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Los Alamos NATIONAL LABORATORY

An Overview of Stockpile Stewardship

Physics Division Bootcamp Presentation

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TBD

Outline:

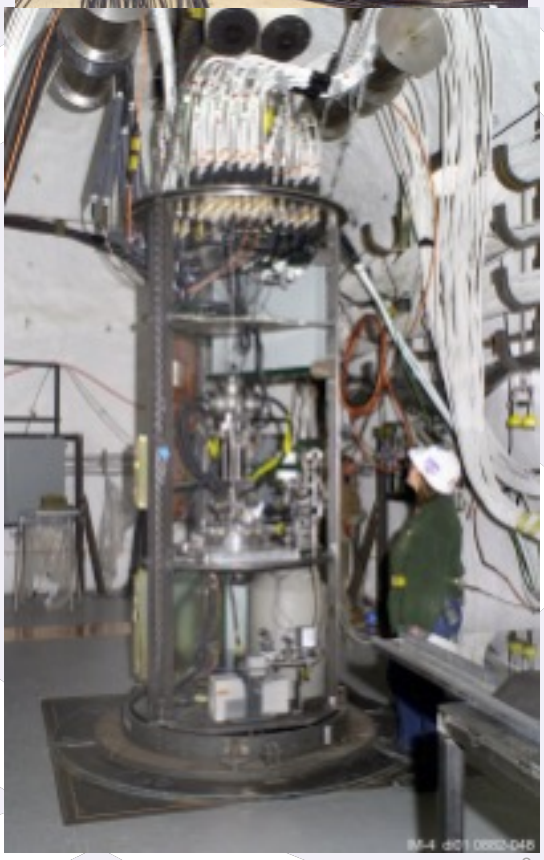
- Differentiation of stockpile eras
- Definition of Stockpile Stewardship
- Aspects included in Stockpile Stewardship
- Description of Annual Assessment components
- Contributions to Stockpile Stewardship

Feel free to interrupt with questions!

Let's start with a differentiation of the eras of our stockpile

Testing Era:

Confidence in the initial and continued performance of stockpiled weapons relied heavily on successful nuclear tests of the weapon, and also on the expert judgment of experienced weapon designers.



After-CTBT (Comprehensive Test Ban Treaty) Legacy Era:

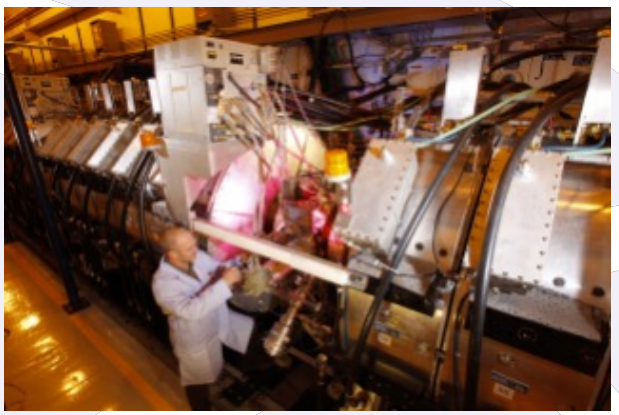
With the advent of the Stockpile Stewardship Program (SSP), the focus shifted to a combination of the following:

- Use of existing nuclear test data,
- Non-nuclear testing to validate subsets of physics, and
- Increased reliance on simulation codes (modern multi-physics, simulation codes).

In order to be able to use the existing nuclear data, you have to be able to maintain the ties to that data. Thus, for the existing legacy stockpile, and for the refurbishment efforts recently done or currently underway (i.e., W76-1, B61-12, and W88 Alt370), the desire is to directly use certain specific tests, which means that the design needs to stay "as much like it originally was as possible."

Let's start with a differentiation of the eras of our stockpile

New Design after-CTBT Era:



For **new** weapons designs (like the W93), the tie to specific tests is no longer possible, and the approach needs to shift. While P-Division has not seen any explicit discussion of how the design community intends to certify a new design, the indications point to the following:

- Almost total reliance on modern code simulation results for confidence in weapon system performance
- Use of existing nuclear test data in combination with a common modeling philosophy
- Use of non-nuclear testing and its data, in that such data can improve the codes' ability to replicate that data, which provides greater confidence (especially when combined with the above) in the overall ability of the codes to simulate performance.

  This can mean both fundamental data to validate individual models and single to multiple physics/effects tests that replicate non-nuclear portions of weapons performance and thus validate multiple models.

What does Stockpile Stewardship mean?

- **Stockpile** is what we call the accumulation of all the nuclear weapons that our country has
- **Stewardship** is defined by Merriam-Webster as **:** the conducting, supervising, or managing of something. *especially **:** the careful and responsible management of something entrusted to one's care.*

So Stockpile Stewardship is the careful and responsible management of our nuclear weapons stockpile. It's worth noting: the term "Stockpile Stewardship" didn't really exist before the end of nuclear testing.

