



U.S. DEPARTMENT OF

ENERGY



Plan for an Integrated Master Schedule for Plutonium Pit Production

Report to Congress
June 2021

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**National Nuclear Security Administration
United States Department of Energy
Washington, DC 20585**

Message from the Acting Administrator

The sole U.S. pit production capability is currently within Plutonium Facility-4, located in the Los Alamos National Laboratory in Los Alamos, New Mexico, which will be more than 50 years old in 2030. Plans to revitalize the Nation's pit production capability have been halted and delayed for decades, while existing plutonium pits, a key component of warheads, have continued to age. In May 2018, the Department of Energy's National Nuclear Security Administration (DOE/NNSA) provided Congress with the recommended alternative to meet the congressionally mandated requirement to produce no fewer than 80 pits per year during 2030. The two-site approach requires a robust management system, including development of a Pit Production NNSA Integrated Master Schedule (NIMS). As requested by Congress, this report describes DOE/NNSA's progress in developing the NIMS and the plan to complete and implement this portion of the management system by the end of fiscal year 2021. Of note, the Nuclear Posture Review (NPR) is underway. The results of the NPR could inform future requests to Congress.

Pursuant to statutory requirements, this report is provided to:

- **The Honorable Patrick Leahy**
Chairman, Senate Committee on Appropriations
- **The Honorable Richard Shelby**
Vice Chairman, Senate Committee on Appropriations
- **The Honorable Jack Reed**
Ranking Member, Senate Committee on Armed Services
- **The Honorable James Inhofe**
Ranking Member, Senate Committee on Armed Services
- **The Honorable Dianne Feinstein**
Chairman, Subcommittee on Energy and Water Development
Senate Committee on Appropriations
- **The Honorable John Kennedy**
Ranking Member, Subcommittee on Energy and Water Development
Senate Committee on Appropriations
- **The Honorable Angus King**
Chairman, Subcommittee on Strategic Forces
Senate Committee on Armed Services
- **The Honorable Deb Fischer**
Ranking Member, Subcommittee on Strategic Forces
Senate Committee on Armed Services
- **The Honorable Rosa L. DeLauro**
Chairwoman, House Committee on Appropriations

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Department of Energy/National Nuclear Security Administration | June 2021

- **The Honorable Kay Granger**
Ranking Member, House Committee on Appropriations
- **The Honorable Adam Smith**
Chairman, House Committee on Armed Services
- **The Honorable Mike Rogers**
Ranking Member, House Committee on Armed Services
- **The Honorable Jim Cooper**
Chairman, Subcommittee on Strategic Forces
House Committee on Armed Services
- **The Honorable Michael Turner**
Ranking Member, Subcommittee on Strategic Forces
House Committee on Armed Services
- **The Honorable Marcy Kaptur**
Chairwoman, Subcommittee on Energy and Water Development
House Committee on Appropriations
- **The Honorable Mike Simpson**
Ranking Member, Subcommittee on Energy and Water Development
House Committee on Appropriations

If you have any questions or need additional information, please contact Dr. Howard Dickenson, Acting Associate Administrator for External Affairs, at (b)(6) or Ms. Katie Donley, Deputy Director for External Coordination, Office of the Chief Financial Officer, at (b)(6) (b)(6)

Sincerely,

(b)(6)

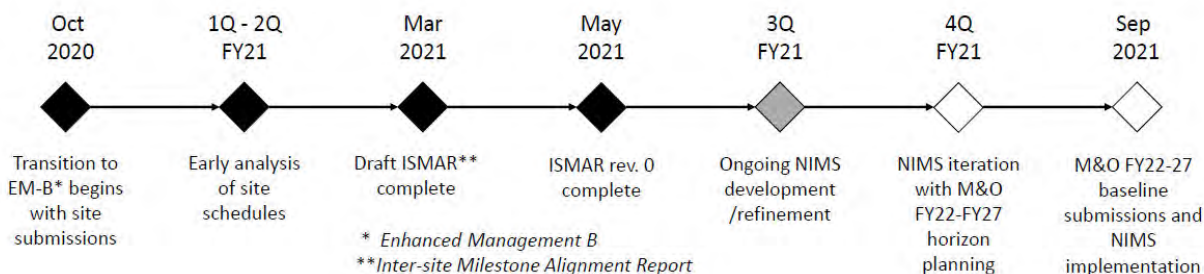
Charles P. Verdon
Acting Under Secretary for Nuclear Security
and Administrator, NNSA

