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# **Fermilab 2016 Facilities Operations Review**

*December 2, 2016*

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**Facilities Division Director**  
**Office of High Energy Physics**

# Outline

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- **Goals of the Review**
- **Fermilab Facilities Reviewed**
- **Charge to the Review Panel**
- **Review Team, Subpanels and Chairs**
- **Background on Fermilab Facilities Operations**
- **Executive Summary of Review Results**
- **Subpanel Reports**
  - **Findings, Comments, and Recommendations**
- **Guidance from OHEP to Fermilab**



# Goals of the Review

- **Fermi National Accelerator Laboratory (FNAL or Fermilab) Facilities Operations review was held May 16–18, 2016, at Fermilab**
- **The purpose of the review was to:**
  - **Evaluate the present performance and efficiency of operating Fermilab’s facilities**
  - **Determine appropriate funding needed to effectively execute the mission of these facilities in support of the vision of the Particle Physics Project Prioritization Panel (P5)**



# Facilities Covered by the Review

- **Fermilab Accelerator Complex**
  - Main Injector, Recycler, Booster and Linac
  - Neutrinos at the Main Injector (NuMI) beam
  - Booster Neutrino Beam (BNB)
  - Muon Campus
  - All other beams provided to experiments



- **Accelerator and detector fabrication and test facilities**
- **Detectors used to carry out those experiments**
- **Computing facilities that support the experiments**
- **Detector Test Facilities operations (e.g., test beam)**
- **Elements of Accelerator Test Facilities operations that support projects, R&D and operations**
- **Overall framework for the indirect support these activities leverage**



# Charge to the Review Panel (1/2)

- Are Fermilab's operational activities **aligned with and supportive of** the vision of the U.S. program as outlined by P5?
- How were Fiscal Year (FY) 2015 resources used (bottom up analysis) to carry out this mission?
  - **Comment on any key changes proposed** for FY 2016 and/or the near-term future
- Considering Fermilab's staff, equipment, and facilities, along with HEP's funding, **has the lab optimized its operational activities** for the most productive program?
- Fermilab has grouped its operational activities into **high, medium, and low priorities**
  - Please comment on this approach and **suggest any key adjustments** needed to better advance the P5 vision
  - Consider also where Fermilab-based efforts are **unnecessarily duplicative** of other capabilities available to the U.S. community



# Charge to the Review Panel (2/2)

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- Assess the **five-year workforce plan** (FY 2015-2020):
  - Is the FY 2015 staffing level and skill mix appropriate and is the proposed evolution optimal?
- Assess the **five-year facility plan** (FY 2015-2020):
  - Are the existing and proposed accelerator improvement projects (AIPs) robust and appropriate to **enhance productivity** while **reducing cost of operations**?
  - Is the facility plan for capital investment clear and **aligned with the national and international priorities of HEP and P5**?
- What level of facility operations and performance could be **sustained** into the out years with **constant-effort funding** at the level of FY 2016 appropriations?
- What **benefits, in order of priority**, could be realized with **incremental funding** above this level?



# Review Team Subpanels

- **Accelerator Operations (4)**

- T. Roser (BNL), CHAIR
- R. Erickson (SLAC)
- Arne Freyberger (TJNAF)
- Michael Banda (LBNL)

- **Accelerator Test Facilities (3)**

- George Neil (TJNAF), CHAIR
- Kevin Jones, (ORNL)
- Soren Prestemon (LBNL)

- **Computing Operations (3)**

- Barb Helland (ASCR), CHAIR
- Ian Bird (CERN)
- Chip Watson (TJNAF)

- **Detector Operations and Test Facilities (4)**

- William Trischuk (Toronto), CHAIR
- Harold Evans (Indiana)
- Vera Luth (SLAC)
- Chris Hearty (UBC & TRIUMF)

- **Operations Finance and Management (4)**

- Jack Anderson (BNL), CHAIR
- Alexander Merola (SLAC COO Emeritus)
- Jon Kotcher (BNL)
- Charlotte Chang (SLAC)



