



# **Engineering Assessment Overview**

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# Introduction

- The Engineering Analysis (EA) refines recommendations from the Plutonium Pit Production Analysis of Alternatives (AoA) to support selection of a single preferred alternative for conceptual design:
  - Repurposing the Mixed Oxide Fuel Fabrication Facilities (MFFF) at the Savannah River Site (SRS) to produce 50 Weapons Reserve (WR) pits per year (ppy) (complementary to the enduring 30 WR ppy mission at Los Alamos National Laboratory)
- The EA was completed by an independent Architectural & Engineering firm, PARSONS, with plutonium expertise provided by a team of subject matter experts
- The EA provides analysis related to:
  - Engineering Feasibility
  - Cost
  - Schedule
  - Risk



- MFFF was designed and constructed to meet Nuclear Regulatory Commission requirements for nuclear safety and DOE requirements for material control and accountability (MC&A) and for safeguards and security
- The safety strategy is to conservatively assume that all the passive and active engineering controls credited for the Los Alamos National Laboratory Plutonium Facility
- Because MFFF is an existing structure, design for the 50 ppy project would be limited to designing process and support systems and the minor modifications to the building.
- Modifying MFFF does include the addition of a significant and somewhat complex conveyance system
- There is more than sufficient room for process equipment, support areas, and utility systems for the production of 50 ppy at high confidence
- The existing Technical Support Building has more than sufficient room to house the operational staff needed

## Provides a fully independent and self-contained 50 ppy capability



- Mixed Oxide Fuel Fabrication Facility
  - Removing the existing fuel manufacturing equipment previously installed in the areas that are being used for pit production
  - Installation of gloveboxes and process equipment
  - Installing an analytical chemistry laboratory
  - Installation of process support and building utility systems
  - Commodity routing and final system connections
- Technical Support Building
  - Modifications to provide Entry Control Facility and Office and Support Space
- Waste Solidification Building
  - Testing and repairing or replacing the existing equipment
- Security Upgrades
  - Installation Perimeter Intrusion Detection and Assessment System (PIDAS)

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# **Equipment and Process Space**

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- Process Equipment List
  - 117 Manufacturing
  - 36 Aqueous

Process Area	Room(s) Size (ft <sup>2</sup> )		
Disassembly and Metal Preparation	6,084		
Foundry	5,919		
Machining	8,942		
Subassembly and Assembly	8,322		
Post Assembly	1,581		
Material Management	2,055		
Material Characterization	1,920		
Sample Preparation and Analytical Laboratory	19,960		
Aqueous Recovery	6,838		
High Energy Radiography	4,100		
Total	65,721		

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## Pre-Conceptual Equipment Layouts 1<sup>st</sup> Floor Plan

(b)(3)

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# **Pre-Conceptual Equipment Layout** 2<sup>nd</sup> Floor Plan

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## Pre-conceptual Equipment Layout 3<sup>rd</sup> Floor Plan

(b)(3)



# **Cost and Schedule Estimates**

### **UNCLASSIFIED CONTROLLED NUCLEAR INFORMATION**

- Cost Estimate Range \$1.83 \$4.58 B
- Point Estimate \$2.29 B
- Schedule
  - Start Conceptual Design Oct 2018
  - CD-1 Approval Dec 2019
  - CD-3A Approval Feb 2021
  - CD-2/3 Approval Sep 2022
  - Construction Completion Jul 2025
  - CD-4 Approval Jan 2028

Cost Element	\$M
Project Management	263.4
Engineering/Design	252.0
Site Preparation/D&D	25.9
Equipment Procurement	258.4
Construction/Installation	563.9
Startup/Commissioning	194.9
Management Reserve/Contingency	589.4
Other Project Costs	157.1
Total (Point Estimate)	2,294.8

The cost estimate and schedule is a rough-order-of-magnitude estimate (Class 5 in accordance with DOE Cost Estimating Guide estimate classification) and is intended to provide a means of comparing relative costs to support the decision-making process.

Estimates and schedule are not intended for budgeting purposes.