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Executive Summary

The Department of Energy’s National Nuclear Security Administration (DOE/NNSA) is obligated by Federal law and Department of Defense requirements to establish a capability to produce no fewer than 80 plutonium pits per year (ppy). In May of 2018, the NNSA Administrator approved the preferred alternative¹ to meet the congressionally mandated pit production requirements. This two-site selection requires DOE/NNSA to manage simultaneous major acquisition projects while also performing modernization and ongoing program work across four DOE/NNSA sites. Program scope was assigned to the DOE/NNSA’s Office of Defense Programs, specifically the Plutonium Program Office, as the organization responsible for the 80 ppy mission. Through careful coordination of stakeholders, DOE/NNSA is working to incorporate all elements of required scope into a single Pit Production NNSA Integrated Master Schedule (NIMS) for plutonium pit production capabilities. Of note, the Nuclear Posture Review (NPR) is underway. The results of the NPR could inform future requests to Congress.

Information for the Pit Production NIMS will ultimately be collected from several primary sources: program scope directly managed by the Office of Defense Programs, key milestones and metrics pulled from acquisition projects managed under DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, key interface milestones from other offices that support the 80 ppy mission, and other specific items as requested by DOE/NNSA leadership. As elements of the program mature, they will be integrated into the schedule, which DOE/NNSA estimates will be implemented by end of FY 2021. Key steps to achieve implementation are depicted in the summary schedule below.



The Pit Production NIMS will incorporate detailed site schedules for direct-managed program scope focused on pit manufacturing and future production efforts. When complete and implemented, the Pit Production NIMS will provide a cohesive product to allow insight into the consequences of changes and/or delays between sites. It will also provide DOE/NNSA with a

¹ The recommended alternative consists of continuing to invest in the Los Alamos National Laboratory, in Los Alamos, New Mexico, to produce at least 30 ppy; and repurposing the Mixed Oxide Fuel Fabrication Facility at the Savannah River Site, near Aiken, South Carolina, to produce at least 50 ppy.

means to normalize individual site schedule data when required and verify the program-level critical path and provide a strategic view of key milestones to all applicable stakeholders.



Plan for an Integrated Master Schedule for Plutonium Pit Production

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I. Legislative Language

This report responds to legislative language confirmed in the Joint Explanatory Statement accompanying the *Consolidated Appropriations Act, 2021 (P.L. 116-260)* stating:

“The agreement reiterates House direction regarding plutonium pit production and clarifies that the plan to complete a resource-loaded integrated master schedule shall include all pit production-related project and program activities that shall provide additional details within high-level milestones for projects based on GAO best practices.”

Initially the House Report (H. Rept. 116-449) stated:

“The Committee notes that NNSA has taken a number of positive steps, including the shift to managing infrastructure investments in New Mexico and South Carolina under DOE Order 413.3B, has developed some high-level milestones, and has improved the transparency and quality of the data provided to the Committee. However, the Committee remains concerned that the NNSA has not prioritized the development of a resource-loaded integrated master schedule that includes all pit production-related project and program activities as recommended by the GAO, and does not appear to have plans to complete such a schedule until after it would have had to achieve certain pit production milestones. As such, the NNSA is directed to submit to the Committee not later than 30 days after enactment of this Act a plan to complete the resource-loaded integrated master schedule.”

II. Introduction

In May 2018, the Administrator for the Department of Energy’s National Nuclear Security Administration (DOE/NNSA) delivered to Congress the recommended alternative for recapitalization of DOE/NNSA’s plutonium science and production capabilities, as required by Section 3141(a) of the *National Defense Authorization Act for Fiscal Year 2018 (P.L. 115-91)*. The recommended alternative, a two-site solution to produce no fewer than 80 war reserve plutonium pits per year (ppy), was certified as acceptable by the Nuclear Weapons Council, as required by Section 3141(b), also in May 2018.