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# BACKGROUND ON FERMILAB FACILITIES OPERATIONS

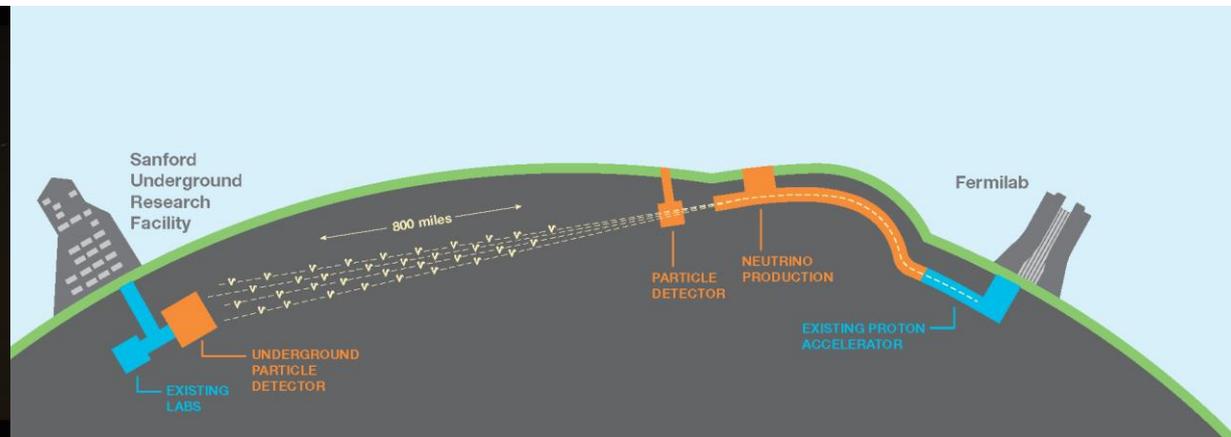
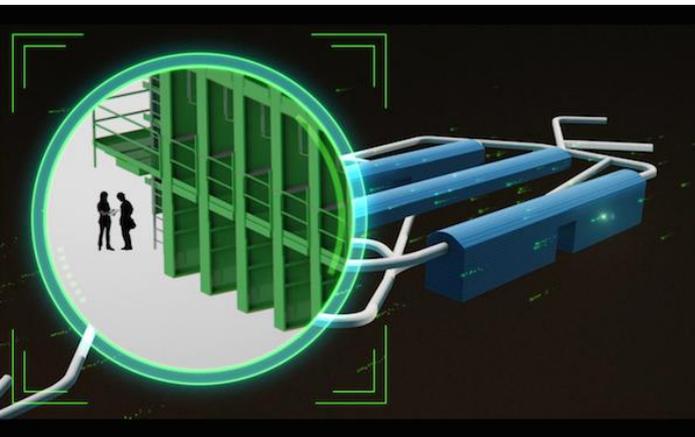


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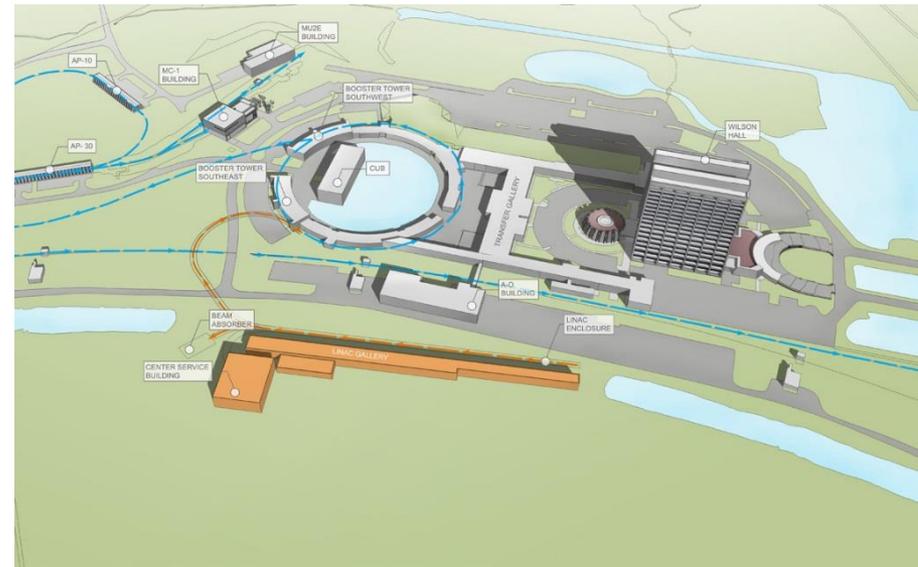
# Reinventing Fermilab

- Since Tevatron shutdown (end FY11) and P5 Report release (May 2014), Fermilab has been reinventing itself for a new era in which it will become the international leader of research at the Intensity Frontier
  - Nigel Lockyer, appointed Fermilab Director in September 2013, has reorganized the lab to implement revamped program
- Fermilab's goal is to become for accelerator-based neutrinos what CERN is for the Higgs boson