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## Threats

- MFFF ongoing construction leads to increased costs for modifications or facility retrofit
- Difficulties closing out the MOX project and contract result in schedule delays
- Facility configuration results in increased safety and security requirements and associated lifecycle costs
- Opportunities
  - Some work required for pit production at MFFF can be completed as part of MFFF closeout
  - Analytical capability will be located in existing HC-2 Security Category 1 space
  - Improved operational efficiency using lessons learned and best practices with SMEs from separate sites
  - Separate sites each with production capabilities can ensure continuing mission support
  - Additional HC-2 space is available to support other NNSA programs.
  - Opportunity to make use of purchase and stored commodities from the MOX project
  - Remove walls for construction and operations
  - MFFF would not have to be safety class due to distance from the site boundary
  - Use of F/H analytical laboratory

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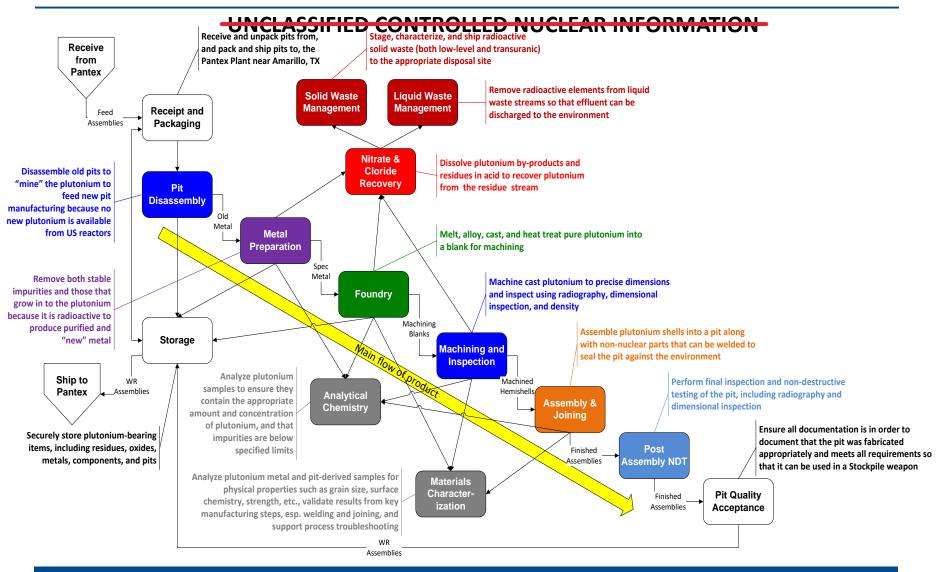
# **Back-up Slides**

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## **Process Overview**



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## **Critical Path Schedule**

