



# Focusing for the Future

## Fermilab Response to DOE Operations Review

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# Bottom line up front

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- HEP convened a thoughtful, seasoned committee to investigate large swath of “operations activities” at Fermilab – intensive & comprehensive
  - We support the findings, comments, recommendations
- “Operations” is a distinguishing feature of a DOE national laboratory...requires the combination of scientists, engineers, technicians, computing professionals, and “back office” to reliably operate & manage state-of-the-art capabilities for broader community
- Review found many good things about Fermilab and its support of P5 objectives
  - Level of output exceeds what you’d expect from inputs
  - Key “area for improvement” is in planning & communicating intentions, actions, strategies, and necessary trade-offs
- In this budget environment, the mantra is “Do more for less for more”
  - Do more output for less input for more people
  - Do more science for less money for more impact

# Agenda

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- Fermilab actions to address the Eight Recommendations
- Fermilab path to incorporate the HEP Guidance

# #1 – Planning for accelerator complex...

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- *The lab's planning is funding driven rather than need[s] driven. The lab's present approach with the Proton Improvement Plan [PIP] 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. The lab should increase the 7835 spare inventory to a four-year supply.*
- We concur that the laboratory needs a comprehensive facilities plan that parallels the approach of the Campus Master Plan.
  - (a) Based on recent conversations with HEP, we would exclude computing facilities and focus primarily on the testing, development, and production infrastructure (i.e., focus on Detector Test Facilities and Accelerator Test Facilities). This plan will be drafted and available by March 2017.
  - (b) In terms of a “facility refurbishment plan” for the Fermilab Accelerator Complex, we propose to prepare a “PIP-I+” plan that would be an input to the overall decadal plan for the Accelerator Complex including assessment of ageing and obsolete equipment and a smooth transition to PIP-II. We envision including the community in this effort and it would take about 18 months.

## #2 – Divisional strategic plans

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- *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.*
- The spirit of “one lab” is an important ingredient for our future, particularly as we relate to the agencies and the domestic and global communities.
- The present and future roles of each Division in executing the overall laboratory plan will be identified.
- The division strategic plans will be part of a single comprehensive plan prepared by the laboratory as part of the DOE annual review and budget processes (Feb, Jun deadlines).

## #3 – Synergies/separations among lab units

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- *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.*
- The Technical and Accelerator Divisions often work together on a number of key deliverables. At the moment, the Director, the Chief Accelerator Officer, and the Chief Technology Officer provide coordination and create synergy. We recognize that more is possible: we are one lab with one, common vision.
  - An example of “work in progress” is the development of a phased plan to combine engineering and technical resources for helium, nitrogen, and argon cryogenics across the laboratory. First steps will be underway in mid-FY2017.
  - The facility-planning exercises (see Recommendation #1) will also identify ways to consolidate and strengthen key activities among the different elements of Fermilab.

## #4 – Next computing dollar

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- *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.*
- The Committee endorsed the approach of preserving services and stretching out hardware renewal in tight budget environments. We will not abandon this strategy, but in our annual work planning and budget planning, we take into account priorities across the programs and computing capabilities are a crucial, cross-cutting element.
- The trade-off between old, energy-hogging, slow equipment versus new, higher-performing equipment is a point of tension.
- To respond to future, growing demands for capacity Fermilab is working with DOE to examine participation in the High-Performance Computing acquisition at Argonne...would modernize and boost the lab's horsepower for community use

## #5 – Workforce plan

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- *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.*
- This item is a Notable Outcome for DOE’s “Performance Evaluation and Management Plan” (PEMP) for Fermilab in FY2017. We will work with the Fermi Site Office to develop a framework for workforce planning that focuses on detector operations and test facilities. This framework will be discussed with HEP by Apr 1 with draft results by Jun 1.
  - We don’t project growth in lab staffing, but we do expect the mix of skills and focus of work to evolve
  - Will identify the crucial, bottle-necked resources that limit or complicate performance

## #6 – Indirects

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- *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.*
- The annual process for work planning and budgeting has been revised. Now explicitly included the types of trade-offs and impact analyses referenced.
  - P5 → Lab Goals leveraging Lab Capabilities → Lab Objectives → Lab Activities
  - All informed by analysis of project, operational, and enterprise risks
  - <http://ppp-docdb.fnal.gov/cgi-bin/RetrieveFile?docid=91&filename=FNAL-Strategic-Plan.pdf>
- For FY2017, we have reduced the budgets for the top-three, overhead-funded business units by 2.5% and will reinvest the savings in supporting science.
- We are now strategically managing regular staff turnover (aka attrition)
- HEP can look forward to seeing the results of this work as well as examples of the process in the spring budget presentations in Germantown and the summer field-work proposals.