# Enabling Intensity Frontier Science

- Current neutrino program includes the MINERvA, NOvA, and MicroBooNE
- Lab organizing neutrino experiments into a Short-Baseline Neutrino (SBN) program and a LBNF/DUNE program
  - SBN will complement MicroBooNE with SBND and ICARUS
- Successful neutrino program relies on the Fermilab Accelerator Complex to deliver proton and secondary beams with adequate reliability and intensity
  - Complex being improved through the Proton Improvement Plan (PIP), which focuses on the Linac and Booster as well as ongoing improvements to the Recycler
  - PIP is essential to:
    - Achieve sustained NuMI beam power of 700 kW for NOvA
    - Improve Booster cycle time to enhance Booster Neutrino Beam (BNB) for SBN program and beam for Muon Campus (Muon g-2 and Mu2e)
- Ongoing Future improvements to the Accelerator Complex are planned, including PIP II
  - PIP II will replace Linac with a superconducting Linac of twice the energy and enable 1.2 MW beam power for LBNF in the mid-2020s



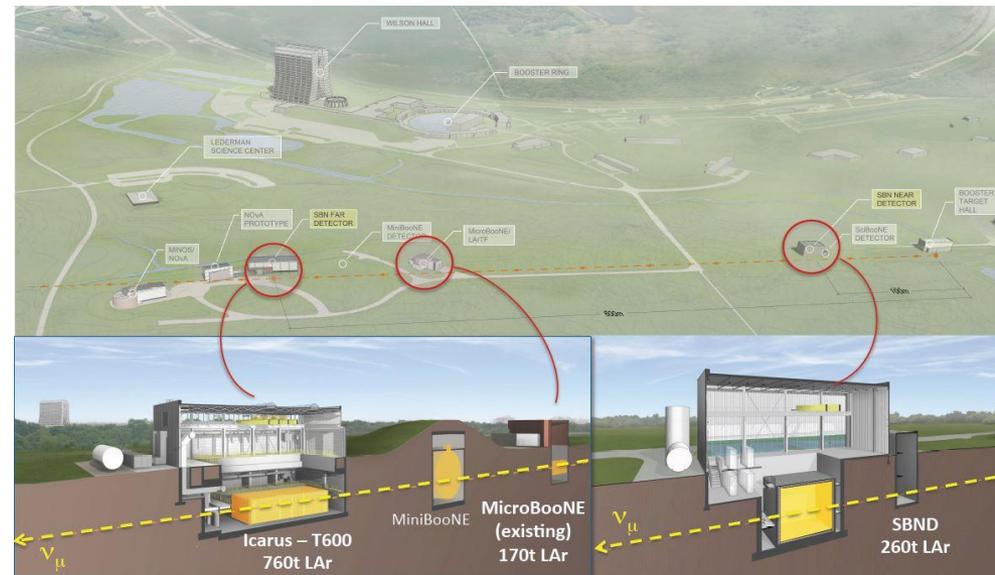
# Accelerator Operations & Accelerator Test Facility

- **The Accelerator Operations budget in FY 2016 is \$82.2M with an additional \$8.7M for Accelerator Improvement Projects (AIPs)**
  - Includes costs for operation of the Fermilab Accelerator Complex, which includes site power, equipment, and AIPs as well as computing activities related to operation of the accelerators
- **Accelerator Test Facility Operations are funded separately at the level of \$19.1M in FY 2016**
  - Supports operation and maintenance of test facilities, processing and fabrication facilities and other supporting infrastructure
  - Test facilities support the programs to develop:
    - High-field magnets and crab cavities for the LHC
    - Second generation LCLS-II and PIP II cryomodule production
    - Testing and R&D on future upgrades of the complex



# Pursuing Neutrino Program Goals

- Neutrino Division formed out of the Particle Physics Division (PPD) in order to support lab's emphasis on neutrino physics
  - Established in 2014 under the leadership of Regina Rameika
- Lab also formed Neutrino Platform in 2015
  - Will support detector R&D, target and beamline development, software, computing, theory
- International collaborations are essential for lab to reach goals
  - Attempting to attract global community of neutrino physicists, and partner with CERN and other labs, to realize vision
    - SBN program
    - LBNF/DUNE
    - PIP-II MW-class neutrino beam



# Muon Campus

- **Fermilab will host the Muon g-2 and Mu2e experiments**
  - P5 recommended experiments sensitive to physics beyond the Standard Model at energy scales above the reach of the LHC
  - Muon g-2 experiment scheduled to begin data taking in 2017
- **Fermilab created Muon Campus to host these muon experiments**
  - Established through three GPP and four AIP to exploit synergies between the two experiments and generate cost savings
  - Muon program relies on Muon Campus to provide intense low energy secondary and tertiary beams required to create muon beam with required specifications