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Noming     United     United<	ID	Activity Name	Original Start	Finish	2018 2019 2020 2021 2022 2023 2024 2028 2028 2027	2028 2029 2030 2031
Image: Note of the constant of the cons		-contraction			and and and and and and and and	
Model     Max NTP: Compare Target Balantestar     In Order     Model	Alternative 1 -	Modily MFFF at SRS with Production Module	190m 01-Oct-18	04-Jan-35		
No.     Col-Laponit     No.     Col-Laponit     No.     Col-Laponit     No.     Col-Laponit     No.     Col-Laponit     No.	Milectones		109m 01-Oct-18	20-Jan-28	•	20-Jan-28, Milestones
Bit Production     Display 1000     Display 1000 <thdisplay 1000<="" th="">     Display 1000</thdisplay>		Issue NTP to Conceptual Design Subcontractor	Om 01-Oct-18		Issue NTP to Conceptual Design Subcontractor, 01-Oct-18*	
BUILD NET Configuration     Build Net Conf		CD-1 Approval				
Build     UTT CO-Adjusti     UPT CO-Adjusti       0.100     Concepts Using     0.10000     0.10000     0.10000     0.10000     0.10000     0.100000     0.10000     0.1000						20-Jan-28, MFFF
Choose     Choose<						
NUMBER     Constrained     Constrained <t< td=""><td></td><td></td><td></td><td></td><td></td><td>MPTP CD-4 Approval,</td></t<>						MPTP CD-4 Approval,
MTT18     bable (back) table) (COI) and Consellate (back) back) (Back)     Solution     With Data (back) (Back) back (Back)     Solution     <						
WT103     Indexests (rbs)     Sol (sope)     Occur     Indexests (rbs)     Sole (sope)     Sole (sope)       WT103     Indexests (loss)     Indexests (loss						
UPER Enducidament for PE Production     UPER Enducidament for PE Production     UPER Enducidament for PE Production     V/V/V/PER Enducidament for PE Production       W/V/V/V/V/V/V/V/V/V/V/V/V/V/V/V/V/V/V/V						
Descense     Descense     Descense       0     WTF1 20     Network (200)     Network (200)     Network (200)       0     WTF1 20     Network (200)     Network (200)     Network (200)       0     WTF1 20     Network (200)     Network (200)     Network (200)       0     Network (200)     Network (200)     Network (200)     Network (200)       0     Network (200)     Network (200)     Network (200)     Network (200)       0     Network (200)     Network (200)     Network (200)     Network (200)       0     Network (200)     Network (200)     Network (200)     Network (200)       0     Network (200)     Network (200)     Network (200)     Network (200)       0     Network (200)     Network (200)     Network (200)     Network (200)       0     Network (200)     Network (200)     Network (200)     Network (200)       0     Network (200)     Network (200)     Network (200)     Network (200)       0     Network (200)     Network (200)     Network (200)     Network (200)	_					30-Jan-29, MFFF Refurbishment for PE Pr
Bit 1713     Aleksey Deep Integr     Integration       W17130     Aleksey Deep Integrite     Integrite       W17130     Aleksey Integrite     Integrite       W17130     Integrite     Integrite       W17130     Integrit     Integrite<					21-Jan-22 MEEE CD-20 Prolim and Final Design	•
Description     Display						
DEMONS     Description     On 10,202,204,000     Other Processing Constraints Subjections     Other Processing Constraints						
ADO     MYPT Price Using:     No     No     MYPT Price Using:       ADO     MoVER Production Using (COD)     10     Separative Using (COD)     10     10     Separative Using (COD)     10 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
AND     Peterson Documental Methylologia (2004)     7n     24/35     W/TP Matrix (2005) Prolongia Statinti     10     100-000     10						
A73     MYT Badag CD-30 Pricing Bantal     50     1-00-20     1646-21       A75     MYT Badag CD-30 Pricing Bantal     50     1-00-20     1646-21       A75     MYT Badag CD-30 Pricing Bantal     50     1-00-20     1646-21       A75     MYT Badag CD-30 Pricing Bantal     50     1-00-20     1046-21       A75     MYT Badag CD-30 Pricing Bantal     50     1-00-20     1046-21       A75     MYT Badag CD-30 Pricing Bantal     50     1-00-20     1046-21       A75     MYT Badag CD-30 Pricing Bantal     50     1-00-20     1046-21       A75     Intid Controls and Proce Dimension     50     1-00-20     1046-21       A76     Intid Controls and Proce Dimension     50     1-00-20     1046-21       A76     Intid Controls and Proce Dimension     50     1046-20     20     1046-20       A77     Controls and Proce Dimension     50     1046-20     20     1046-20       A77     Controls and Proce Dimension     50     1046-20     20     1046-20       A78     Controls and Proce Dimension						
