



## Accelerator Complex Long Shutdown Planning

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PAC Meeting

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# Introduction

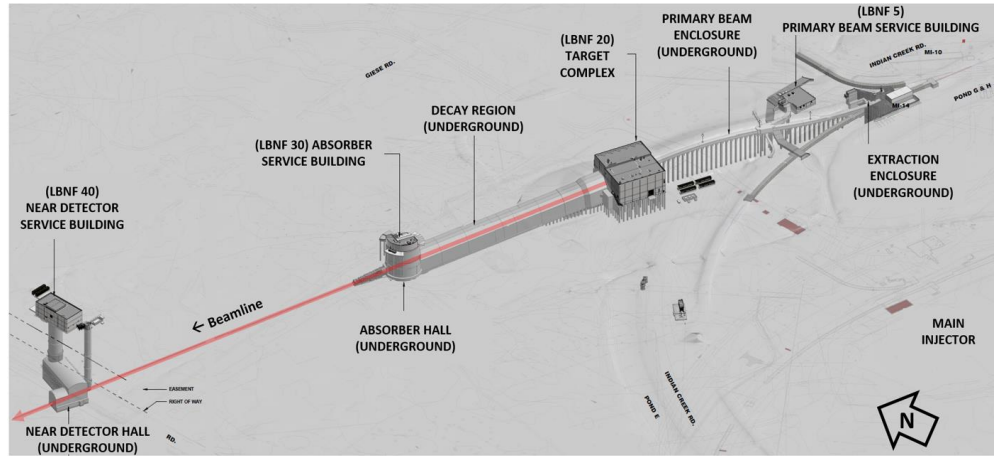
- A long (>2y) shutdown of the accelerator complex is required to tie-in elements of PIP-II and LBNF beamlines. The plan had been last updated in 2019 (?).
  - The 2019 update planned a 2y shutdown Jan-2027 : Jan-2029, followed 1y later by a six-month shutdown Jan-2030-Jun2030.
- We recently revisited the plan for this shutdown. Due to evolution of project schedules, we have revised the long shutdown schedule.
- In addition to general stakeholder interest, an update was required for several project reviews, Detector & Computing Ops Review, and planning purposes e.g. LBNF-DUNE NSCF RFP
  - Update already presented at PIP-II IPR, Mu2e IPR, and DOE budget briefing
  - Updated plan has been discussed with OHEP and FSO
- The shutdown plan may continue to evolve due to several factors that impact timing/duration of the shutdown (e.g. project performance, funding, science programmatic decisions, shutdown/installation planning maturation, accelerator upgrades, unplanned maintenance).
  - **Currently establishing a mechanism for maintaining the shutdown schedule**

# Methodology

- Lab Director, CRO, Deputy CRO, CPO, AD ALD and representatives from LBNF/DUNE, PIP-II, and UIP engaged in update.
- Considerations:
  - Projects with activities linked to the shutdown including LBNF/DUNE, PIP-II, UIP
  - CD-4 dates for LBNF/DUNE and PIP-II were held as a constraint
  - Impacts to data taking for Mu2e, SBN, NOvA, DUNE, FTBF, and SpinQuest
  - *Other strategic reasons for shutdowns such as operational cost savings were not considered in detail.*
- We evaluated three scenarios:
  1. Shutdown starting Jan.2027, with updates based on current project baseline schedules
    - Earlier than necessary for PIP-II. Results in longer shutdown than necessary. No Mu2e data taking prior to shutdown.
  2. Shutdown starting Jul.2027
    - Just in time shutdown for PIP-II. Also results in longer shutdown than necessary. Mu2e data taking prior to shutdown unlikely.
  3. **Shutdown starting Jan.2028 – favored scenario** from Fermilab leadership perspective

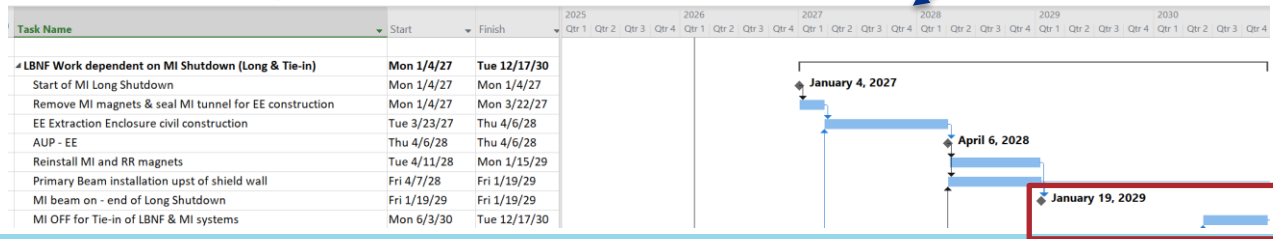
# Long Shutdown – LBNF/DUNE

- The total Main Injector downtime required for LBNF is 2.5 years including the following activities.
  - Removal of MI magnets, seal tunnel in preparation for Extraction Enclosure construction – 3 months
  - Extraction Enclosure civil construction – 12 months
  - Primary beamline installation upstream of shield wall, reinstall MI/RR magnets – 9 months
  - Tie-in of LBNF and MI systems – 6 months – **\*\*Initially planned as an independent shutdown occurring 1y after the long shutdown period**
- Other civil construction related to the Near Detector, Target Hall, Decay Region, Absorber Complex, and a portion of the Primary Beam Enclosure (downstream of a new shield wall) can be performed independent of a shutdown.