# Detector and Targetry

- **Detector Operations responsible for particle detectors and needed support infrastructure, including detector halls and computing**
  - Neutrino program detectors: \$6.3M FY 2016
  - Muon program detectors: \$4.2M in FY 2016
  - NOvA det. ops includes near (Fermilab) and far (Ash River, MN) detectors
  - SBN detectors include MicroBooNE, will add ICARUS & SBND in FY 2018
- **Muon program detector efforts had starts in Detector Test Facilities, which had \$5.5M budget in FY 2016**
  - Muon g-2 experiment starts in FY 2017
  - Mu2e experiment starts in FY 2019-20
- **Demand for multiple beams led to creation of Targetry Systems Operations Department in February, 2015**
  - In addition to long term planning, is constructing and maintaining spares for NuMI and BNB targets and horns



# Computing

- **Operations of the Computer Division are critical to planning, designing and analyzing equipment and experiments supported by Accelerator and Detector Operations**
- **Computing Division supplies software systems and frameworks used in accelerator and detector work, including:**
  - “art” software framework, used by NovA, Mu2e, g-2, and more
  - “LArSoft” simulation, reconstruction, and analysis toolkit for liquid argon TPC experiments
  - “artdaq” real-time software system for data acquisition
- **Scientific Computing Operations Budget in FY 2016 is \$19.5M**



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# REVIEW RESULTS: EXECUTIVE SUMMARY



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# General Impressions

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- In general, the review panel was impressed by many accomplishments of the Fermilab management and staff, including:
  1. New energy and focus of the lab
  2. Progress made by the Proton Improvement Plan (PIP)
  3. Alignment of the Fermilab program with the recommendations of P5
  4. Strategic planning within the Computing Division
- Review committee favorably impressed by Fermilab's past performance
  - Examined all operational activities, associated budgets & planning docs.
  - Found that **Fermilab's operations are lean and effective**
  - Complemented Lab in **delivering and often exceeding its annual goals** in a challenging environment, where funding limitations forced Lab to continue operating equipment well beyond normal lifetime



# Review Committee Praise

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- **Recent reorganization of the lab aligns it with goal to become the premiere international center for neutrino-based research through its long- and short-baseline neutrino programs**
  - **Rapid development of LBNF and founding and growth of DUNE collaboration impressed the review committee**
- **Praised the Accelerator Division's timely construction of the Muon Campus and the success of PIP**
  - **Impressed with the reliability and steady improvements in the NuMI and BNB beamlines**
- **Computing Division commended for developing a common software stack**
- **Accelerator Test Facilities operated at the lab cited as valuable infrastructure for the entire HEP program**



# Overall Comments & Recommendations 1

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The review panel also had critical comments and recommendations.

Recommendations are action items for the lab, summarized here:

- 1. The lab's planning is funding driven rather than need driven.**
  - The lab's present approach with the Proton Improvement Plan retires the greatest operational risks, yet significant risks remain.
  - The lab should develop and initiate, as soon as feasible, a consolidated facility refurbishing plan, as a follow-up to PIP.
- 2. Only the Computing Division has developed a sound strategic plan for the near and far terms.**
  - All the other divisions evaluated in this review had not done this exercise and are not working from actual strategic plans.
  - The lab should complete strategic plans for each of the divisions reviewed herein and present them to HEP within 12 months.

# Overall Comments & Recommendations 2

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3. **The lab should consider opportunities for increasing efficiency...**
  - by critically evaluating the distribution of work and/or functions between the Accelerator and Technical Divisions in the context of the current laboratory mission.
  - The lab should complete this analysis within 12 months.
4. **The Computing Division should not depend solely on external hardware and cloud computing.**
  - It should realign its budget to replace some of its aging hardware to achieve a more balanced, stable and attractive facility.
  - It should identify funds to add back a minimum of \$500,000/year for computing hardware starting in FY 2017.
  - And it should evaluate the annual cost savings of retiring compute nodes at 6 years, including both electricity costs (including air conditioning) and labor costs.



# Overall Comments & Recommendations 3

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- 5. **The lab should construct a workforce operations plan,...**
  - in the next six months, to understand the interplay between its planned experiments and to ensure that personnel with the proper skills mix are available to support detector operations and the test facilities in a timely fashion as the lab embarks on an ambitious construction period.
  
- 6. **To optimize its operational activities, the lab should advance its paradigm of budget planning to be mission and Enterprise Risk Management (ERM) driven.**
  - This process should include:
    1. Engaging both direct and indirect division directors to discuss budget decisions and trade-offs, and
    2. Providing “stretch” targets to Indirect Divisions, i.e. -5%, flat, and over target.
  - Invite the division directors to present to lab customers their trade-offs and risks.
  - This exercise should also include appropriate benchmarking.