DOE/NNSA began work to implement this two-site solution for pit production, assigning the primary mission responsibility and coordination duties to DOE/NNSA’s Office of Defense Programs. Defense Programs held a series of workshops including all DOE/NNSA organizations with roles in the 80 ppy preferred alternative to establish a high-level path forward. These workshops involved active participation from several offices, including: the Office of Acquisition and Project Management, which manages capital acquisition projects; the Office of Safety, Infrastructure and Operations, which is responsible for mission enabling general purpose infrastructure; the Office of Defense Nuclear Security, which manages physical security

for DOE/NNSA; and other offices with supporting roles in the program, such as the Office of Defense Nuclear Nonproliferation, the Office of Information Management, the Office of General Counsel, and DOE/NNSA Field Offices.

The results of these efforts provided the framework for managing DOE/NNSA's pit production mission in which Defense Programs directly manages ongoing scientific and program work at the Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico; the Lawrence Livermore National Laboratory (LLNL) in Livermore, California; the Kansas City National Security Campus (KCNSC), in Kansas City, Missouri; and the Savannah River Site (SRS), near Aiken, South Carolina. Other DOE/NNSA offices manage the necessary capital acquisition project work necessary to meet the expanded pit production demands under DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, and other ongoing modernization work at LANL and SRS.

Defense Programs established a schedule-of-schedules approach to leverage existing management structures in DOE for capital acquisition projects and established infrastructure and security programs. Development of a pit production milestone schedule began in early 2019, incorporating 80 ppy activities from the framework and a variety of other program documents. The milestone schedule was implemented in October 2019 and began monthly status updates with the nine Federal stakeholders and four Management & Operating contractors (M&Os) thereafter. This schedule forms the foundation for the Pit Production NNSA Integrated Master Schedule (NIMS) that will combine detailed schedules from Defense Programs' direct-managed scope and selected milestones at the necessary level of detail from capital acquisition projects and supporting offices. Once implemented, the Pit Production NIMS will provide a single tool to assist DOE/NNSA in day-to-day management needs, facilitate coordination and execution of key integration milestones, and highlight potential schedule inhibitors.

III. Pit Production NIMS Strategy

DOE/NNSA's approach to develop the Pit Production NIMS involves incorporating data from multiple lower-level schedules into a single product managed by Defense Programs to track the entire 80 ppy mission, which will consist of:

- Program scope directly managed by Defense Programs to establish required pit manufacturing capabilities at LANL and SRS, and to implement support functions at LLNL and KCNSC;
- Capital acquisition projects at SRS and LANL to establish expanded pit manufacturing capabilities, directly managed under DOE Order 413.3B with program oversight from Defense Programs and project oversight from the Office of Acquisition and Project Management; and

- Sustaining mission-essential and supporting facilities at each site.

Of these three activities, the first category is managed in adherence to the Defense Programs Program Execution Instruction (DP-PEI). Secondly, DOE Order 413.3B provides an established framework for management and schedule development for capital acquisition projects. Finally, other supporting organizations have their own management structures to enable the pit production mission.

As the overall mission responsibility lies within Defense Programs, the Plutonium Program Office is the appointed federal program office (FPO) responsible for coordinating all elements of scope and integrating it into a single Pit Production NIMS, which, once complete, will incorporate information from four primary sources:

- Milestones from multiple NNSA offices² for work supporting the 80 ppy effort;
- Schedules from capital acquisition projects at LANL and SRS, following DOE Order 413.3B procedures;
- Site schedules for work performed by LANL, LLNL, KCNSC, and SRS directly managed by Defense Programs; and
- Other information requests, as needed, to support mission planning and execution.

The relationship of these underlying detailed Primavera P6 schedules and milestones in the Pit Production NIMS is shown in Figure 1.

² Milestones supporting the 80 ppy effort are provided from multiple offices, including: the Office of Defense Nuclear Nonproliferation, the Office of Safety, Infrastructure and Operations, the Office of Defense Nuclear Security, the Office of Information Management, NNSA General Counsel, Los Alamos Field Office, and the Savannah River Field Office.