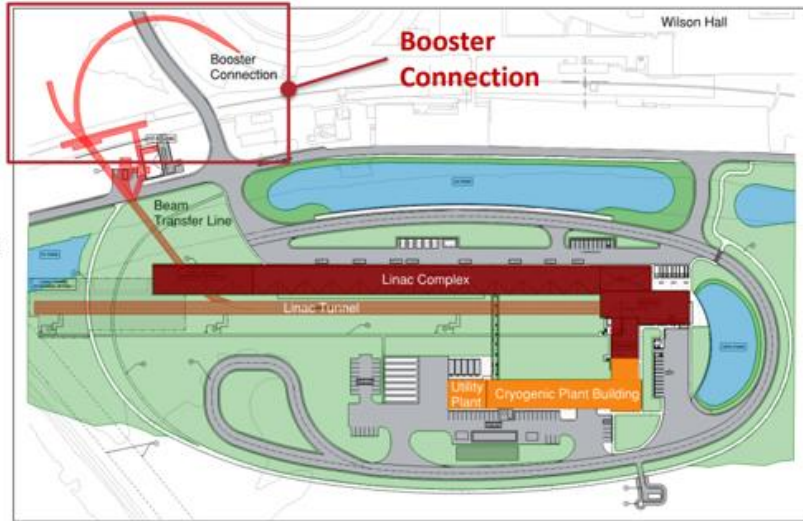
- Schedule assumes CD-1RR funding profile

Schedule prior to current update

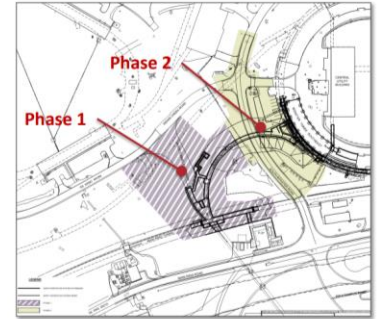


# Long Shutdown – PIP-II

- The PIP-II baseline schedule of long shutdown has been delayed ~5 months as compared to Jan.2027 in earlier version of the long shutdown plan.
- PIP-II connection to the Booster tunnel (aka Booster Connection Phase 2) requires the start of the long shutdown. Phase 1 requires test beam shutdown, also shuts down MI systems.
- Linac construction, installation, commissioning are schedule drivers for restarting the Booster.



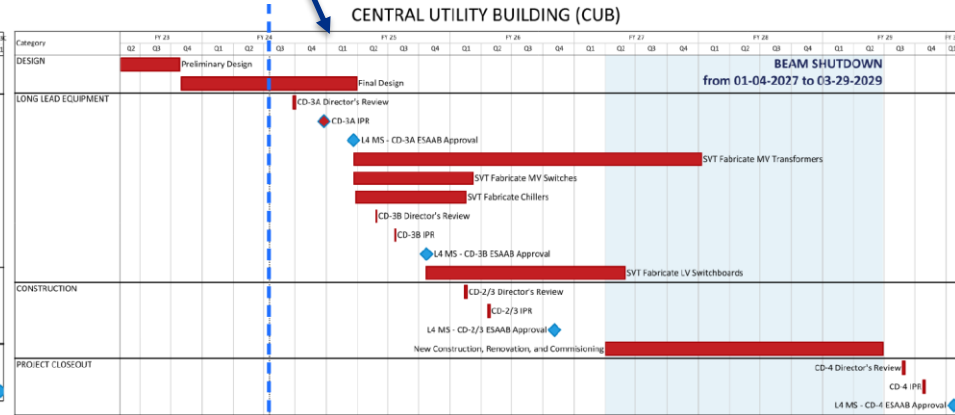
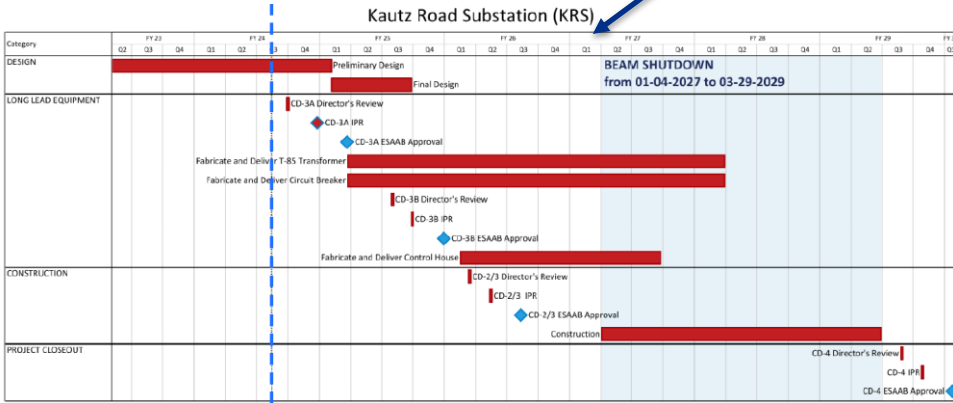
- Coordinating the shutdowns with the Lab
  - Conventional Facilities needs to be ready to go when Lab is ready for the shutdown
- Anticipate awarding the contract to one subcontractor but performed in 2 phases
  - First phase impacts the Fixed Target program
  - Second phase impacts the accelerator operations