# Overall Comments & Recommendations 4

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- 7. The lab should expand its ERM process to include operational risks of such a priority as to require senior management attention.**
  - This will facilitate integrated Fermilab-wide resource allocation to address high priority operational risks.
- 8. The lab should establish a process for generating the Director's priorities...**
  - by which they are directly derivable from, and are therefore consistent with, strategic and other Laboratory planning and goals;
  - is accompanied by a change management plan;
  - can be conveyed in a simple and straightforward manner to the intended audiences;
  - and is more transparently consistent with the community vision as put forth by P5.

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# ACCELERATOR OPERATIONS



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# Accelerator Ops: Findings

- The funding plan for Accelerator Operations including Accelerator Improvement Projects (AIP) from FY 2015 to FY 2020 is approximately flat:

Accel Ops + AIPs	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020
Funding Plan (\$M)	81	91	87	89	89	91

- The Accelerator Division staff count is approximately 450 in four departments:
  - PIP-II, Accelerator Systems, Engineering & Support, Accelerator Physics Center
- In FY 2015, Accelerator Operations tasks were charged for 270 FTE total:
  - 234 FTE from the Accelerator Division
  - 21 FTE from the Technical Division
  - 14 FTE from Particle Physics Division and
  - 1 FTE from Scientific Computing Division
- The rest of the Accelerator Division works on projects.



# Accelerator Ops: Findings

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- PIP has increased proton throughput with less lost beam power in the Booster than before the upgrade.
- Good vacuum and low beam losses in the recycler is the key to reliable 700 kW operations.
- Inventory of spares is insufficient to maintain reliable and sustainable operations of the MI and RR
- Beam delivery systems are important but conventional
- Targets and focusing horns are critical components for producing neutrino and muon beams
  - Must function reliably under conditions of intense radiation, corrosive vapors, severe mechanical stress
- Target Systems Department established in 2015 to provide targets and focusing horns.



# Acc. Ops: Comments & Recommendations

- **Accelerator Division staff commended for accomplishments:**
  - Completed majority of the Proton Improvement Plan (PIP), aggressively built-up Muon Campus, operated facility with record beam intensities
  - Did so under challenging funding and resource availability
    - Assigned low priority for receiving the needed skilled staff as laboratory focused priority on completing projects on budget and schedule
- **Although on its way to demonstrate the 700 kW proton beam on target, present and near-term planned resources insufficient to operate facility in a reliable and sustainable manner**
  - Inventory of spares insufficient; may be acceptable short-term risk but not sustainable long-term
  - In long term, operations should manage its resources based on need and not on affordability, much as the projects are being managed
  - Expanding the scope to also operate the Muon Campus starting in FY 2017 with flat or reduced funding is not realistic

## **RECOMMENDATION:**

- **Complete a strategic plan for Accelerator Operations that covers both near-term and long-term by April 2017.**



# Acc. Ops: Comments & Recommendations

- Accelerator Division has skilled staff to accomplish current tasks but cannot afford the staffing levels required for reliable and sustainable operations as scope of accelerator programs expands
- Proton Improvement Plan addressed the refurbishment of aging and deteriorating equipment in the accelerator complex while upgrading performance
  - Still many areas where equipment needs to be replaced or refurbished to ready the facility for reliable and sustainable accelerator operation for the next two to three decades
- Inventory of 7835 spare Linac power tubes should be increased to cover four years of operational tube usage (~6 tubes/year)

## RECOMMENDATIONS:

- Develop a consolidated facility refurbishing plan, as a follow-up to PIP by April 2017.
- Increase the 7835 spare inventory to a four-year supply.



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# ACCELERATOR TEST FACILITIES



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# Accelerator Test Facilities: Findings

- **Accelerator Test Facilities (ATF) consists of a suite of test stands, services, capabilities, and accelerator expertise with an annual budget of \$18.7M plus substantial contributions from projects and other programs**
- **Main focus areas are:**
  - **Magnet Capability (both Superconducting and Warm), ~25% of budget**
  - **Superconducting RF (SRF) Capability with ~34% of budget**
  - **Beam Test Facilities, ~10% of budget**
  - **Cryogenic Plants and their Operation, ~31% of budget in support of the other activities**
- **Staffing and resources for ATF operations, maintenance and improvement widely dispersed across Accelerator Division and Technical Division**
  - **Technical Division Chief is responsible for oversight and funding for ATF operations and maintenance**
- **Operational activities are generally well aligned with P5**