ATO     MTT Flads, Coll     Mit Coll	A375	MFFF Building CD-2/3 Package Submittal	5m 11-Dec-20	18-May-21	HITT Builden CD-2/3 Parkage Scheddal	
BAS     WTF Bading CD-20 Pricesp Networ     Bit International State (State State St		Verily 90% Design Completion	1m 02-Apr-21	04-May-21	1 1 1 1 20% Dexign Completion	
No. 101     United Decembers	A370					
A 55   Intel Givebous and Process Eggenet In WFF   (5) - 24-20     A 55   Intel Givebous and Process Eggenet In WFF   (5) - 24-20     A 56   Intel Givebous and Process Eggenet In WFF   (5) - 24-20     A 56   Intel Givebous and Process Eggenet In WFF   (5) - 24-20     A 56   Intel Givebous and Process Eggenet In WFF   (5) - 24-20     A 56   Intel Givebous and Process Eggenet In WFF   (5) - 24-20     A 56   Intel Givebous and Process Eggenet In WFF   (5) - 24-20     A 57   Intel Givebous and Process Eggenet In WFF   (5) - 24-20     A 56   Intel Givebous and Process Eggenet In WFF   (5) - 24-20     A 57   Intel Givebous and Process Eggenet In WFF   (5) - 24-20     A 50   Intel Givebous and Process Eggenet In WFF   (5) - 24-20     A 50   Intel Givebous and Process Eggenet In WFF   (5) - 24-20     A 50   MFF Eggenet Constitution Response The Process Eggenet In WFF   (5) - 24-20     A 50   MFF Eggenet Constitution Response The Process Eggenet In WFF   (5) - 24-20     A 50   MFF Eggenet Constitution Response The Process Eggenet In WFF   (5) - 24-20     A 50   Constato Constitution Response Eggenet In WFF   (5) - 24-20  <	😑 A380	MFFF Building, CD-2/3 Package Review				
ABS     Install-Angle Laboratory Explanet     Implif Page Connection       AAS     Install Angle Connection     Implif Page Connection       AAS     Install Page Connection     Implif Page Connection       AAS     Install Page Connection     Implif Page Connection       AAS     Complex Explanet     Implif Page Connection       AAS     Mass Explanet     Implif Page Connection       AAS     Complex Explanet						
A5   Initial Pipig Connocidies   12   55-05-22   0-10-32     A55   Initial Pipig Connocidies   12   55-05-22   0-10-32     A75   Complex Galaxies Connocidies   12   55-05-22   0-10-32     A76   Complex Galaxies Connocidies   12   55-05-22   0-10-32     A76   Complex Galaxies Connocidies   12   55-05-22   0-10-32     A77   Complex Galaxies Liss UII) Connectors   6   0-10-32   0-10-32     A77   Complex Galaxies Liss UII) Connectors   6   0-10-32   0-10-32     A77   Complex Galaxies Liss UII) Connectors   6   0-10-32   0-10-32     A77   Complex Galaxies Liss UII (Connectors)   60-0-10-32   0-10-32     A77   Complex Galaxies Liss UII (Connectors)   0-10-427   0-10-42     A405   MUTP Docess Splem-Low Test Testing   20-10-42   0-10-42     A405   Complex Andread Consclucation Actions   20   0-10-42     A405   Complex Andread Consclucation Actions   20   0-10-42     A405   Complex Consclucation   10   0-10-42     A405   Comple						
A70   Initial INAC Connoldies   121   Society   White 20     A70   Initial Bicking Commodies   121   Society   White 20     A71   Initial Bicking Commodies   121   Society   White 20     A72   Initial Bicking   121   Society						
# 78   Initial Electrical / Comparisation Commendias     # 78   Complete Readings Construction Receiptons     # 77   Complete Readings Construction Receiptons     # 78   Initial Statistical / Communication Construction     # 77   Complete Readings Construction Receiptons     # 78   Initial Statistical / Communication Construction     # 78   Initial Statistical / Communication Receiptons     # 78   Complete Receipton Receiptons     # 78   Complete Receipton Receiptons     # 78   MPT Receipton Receipton Receiptons						
AR   Complex Relation Connections   60   60-Hav-23   60-Hav-23<						
A77   Complex Analytical Lab UBy Connections   En 04/by-23   04/by-24   104/by-24						
AB   MFTF Explorent. Construction Acceptances Treating   100   104/apr-24   144/apr-24						
Baseling     Commissioning (strict)     OPEN (Stric)          AT30						fance Testing