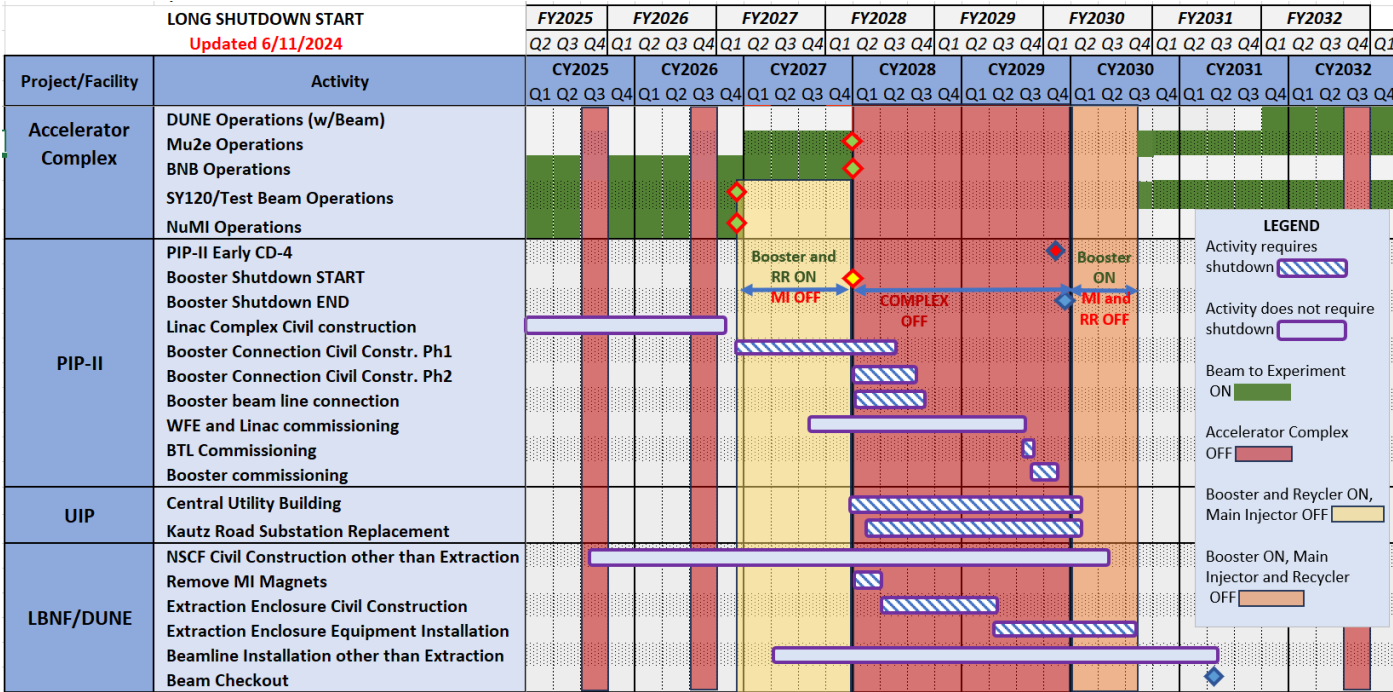
# Long Shutdown – UIP

- UIP construction schedule is fully dependent on the long shutdown.
- Delaying shutdown start directly translates to escalation on construction contracts.

Schedules prior to current update



# Updated Plan - January 2028 Shutdown Start



- This scenario provides at least as much beamtime to experiments prior to shutdown as previous plan. DUNE beam startup unchanged.
- Eliminates need for separate 6-month shutdown for LBNF tie-in to MI.

# Impacts to Science Program – Old Plan vs New Plan

	Stop Run Old Plan	Stop Run New Plan	Notes
NOvA	Jan-2027	Jan-2027	unchanged
SBN	Jan-2027	Jan-2028	+12 months running
Mu2e	Jan-2027	Jan-2028	Allows for 1 <sup>st</sup> data prior to shutdown
FTBF	Jun-2026	Jan-2027	+6 months running
SpinQuest	Jun-2026	Jan-2027	+6 months running

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## Next Steps

- Create webpage for posting this plan and other relevant program schedules.
- Identify relevant schedule milestones for monthly project reporting.
- Establish cadence and process for future updates, e.g. every six months.