# ATF: Comments

- **ATF does not have its own strategic plan**
  - Development of a plan including each facility would help to focus the test facility operational fund investments and establish priorities based on perceived future needs
  - Test facilities naturally serve DOE-SC beyond HEP and P5
    - Fermilab management's vision needs to accept that such facilities are really an SC resource, and perhaps should be treated a bit differently than projects
  - Lab should reevaluate ATF management model
    - Should develop and manage these facilities according to a specific ATF strategic plan that recognizes effective stewardship, utilization and funding transparency of these facilities for HEP and other customers
- **Funding approach for facilities maintenance and upgrades should be clarified/revised to better match the realities of DOE-SC needs**
  - Whereas Fermilab projects are singularly HEP focused, test facilities will typically provide expertise of value to broader SC needs. A present example is the LCLS-II project.
- **Significant cryogenic skills are needed now and through the next five years**
  - Multiple projects appear to have been affected by the shortage
  - Fermilab has worked to address the issue with recent hires and recognized that maintaining staffing will require multiple hires yearly to address attrition



# ATF: Recommendations

## RECOMMENDATIONS:

- **Consider opportunities for efficiency by critically evaluating the distribution of work and/or functions between the Accelerator and Technical Divisions in the context of the current laboratory mission. Complete this analysis within 12 months.**
- **Develop a strategic plan for the integrated suite of Accelerator Test Facilities that looks out to the one, three, five and ten-year horizons and incorporates current facility condition assessments and identifies necessary improvements and/or capability enhancements driven by the anticipated future needs of projects and general accelerator research and development.**
- **Develop a justification for the IB1 cryogenic upgrade that takes into consideration the current condition of the facility and anticipated demands on it.**



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# COMPUTER OPERATIONS



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# Computer Operations: Findings

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- Fermilab has a core capability in “Advanced computer science, visualization and data.”
- SCD completed a re-organization in FY 2015 and is currently organized around the following focus areas (143 FTEs total):
- SCD continues to analyze the skillset of their organization and has identified the critical skills needed to realize their vision
- Scientific Computing Operations fully burdened budget for FY 2015 was \$20.7 M
  - Included \$17.2 M for effort and \$3.5 M for M&S
- Lab plan at review shows decrease of ~\$1.1 M in FY 2016 budget with inflationary growth through FY 2020, resulting in a significant reduction in computing hardware in the out years



# Computer Operations: Findings

- Key strategy of SCD is to provide a common software stack
- FermiGrid compute and mass storage services have been used effectively
  - 35 million core hours used in FY15; on pace to use 60 million hours in FY16
- HEPCloud portal will allow SCD to integrate transparent access to opportunistic compute cycles and potentially to commercial cloud resources for peak needs
- Computing requirements are estimated to grow, but hardware aging
  - Estimate 20% growth per year from FY16–18 but over half of the computing resources at Fermilab are 5 years old or older
  - Current hardware assumed to be cost effective and reliable for another 2 years; although some of the hardware will be 9 years old at that time
- SCD identified 13 risks in their risk register: one high, six medium, six low
  - The *“inability to leverage computing industry hardware and software advances”* was identified as the highest risk
  - Staff risks were identified as *“inability to compete for technologically knowledgeable personnel”* (medium) and *“Loss of critical personnel”* (low)
  - *“Significant computing hardware failures”* was also rated as a low risk.



# Computer Operations: Comments

- **For restricted budget in FY 2016, decision is to maintain common software stack and corresponding operational services that are key to success of experiments**
  - This is the correct strategy, since losing skillset in this team would be extremely difficult to replace
  - However, this is at the cost of not being able to refresh aging hardware and an inability to locally provision sufficient computing resources for the stated requirements in 2017 and 2018
- **Maintaining onsite computing capacity to meet majority of computing needs should be a high priority for Fermilab's infrastructure**
  - It is elemental in attracting national and international users to the lab
- **Facilities group should perform careful cost/benefit analysis of retiring its least energy efficient nodes, 2010 and older, as soon as possible**
  - Likely that oldest nodes could be turned off, replaced in performance with newer hardware, and the resulting operational cost savings would pay for the added nodes in about 3 years
  - Leaves additional 3 years of "new" capacity in out years when old nodes would have died anyway
- **Other areas that SCD and HEP may want to explore are:**
  - SCD should work with HEP to request reasonable allocation from National Energy Research Scientific Computing Center (NERSC) to determine yearly additional resources needed to support "burst" demands before finalizing contract with cloud provider
  - Fermilab should work with the DOE National Lab CIOs to explore advantages of consolidating purchases of Cloud services
    - Lab should also explore use of any Cloud service agreement that the DOE CIO may have negotiated



# Computer Operations: Recommendations

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## RECOMMENDATIONS:

- Identify funds to add back a minimum of \$500,000/year for computing hardware starting in FY 2017.
- Evaluate the annual cost savings of retiring compute nodes at six years, including both electricity costs (including air conditioning) and labor costs.