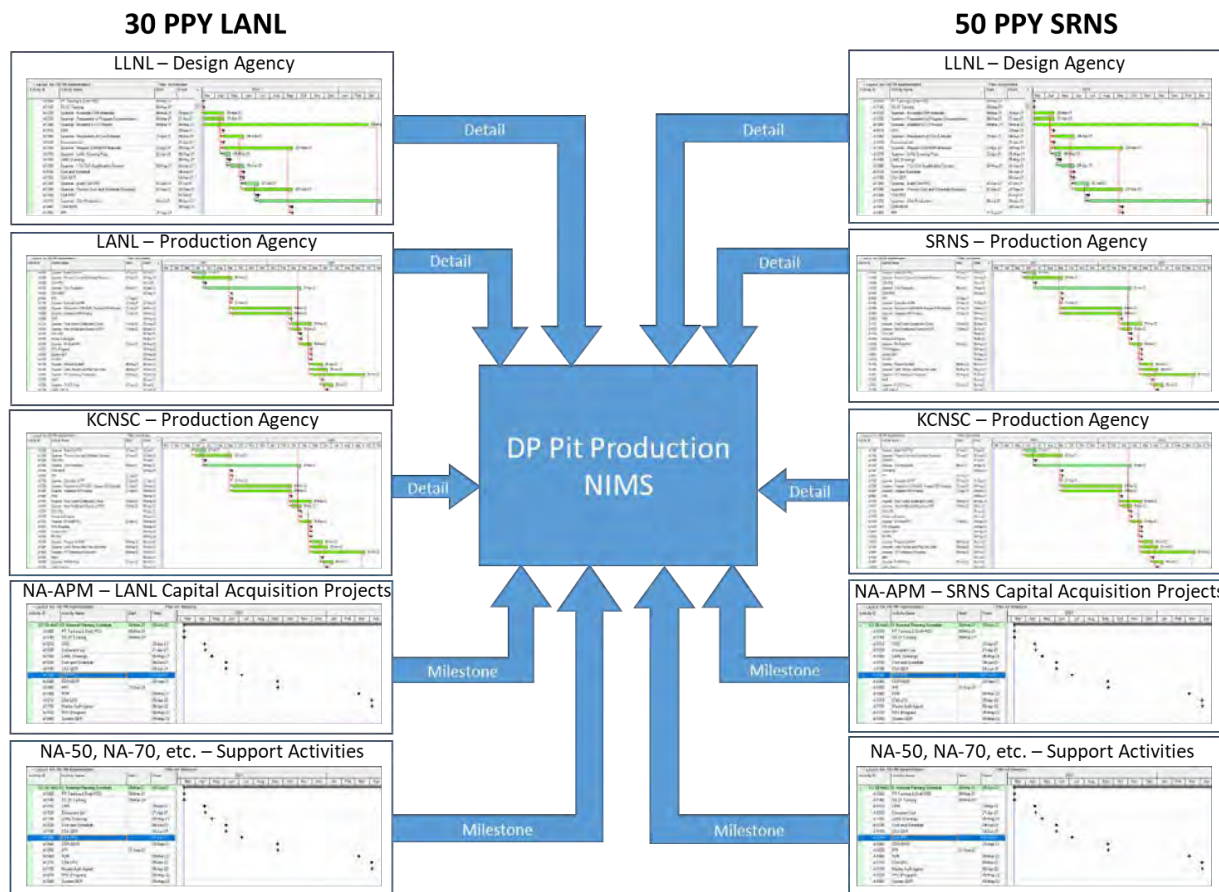


Figure 1. Illustration of Pit Production NIMS and underlying schedules using notional data

Management milestones from other DOE/NNSA offices include key activity and integration milestones provided to Defense Programs, as defined by their own management practices. These are key activities where the timing of completion is important to the 80 ppy effort, but their implementation may support multiple DOE/NNSA missions and are generally not managed as part of the 80 ppy program.

Capital acquisition projects generate their own detailed schedules under DOE Order 413.3B, and Defense Programs uses these schedules, incorporating key milestones and, if needed, limited supporting schedule logic as it ties into the overall 80 ppy mission.

M&O work that is directly funded and managed by Defense Programs, is reported in detailed schedules to the FPO at the highest level of fidelity eventually tracked in the completed Pit Production NIMS.

The last items represent other activities and specific one-time events that DOE/NNSA leadership request Defense Programs track in the completed Pit Production NIMS.

As these source schedules mature, more detail will be included in the completed Pit Production NIMS. In the case of capital acquisition projects, Defense Programs will pull from these schedules as the projects complete preliminary design and achieve approval of a performance baseline at Critical Decision (CD)-2, *Approve Performance Baseline*, in accordance with DOE Order 413.3B.