During testing, weapons entered the stockpile and were replaced relatively quickly – no long-term management needed.

Also, stockpile stewardship is considerably different than initial weapons certification. Weapons certification has specific requirements, and stockpile stewardship has been more organic with time.

What does Stockpile Stewardship include?

Stewardship includes various ongoing activities:

1. As required by statute: Annual assessment of the stockpile
2. Maintenance and improvement of the ability to simulate physics and engineering performance of the weapon; weapon safety and surety, too
3. Sufficient understanding of the materials and physics to be able to address questions and issues
   - SFIs (Significant Finding Investigations)
   - Safety and surety aspects
   - Aging concerns
   - Questions from the production complex
   - Surveillance findings

4. Surveillance and other testing (both component-level and more integrated)

And depending on various factors, there may also be

- LEPs (Lifetime Extension Projects) or significant modifications (ALTs) – these are official programs of record that address significant changes.

Annual Assessment has a variety of required components

Statue-specified components:

- Annual Assessment Letters from the Director
- Annual Assessment Reports (safety, reliability, performance)
- Director's Red Teams (DRT) for annual assessment
- Independent Nuclear Weapons Assessment Process (INWAP)

Contributing activities:

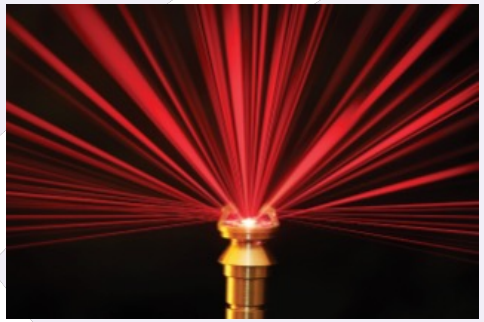
- Stockpile Assessment Team (SAT) briefings at the Stockpile Assessment Conference (SAC) to US Commander, Strategic Command, Director)
- Outbriefs from SAC and DRT
- Local annual assessment briefings to the Director
- Enhanced surveillance and other contributing programs' briefings to inform annual assessment

All aspects listed except for the SAC and its outbrief contribute to the Director's Annual Assessment Letters.

Stockpile Stewardship (regardless of era) gets contributions from:

Program-wise:

- The Directed Stockpile Work (DSW) programs are very stockpile-focused.
- Basically anything that the Science/Engineering Campaigns (OES, ETM) or Advanced Strategic Computing (ASC) funds is intended to support stockpile stewardship – how is more clear in some cases than in others



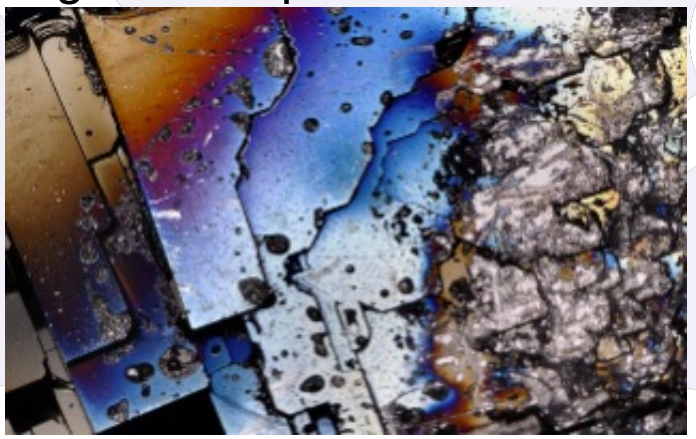
Data-wise:

- The nuclear test database
- Subcritical experiments, hydrotests, etc.
- Fundamental and small to medium scale efforts that help lead to improved models in the performance codes
- Uncertainty improvements
- Data from exploratory efforts that lead to better physics and models in the performance codes

A personal experience might be helpful here:

Aging assessment – determining reasonable aging trends for various material properties, then using those to find the impact on performance

- Worked with theorists, model developers and experimentalists to determine the aging trends of the materials
- Worked with engineering modelers to get the appropriate contours for the conditions
- Worked with surveillance folks to get data taken through their programs
- Worked with statisticians to develop representative sets of conditions to cover the range of potential ages and impacts and to analyze the results
- Worked with system representatives to get the runs done and the results back to the statisticians, and then to get the impacts included in system assessments as appropriate
- Reported results



Are there any more questions?

Some personal experiences might be helpful here:

My history at LANL:

- Graduate student in T-div working part-time on a new spray model
- Postdoc in DX/X/CNLS working on adjoint differentiation of hydrocodes
- Staff member in XTD/X
  - HE modeling
  - Verification and Validation (V&V) efforts
  - W76 system point of contact
  - Aging assessment coordination
  - Campaign 1 (PAT) project leader, deputy program manager, and acting PM
- Line management