainty estimation**

Incorporation of Verification and Validation into Uncertainty Estimation for Predictions



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