The detailed development and implementation of the Pit Production NIMS begins with Defense Programs’ direct-managed scope. The program management processes and procedures for these activities and scope are specified in DP-PEI, which “establishes the program management categories; establishes execution requirements for the categories; ...” and defines the activities that programs must undertake to fulfill these requirements. By way of comparison, the scope managed by other DOE/NNSA organizations is governed by other program management classifications, ranging from the least prescriptive Standard Management to design and construction industry-standard procedures implemented for Capital Acquisition Management. These classifications are depicted in Figure 2.

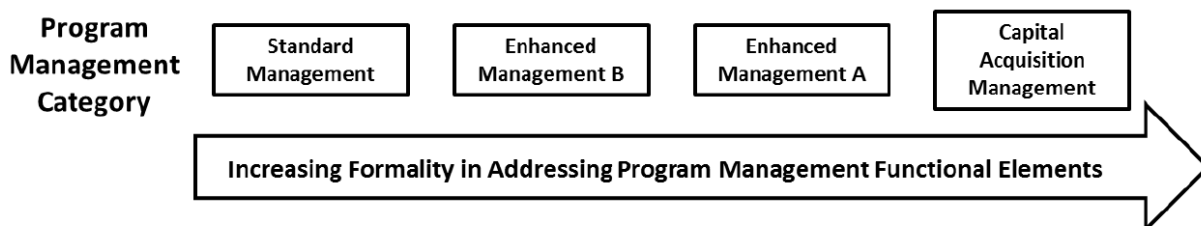


Figure 2. Tailored Approach to Program Management Categories

Per DP-PEI, the FPO is categorized as an Enhanced Management B (EM-B) program, and the process for addressing the thirteen required program execution elements, including integrated schedule, was approved in June 2020. The EM-B requirements that apply to the M&Os under Defense Programs’ direct-managed scope were communicated through a series of meetings and workshops throughout the second half of fiscal year (FY) 2020, with the transition to EM-B compliance beginning in FY 2021. This includes M&O submission of data products that are required for development and implementation of the Pit Production NIMS. The M&O EM-B requirements are implemented through the publication of formal, interrelated procedures called Project Controls Procedures (PCPs). The PCPs were developed and iterated with the M&Os in the 4th quarter (4Q) of FY 2020 and 1Q FY 2021, with the initial site schedule procedures being formally issued in July 2020. These schedule PCPs supported M&O development and submission in 1Q FY 2021 of individual site baseline schedules covering Defense Programs’ direct-managed scope.

The schedule PCPs define the key milestones representing significant accomplishments by the M&Os performing this scope. This involves activities related to actions of the Product

Realization Team³ and equipment installation/upgrade teams developing 10 ppy capability at LANL. The procedures further present milestone names, ownership, levels, and schedule coding requirements, in addition to definitions for hand-off milestones⁴ between the sites. The key milestones establish the framework for M&O baseline schedule and monthly status update submissions to the FPO.

Once complete and implemented, the Pit Production NIMS will allow the FPO to:

- Portray the schedule baseline and current status allowing for Defense Programs evaluation of program performance and proactive identification of potential issues;
- Perform programmatic “what-if” evaluations to determine the potential effect of significant changes caused by the realization of internal or external issues or risks;
- Integrate individual site program schedules so that key milestone dates and key inter-agency integration points (deliverables and receipts) not in alignment are identified; and
- Identify key external interface milestones that affect Defense Programs direct-managed scope but are managed outside of the program.

IV. Progress to Date

The initial Pit Production NIMS development has been for Defense Programs direct-managed scope. To that end, the transition to EM-B compliant site schedules began with the M&O FY 2021 submissions and subsequent M&O monthly status updates. The baseline submissions and subsequent monthly statuses also include cost expenditure data, therefore enabling the FPO to monitor both cost and schedule performance via a performance reporting system as part of EM-B.

The first step in building the Pit Production NIMS was identifying hand-off milestones. The Pit Production NIMS integrates schedules at the level of these hand-off milestones, allowing for monthly systematic review. Figure 3 is a high-level depiction of the Pit Production NIMS in relation to hand-off milestones.