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# DETECTOR OPERATIONS AND TEST FACILITIES



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# Detector Ops. and Test Facilities: Findings

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- The detector and test beam facilities at Fermilab are key assets to the lab and US HEP now and in the future
- Fermilab has found an innovative way to get the SBN program off the ground without direct additional investments
  - Some General Plant Project (GPP) infrastructure to house new detectors
  - In-kind contributions of experimental apparatus such as the ICARUS detector that is currently being refurbished at CERN
- Risk registry being developed is a useful tool for experiment and detector test-facility planning
  - Raising awareness among staff about most likely and potentially damaging risks
- Detector test-facilities have a long list of improvements and additional capabilities (both equipment and specially trained personnel) that would make them more effective if additional funding were available



# Det. Ops. & Test Facilities: Comments & Recommendations

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- **All aspects of detector operations and the detector test facilities are well aligned with the US program as outlined by P5**
  - Lab moving ahead expeditiously to implement a short- and long-baseline neutrino program and establish the muon campus to support high priority precision experiments in the P5 plan
- **Improved tracking of utilization of detector test facilities and test beams would be beneficial**

## **RECOMMENDATION:**

- **The lab should construct a workforce operations plan by April 2017 to understand the interplay between the planned experiments and to ensure that personnel with the proper skills mix are available to support detector operations and the test-facilities in a timely fashion as the lab embarks on this ambitious construction period.**

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# OPERATIONS FINANCE AND MANAGEMENT



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# Ops. Finance and Management: Findings

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- Fermilab has 1,800 employees and more than 2,600 users
- Total lab budget reduced from \$446M in FY 2015 to \$433M in FY 2016
  - Accelerator and Detector Ops down \$6M (3.5%, \$168M→\$162M)
  - Lab indirect spending up \$10M (7.7%), with increases in:
    - Facilities Management, ESH&Q and Executive Management (Office of Partnerships and Technology Transfer, Integrated Planning and Performance Management, Project Management, LDRD)
  - LDRD is 0.6% at Fermilab, compared to 3.0% at LBNL, 6% at SLAC
- **Budgeting is a top down process at Fermilab**
  - Both Org Burden and lab indirect allocations removed centrally off the top
  - Division heads are in full control only after both reserves and overhead burdens are removed from the HEP funding allocation



# Ops. Finance and Management: Findings

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- **Fermilab implements planning process that attempts to ensure organizational activities are aligned and prioritized with long-term goals and P5 vision**
  - Fermilab-wide planning process generates an Annual Lab Plan, that is presented to DOE, and which drives the Fermilab Strategic Plan
  - Plan includes annual objectives, or outcomes that can be observed/measured
    - Perception by some Lab members that some needed outcomes may not be included
  - Objectives are subdivided into activities and include performance metrics
- **Important element of Strategic Planning & resource optimization is risk**
  - Identify risks, Normalize them by comparison with each other, and their management (minimization, mitigation, avoidance, acceptance, etc.)
  - Fermilab is implementing an Enterprise Risk Management (ERM) System
  - ERM currently identifies strategic risks and a collection of global risks



# Ops. Finance and Management: Findings

- **Fermilab Campus Master Plan supports the implementation of P5 plan**
  - Campus Master Plan is aggressive and presents comprehensive approach to enhancing Fermilab's future infrastructure
  - Utilizes a variety of best business practices to determine priorities for needed maintenance and modernization of general purpose facilities
  - Consistent with the Lab Plan, needed improvements to Fermilab Facilities, including modernization, consolidation and centralization, are explicitly noted
- **Laboratory leadership has outlined a plan that would address constant level funding effort using three principles:**
  - Grow the DOE HEP top-line budget and manage with this in mind
  - Fund highest-priority items first, even if new, and bring lower-priority elements forward for supplemental funding requests or termination
  - Handle budget issues internally and only request external help when absolutely needed
- **Fermilab plans to respond to a funding reduction by reducing the scope of facilities and operations**



# Ops. Finance and Mgmt.: Comments & Recommendations

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- Fermilab commended for establishing a set of priorities and making significant attempts to use them to advantage, both within and external to the Lab
- Much of Lab workflow and focus appears to adhere to the P5 plan
- Process whereby the “Director’s Priority Slide” (DPS) is established, and how the priorities are applied, was not clear
  - Do not directly map onto P5 vision and are subject to misinterpretation

## RECOMMENDATION:

- Establish a process for generating the Director’s priorities by which they are directly derivable from, and are therefore consistent with, strategic and other Laboratory planning and goals; is accompanied by a change management plan; can be conveyed in a simple and straightforward manner to the intended audiences; and is more transparently consistent with the community vision as put forth by P5.