Ad5   MFF Process Set Leningvales Testing   12n   14-54y-28   MFF Process Set Leningvales Testing     Ad50   Process Let Integrates Testing   12n   24-54y-28   01-48y-27   01-48y-27     Ad50   Complete Pre-Stat Contextic Actions   2n   01-48y-27   01-48y-27   01-48y-27     Ad50   Complete Pre-Stat Contextic Actions   2n   01-48y-27   01-48y-27   01-48y-27     Ad50   Complete Pre-Stat Contextic Actions   2n   01-48y-27   01-48y-27   01-48y-27     Ad50   Complete Pre-Stat Contextic Actions   2n   01-48y-27   01-48y-27   01-48y-27     Ad50   Complete Contextic Actions   2n   01-48y-27   01-48y-27   01-48y-27     Ad55   Request CD-4 Deckage Review   2n   04-48y-27   01-48y-27   01-48y-27     Ad55   MFF Process Hot Commander Actions   1m   01-0-0-77   05-48y-27   01-48y-27   01-48y-27     Ad55   MFF Process Hot Commander Actions   1m   01-0-0-77   05-48y-27   01-00-77   01-48y-27     Ad55   MFF Process Hot Commander Actions   1m   01-00-77   05-48y-38   01-48y-38 <td< td=""><td></td><td></td><td></td><td></td><td></td><td>30-Jan-29, MFFF Start-Up / Commissionit</td></td<>						30-Jan-29, MFFF Start-Up / Commissionit
AB0   Process Live integrated Testing   12m   24-49-27   07-May-27     AB05   Conduct Contractor ORR   1m   07-Agr-27   07-May-27   07-May-27     AB05   Conduct DOE ORR   1m   07-Agr-27   07-May-27   07-May-27     AB05   Conduct CO-RR   1m   07-Agr-27   07-May-27   07-May-27   07-May-27     AB05   Request CD-4 Start-4 Authorization   1m   07-Agr-27   07-May-27   07-May-27   07-May-27   07-May-27     A75   MFF FO-4-Package Rwiwe   2m   07-May-27   07-May-27   07-May-27   07-May-27   07-May-27     A720   Trenation to War Recerve (WR) Production   7			12m 18-Apr-25	29-Apr-26	MFFF Process System	-Level Testing
AB0   Complete Pre-Start Connective Actions   2n   07-May-27   06-Jug-27			12m 29-Apr-26	07-May-27		
A570   Conduct DOE ORR   11   06-Jule 27   06-Jule 27   06-Jule 27   07-06-37     A500   Complete Contraction Actions   10   06-Jule 27   07-06-37   07-06-37   07-06-37   07-06-37     A575   MTFF CD-4 Package Review   20   07-06-37   09-Jule 27   25-Jan-38     A575   MTFF CD-4 Package Review   20   07-06-37   09-Jan-28   09-Jan-28     A755   MTFF Process Hot Commissioning   120   25-Jan-38   09-Jan-28   09-Jan-28     Transition to War Reserve (WR) Production   720   30-Jan-28   04-Jan-38   04-Jan-36     A720   Transition to WR Production   720   30-Jan-38   04-Jan-36	- A655	Conduct Contractor ORR	1m 07-Apr-27	07-May-27		Contractor ORR
A80   Complete Consiste Actions   2n   05-Aug-27   07-00-27     A805   Request CD-4 Start-go Authorization   1m   07-00-27   05-ban-28     A805   MFTF CD-4 Nackage Newtee   2n   06-ban-27   05-ban-28     A715   MFTF Process Hot Commissioning   12n   20-ban-28   06-ban-28     A720   Transition to War Reserve (WR) Production   72n   06-ban-38   06-ban-38     A720   Transition to WR Production   72n   06-ban-38   06-ban-38     DADESONS   Page 1 of 1   06-ban-38   06-ban-38	- A660	Complete Pre-Start Corrective Actions	2m 07-May-27	08-Jul-27		iete Pre-Start Corrective Actions
ARES   Request CD-4 Start-go-Atthorization   1m   07-Och 77   09-Non-27   0		Conduct DOE ORR				
ASTS   MTTT CD-4 Package Review     ASTS   MTTT Process Not Commasking   12m (20-km-28)     Transition to War Reserve (WR) Production   72m (30-km-28)   60-km-26)     ATZO   Transition to WR Production   72m (30-km-28)   60-km-26)						
with The Transition for War Reserve (WR) Production Transition for War Reserve (WR) Production Transition for War Reserve (WR) Production   with Transition for War Reserve (WR) Production Transition for War Reserve (WR) Production Transition for War Reserve (WR) Production   with Transition for War Reserve (WR) Production Transition for War Reserve (WR) Production Transition for War Reserve (WR) Production   with Transition for War Reserve (WR) Production Transition for War Reserve (WR) Production Transition for War Reserve (WR) Production   with Transition for War Reserve (WR) Production Transition for War Reserve (WR) Production Transition for War Reserve (WR) Production   with Transition for War Reserve (WR) Production Transition for War Reserve (WR) Production Transition for War Reserve (WR) Production						
Transition to War Reserve (WR) Production 72m 36-Jan-36   A720 Transition to Wit Production 72m   30-Jan-32 04-Jan-36				-	••••••••••••••••••••••••••••••••••••••	
					-	MFFF Process Hot Commissioning
PARSONS Page 1 of 1						
PARSONS Page 1 of 1 Unclassified Controlled Nuclear Information	A720	Trenetton to WR Production	72m 30-Jan-29	O4-Jan-35		14 <b>1</b>
		PARSONS				