³ The Pit Product Realization Team (PRT), led by LLNL as the design agency with participation from the LANL and KCNSC production agencies, was initiated in 2013 to focus on the next pit type for production. In addition to manufacturing the first war reserve pit during 2023, the Pit PRT scope includes achieving 10 war reserve ppy during 2024, 20 war reserve ppy during 2025, and an ongoing rate production of 30 war reserve ppy during 2026. The Pit PRT identifies, tracks, trends, and reports progress towards achieving the first production unit and ultimately 30 war reserve ppy at LANL.

⁴ Hand-off milestones are those elements of scope required by a site to achieve a program milestone but are executed by another site. The completed milestone therefore represents a hand-off between the two sites.

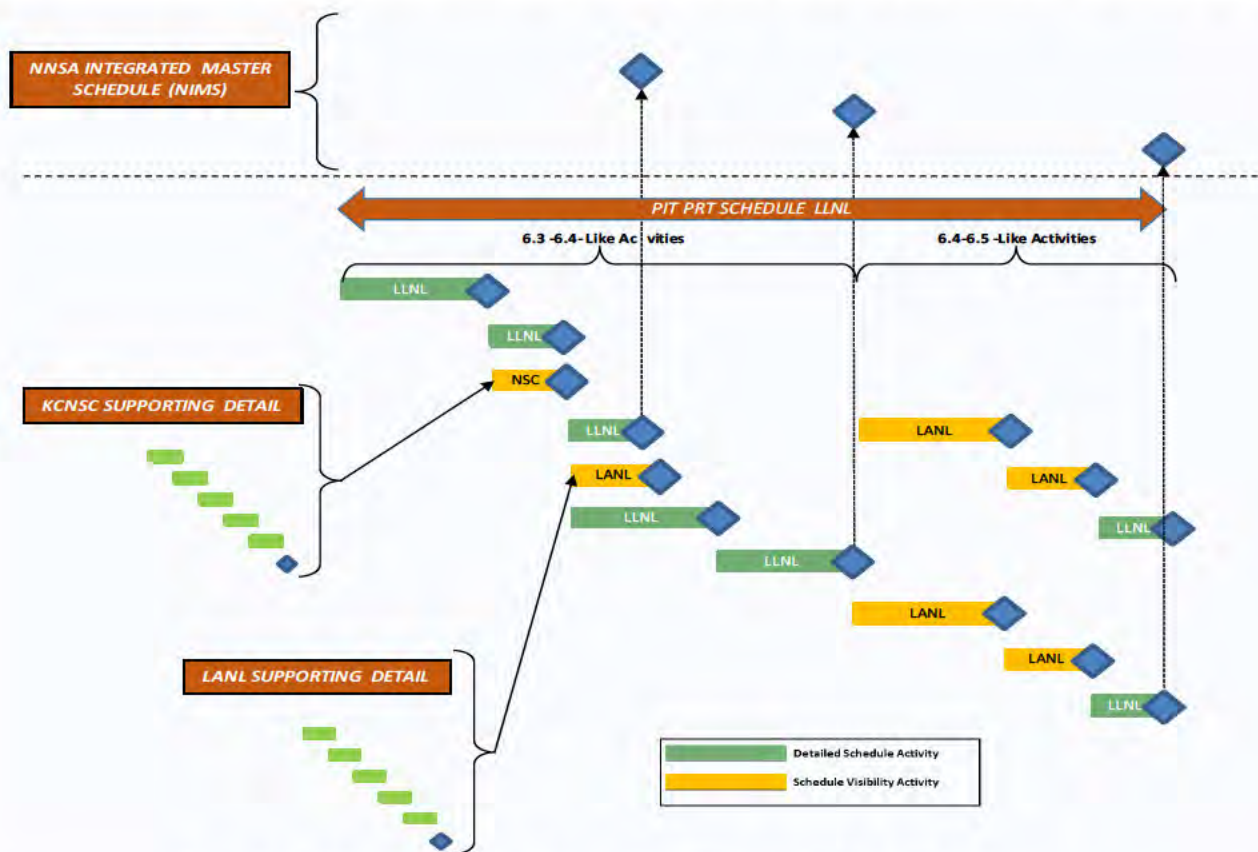


Figure 3. Pit Production NIMS integration of inter-site hand-off milestones

Once fully implemented, the Pit Production NIMS will provide a cohesive product allowing insight into the consequences of changes and/or delays between sites. Furthermore, it will provide the FPO a means to normalize individual site schedule data when required and verify the program-level critical path, program total float, relate potential delays of key milestones to actual performance data, support the application of program risks, and provide a strategic view of key milestones to all applicable stakeholders.