# Ops. Finance and Mgmt.: Comments & Recommendations

- Budget process should be transparent to enable programmatic stakeholders to make informed decisions and should be integrated with Lab's strategic plans and ERM
- Current budget process treats activities funded by overhead pool in a fashion identical to the direct program fund
  - This process does not take into consideration that it usually takes about three direct programmatic dollars to generate one dollar of indirect spending
  - Missing a process that closely scrutinizes the tradeoffs between direct vs. indirect allocations

## RECOMMENDATION:

- To optimize its operational activities, evolve the paradigm of budget planning to be mission and Enterprise Risk Management (ERM) driven. This process should include:
  - Engaging both direct and indirect division directors to discuss budget decisions and trade-offs.
  - Providing “stretch” targets to Indirect Divisions, i.e. -5%, flat, and over target. Invite them to present to lab customers their trade-offs and risks. This exercise should also include appropriate benchmarking.



# Ops. Finance and Mgmt.: Comments & Recommendations

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- **Fermilab should ensure that its Strategic Plan includes and prioritizes all needed elements**
  - Should orient HEP and Lab Staff to this approach to strategic planning and consistently articulate Fermilab priorities and activities in this context
  - Important that HEP and Fermilab are aligned and that Fermilab staff are motivated by a consistent and inclusive plan
  - “Director’s Priorities Slide” should be presented and understood in this context

## **RECOMMENDATION:**

- **Expand the Enterprise Risk Management (ERM) process to include operational risks that require senior management attention. This will facilitate integrated Fermilab-wide resource allocation to address high priority operational risks.**

# Ops. Finance and Mgmt.: Comments & Recommendations

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- **Fermilab is undergoing change**
  - Senior management has identified need for change as articulated in the prioritization ordering of projects and functions
  - Some current organizational structures represent a past focus not necessarily consistent with future direction
  - Does not appear to be a formal change management process in place to facilitate driving change consistently throughout all parts of organization
  - Staff may not understand the reasoning behind stated priorities and may not fully embrace them, leading to ineffective implementation of priority concept and inherent tensions within organization

## **RECOMMENDATION:**

- **Work closely with the HEP to develop a common understanding of what a workforce plan really looks like, in such a manner that it provides insight and transparency to HEP while simultaneously helping the Laboratory leadership team manage and operate the Laboratory.**

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# GUIDANCE FROM HEP TO FERMILAB



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# Guidance from HEP to Fermilab

- **The OHEP has produced a focused list of items to guide the lab in implementing the review panels' comments and recommendations**
  - These points were discussed with the lab in the context of the recommendations that the review panels presented at the closeout
  - Have been followed up with the lab in a series of phone discussions and
  - Fermilab has written a response and preliminary action plan.
- **Action items:**
  1. **Because of the tightness of the HEP budget caused by the P5 projects, the overall priority to addressing the facilities operations review recommendations should be scope reduction.**
    - This can take several forms, as discussed in several of the following items.
  2. **In order to create more contingency and flexibility for strategic investments in programs and infrastructure, the lab should target operations and overhead (support) functions.**
    - Reductions should be achieved by a combination of reducing and outsourcing scope and efficiency improvements.
    - The lab should keep HEP informed of their decisions.



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- **Action items, continued:**
  3. **The director's priorities slide needs a total revamp.**
    - The one dimensional approach is inadequate. It confused the operations review committee and has confused other audiences such as HEPAP.
  4. **The Fermilab annual plan indicates the direct/total FTE ratio is 59%, below what would be considered "healthy".**
    - The lab should be reshaping the staff to devote more effort to science.



# Guidance from HEP to Fermilab

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- **Action items, concluded:**

5. **The level of planning that is done outside of the projects and the computing division at the lab is inadequate.**
  - The lab should improve its planning at the level of its divisions as soon as possible.
  - Each division should formulate and enact a strategic plan within the next twelve months.
  - Funding is now too tight for the OHEP to be able to respond to requests for more than one or two million dollars to handle unforeseen needs within the budget execution year.
  - These need to be accounted for in the OHEP budget formulation that occurs two years before the funds are provided.
6. **A Fermilab-only “optimization” analysis for research/operations programs, along with an ROI (Return on Investment) analysis for infrastructure and support functions, should be started immediately.**



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