Plutonium Pit Production Analysis of Alternatives (AoA) Results & Next Steps

November 2017
To sustain plutonium infrastructure and establish capabilities to resume production of war reserve pits, NNSA is:
- Investing over $1B from FY19 – FY23 to sustain current operations and achieve 30 pits per year (ppy) production capability by 2026
- Investing over $2B in construction projects to replace CMR capabilities and reconfigure space to support production
- Analyzing options, consistent with DOE O 413.3B, for long-term infrastructure needs to support the 80 ppy requirements and other mission needs

Progress:
- Safely resumed operations in PF-4 after a 3-year operational pause
- Began construction activities for the first two CMRR subprojects:
  - RLUOB Equipment Installation Phase 2 (REI2)
  - PF-4 Equipment Installation Phase 1 (PEI1)
  - Both are on schedule and under budget
- Fabricated two development pits in FY17; will build four development pits in FY18
- Completed the Plutonium Pit Production Analysis of Alternatives in FY17
The AoA assessed alternatives to meet the sustained production capacity of no fewer than 80 ppy by 2030.

AoA Assumptions, Facts and Constraints
- LANL is the Plutonium Center of Excellence for the enduring R&D mission
- Capabilities installed under CMRR and Plutonium Sustainment remain in PF-4 and RLUOB
- Operations in PF-4 to meet the 30 ppy goal in 2026 will continue and PF-4 will be capable of an estimated 30 ppy after the upgrades
- The threshold requirement is 80 ppy at high confidence, due to pit aging estimates and planned production schedules to meet military requirements
- Future pits will be produced using current processes and technology
Evaluation Criteria and Other Considerations

Evaluation Criteria:
- Cost, schedule, risk
- Ability to support objective requirements for NNSA and DOE missions
- Capacity for pit reuse operations simultaneous with pit remanufacturing
- Ability to accommodate surge capacity
- Synergy of plutonium science, metal preparation, and production
- Ability to accommodate future changes in mission requirements
- Useful lifetime

Other Considerations:
- Qualified workforce & Expertise / Availability of workforce
- Design Agency (DA) and Production Agency (PA) Colocation / Resiliency
- Environmental
- Transportation
- Mission Impact
AoA Results: Two Preferred Alternatives

1. Refurbishing and repurposing facilities at the Savannah River Site
   - Cost range: $1.4-5.4 B
   - Schedule range: FY24-31
   - Risk: Reconfiguring a partially completed facility for a new mission in a new location

2. Additional footprint to accommodate pit production requirements at Los Alamos National Laboratory
   - Cost range: $1.9-7.5 B
   - Schedule range: FY27-33
   - Risk: Less favorable cost and schedule for achieving a sustained 80 ppy facility
Next Steps

- Conduct detailed engineering analysis (EA) for both alternatives to inform the selection of a single alternative and support conceptual design.

- The EA is analyzing pre-conceptual design options at the two sites and will provide an engineering feasibility report.

- The results of the EA will inform conceptual design for the Deputy Secretary’s approval of Critical Decision (CD)-1 (Approve Alternative Selection and Cost Range) in accordance with DOE Order 413.3B.
  - Project baselines are not established until CD-2 approval (Approve Performance Baseline), which requires 90% design completion.
### 41 Options Evaluated Resulting in Detailed Analysis of 5 Alternatives

<table>
<thead>
<tr>
<th>Production Approach</th>
<th>Capabilities in PF-4</th>
<th>Capabilities Outside PF-4</th>
<th>41 Alternatives Evaluated</th>
</tr>
</thead>
</table>
| 0 - Status Quo       | Pu Science and Cert + Metal Prep and 30 ppy | Production 50 ppy at LANL | LANL0
|                     |                      | LANL1-A (New)             |                           |
| 1 - Split Production | Pu Science and Cert + Metal Prep and 30 ppy | Production 50 ppy at SRS | SRS1-A (MFFP) SRS1-B (K-Area) SRS1-C (WSB) SRS1-D (New) |
|                     |                      | Production 50 ppy at INL  | INL1-A (FPF) INL1-B (New) |
|                     |                      | Production 50 ppy at Pantex/NNSS | PX1 (New) | NNSS1 (New) |
| 2 - Move Production and Metal Prep | Pu Science and Cert | Production various ppy at new construction at LANL | LANL1-B (Aries and Pu238 stay) LANL1-C (Aries stays, Pu238 goes) LANL1-D (Aries goes, Pu238 stays) LANL1-E (Aries and Pu238 go) |
|                     |                      | Metal Prep and 80 ppy at LANL | LANL2 (New) |
|                     |                      | Metal Prep and 80 ppy at SRS | SRS2-A (MFFP) SRS2-B (K-Area) SRS2-C (WSB) SRS2-D (New) |
|                     |                      | Metal Prep and 80 ppy at INL | INL2-A (FPF) INL2-B (New) |
|                     | & other missions out | Metal Prep and 80 ppy at Pantex/NNSS | PX2 (New) NNSS2 (New) |
| 3 - Move Production | Pu Science and Cert + Metal Prep | 80 ppy at LANL | LANL3 (New) |
|                     |                      | 80 ppy at SRS | SRS3-A (MFFP) SRS3-B (K-Area) SRS3-C (WSB) SRS3-D (New) |
|                     |                      | 80 ppy at INL | INL3-A (FPF) INL3-B (New) |
|                     |                      | 80 ppy at Pantex/NNSS | PX3 (New) NNSS3 (New) |
| 4 - Move Metal Prep  | Pu Science and Cert + 80 ppy | Metal Prep at LANL | LANL4 (New) |
|                     |                      | Metal Prep at SRS | SRS4-A (MFFP) SRS4-B (K-Area) SRS4-C (WSB) SRS4-D (New) |
|                     |                      | Metal Prep at INL | INL4-A (FPF) INL4-B (New) |
|                     |                      | Metal Prep at Pantex/NNSS | PX4 (New) NNSS4 (New) |

- 36 of 41 options were eliminated from further consideration after the team developed floor space estimates and initial cost, schedule, and risk assessments
  - Insufficient space
  - High cost for support facilities
  - Late to need
  - Facility condition
  - Mission disruption
### Summary of Results

#### Approach

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Refurbishment</th>
<th>New Facility Construction</th>
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<tbody>
<tr>
<td></td>
<td>SRS MFFF</td>
<td>INL FPF</td>
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<tr>
<td><strong>CD-4 Cost Range (FY18$B)</strong></td>
<td>1.4 - 5.4</td>
<td>1.5 - 5.0</td>
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<tr>
<td><strong>CD-4 Schedule Range</strong></td>
<td>FY24 – 31</td>
<td></td>
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<tr>
<td><strong>80 ppy Schedule Range</strong></td>
<td>FY29 – 36</td>
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#### Risks

- Potentially contentious state government
- No experience with pit production
- Delays in facility availability cause schedule delays
- Potential structural issues with refurbishment
- Change in safety basis from NRC to DOE
- Organizational Interface - Not an NNSA Site (DOE-NE site)

#### Opportunities

- Ample space for future flexibility
- Experienced pit production techs
- Current NNSA production agency
- Current NNSA production agency
- NNSA Site Office
- NNSA Site Office