Development of the Pit Production NIMS began with the FY 2021 M&O baseline submissions, which were reviewed, iterated with the M&Os, and accepted by the FPO in 1Q FY 2021. This began the early-phase FPO analysis of these schedules, the identification of the hand-off milestones, and the advancement of the existing milestone schedule to the Pit Production NIMS to be implemented in September 2021.

V. Path to Complete the Pit Production NIMS

The proposed schedule in this section will enable DOE/NNSA to meet its commitment to implement a Pit Production NIMS in 4Q FY 2021 by fully integrating it with DOE/NNSA's existing future-year nuclear security planning process. The milestones supporting this timeline and

supporting EM-B activities can be found in Table 1, including completed or targeted completion dates.

Table 1. Milestones Supporting Timeline and Enhanced Management B Activities

Activity	Completion (or Targeted Completion) Date
Multiple EM-B Workshops with M&Os	Second half of FY 2020
FPO approach to EM-B approved by Defense Programs	June 2020
FPO schedule requirements and procedures released	July 2020
Formal M&O transition to EM-B compliance begins	October 2020
M&O monthly status update began	November 2020
M&O submission of FY 2021 DP direct-managed scope baseline schedules	1Q FY 2021
FPO early-phase analysis of site submissions	1Q and 2Q FY 2021
FPO identification of Inter-site Milestone Alignment Report (ISMAR)	March 2021
FPO reconciliation of hand-off milestones and release of ISMAR	May 2021
FPO ongoing assessment of site schedules in conjunction with Pit Production NIMS development	3Q FY 2021
Completion and Implementation of Pit Production NIMS in conjunction with M&O FY 2022- FY 2027 horizon planning	4Q FY 2021
Receipt and acceptance of Pit Production NIMS M&O FY 2022-2027 baseline submissions	September 2021

This schedule is also summarized in Figure 4.



Figure 4: Schedule of Pit Production NIMS Development and Implementation

Early analysis of the site schedules is complete and key hand-off milestones have been compiled and added to Defense Programs’ existing list. The draft listing of hand-off milestones was reconciled with the sites and released by the FPO as the Inter-site Milestone Alignment Report (ISMAR), which forms the foundation of the Pit Production NIMS. Ongoing collection, analysis, and building of the Pit Production NIMS schedule logic follows release of the ISMAR. This includes site schedule assessment, feedback, and modification with the M&Os, along with any needed changes to the Pit Production NIMS approach. The Pit Production NIMS will be

implemented in conjunction with the receipt and acceptance of the FY 2022 – FY 2027 M&O baselines in 4Q FY 2021.

The early Pit Production NIMS focus is on Defense Programs' direct-managed scope. As the capital acquisition projects mature the appropriate schedule elements will be incorporated into the Pit Production NIMS. Upon initial Pit Production NIMS implementation, the capability of DOE/NNSA to assess the performance of these program milestones and their impact on the pit production program schedule will improve considerably. As the capital acquisition projects implement project schedules, the Pit Production NIMS will advance to the point of assessing overall schedule performance against the 80 ppy mission.

VI. Conclusion

DOE/NNSA began working to establish an integrated schedule in 2018 immediately after the preferred alternative for the 80 ppy mission was signed by the NNSA Administrator. The complexity of this endeavor requires a flexible approach that does not delay ongoing work to establish war reserve pit production capability.

The development of the Pit Production NIMS is currently in-progress, with initial implementation planned by the end of FY 2021. These efforts require taking multiple programs and projects at different levels of maturity and integrating them into a single product while continuing to execute a portfolio of programs and projects at different levels of management formality and information fidelity. This necessitates a staged approach with intermediate products to gradually mature individual programs to the rigor necessary for the final product.

The Pit Production NIMS will incorporate detailed site schedules for Defense Programs direct-managed program scope focused on pit manufacturing and future production efforts past 2030 and integrate with schedule data from multiple stakeholders. This will provide a high-level view of the entire effort to reach 80 ppy and allows DOE/NNSA leadership to act on potential issues before they impact critical mission objectives.