# #7 – Risk management

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- *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.*
- The Committee offers sound advice on best practices especially in light of changes to OMB Circular A-123. DOE as well as HEP have work to do in this area as well. It would be helpful to see the agencies' risk registries for the field so that we can all have a more effective conversation on how to manage and mitigate identified risks.
- Fermilab convened a workshop in October 2016 to standardize and improve the operational-risk analysis premiered at the DOE Operations Review. The output is a central database of Operational Risks that examine what can jeopardize each Lab Objective. A Risk Management Board is now completing this effort and monitors risk status and progress on mitigations.
  - For instance, what aspects of cryogenic capacity and/or capability most threaten Fermilab success on Projects? What are the trade-offs between complete overhaul and simply scaling back performance?
- This methodology is influencing the Divisional strategic planning and the annual budget presentations in the spring and the field-work proposals submitted each summer.

## #8 -- Priorities

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- *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.*
- The Committee, the community, and the HEP program office offer useful guidance in addressing this set of issues. Our approach for FY2017 is to show Fermilab priorities for research, operations, and projects separately and to comment on the relative priority of project milestones b/c of their schedule specificity (i.e., criticality).
- These new “slides” are to be used primarily within Fermilab to help managers direct the work of their employees and will be shared directly with HEP as well as used to influence the spring budget presentations and the summer FWP.
- As we develop our FY2018-FY2021 plan, we will derive and revise the priorities.

# All sounds pretty easy, right?

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- Just do everything better while improving forecasting, efficiency, and effectiveness in a time of uncertainty
- But the reality is that we must do even better than that to truly advance the “P5 vision”
- How many fingers will we cut off in order for the U.S. program to succeed?
  - As many as it takes...if we can keep the hand.

# #1 – Scope reduction

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- Key thrust of the Review Committee’s analysis was “Fermilab has done well, but when will it break?”
  - They worry that lab’s ability to meet all its commitments has been compromised by successive funding shortfalls
  - In the absence of new money to DOE, they recommended the lab reduce its commitments (aka scope reduction) and refocus those resources on its highest priorities
  - This is a challenge...reducing support for selected activities in order to concentrate resources on other ones...while also considering new high-priority needs (like office space for users)
- To do so, Fermilab is
  - Reducing indirect budgets in most-expensive areas, guided by cost comparisons with other labs
  - Ramping down ancillary activities & more tightly scheduling common resources
  - Analyzing the output/input “derivatives” for the Accelerator Complex and test/production facilities

## #2 – Reduce indirects

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- Fermilab has fourth lowest Indirect Cost percentage compared to other nine SC labs (~31%). We need to do even better.
  - Majority of indirect/overhead budget ensures Fermilab is compliant with the 514 clauses in its DOE contract (only 25 of these deal directly with science)
  - “Takes money to save money” (e.g., modernize travel paperwork)
- We are executing a 2.5% scope-reduction exercise in facilities management, computing, and overall management. Dollars freed up will be re-directed to science.
  - Every little bit helps. Revising travel policies to further tighten.
  - Identifying inadequate, inefficient infrastructure that can be replaced to reduce operational costs and maintenance (e.g., elec & water utility backbones, test-stand control systems, and so on)
- Lab is collaborating with Argonne, Oak Ridge, SLAC to understand where else to gain other efficiencies

## #3 – Priorities slide

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- (See previous)
- We propose an approach where lab communicates internally in each of the three areas (projects, operations, research) about relative “when push comes to shove” priorities
- Like DOE Office of Science, Projects (post-CD-2) are top priority, followed by Lab Operations (community support), and then Lab Research

## #4 – Redirecting staff

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- Ultimately, it is Fermilab director's responsibility to determine how to best achieve the bottom line
  - Laboratory workforce has reduced from 2,300 to 1,750 over past eight years
  - We do not foresee an additional dramatic workforce restructuring (if so, would require federal...consultation)
  - We are, however, restricting hiring to focus on most strategic, impactful roles that address P5 priorities while pivoting laboratory skills & capabilities.
  - Development of the critical/endangered skills register helps guide these efforts
  - Meanwhile, we have renewed commitment to address diversity

## #5 – Planning and control

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- Fermilab has made substantial progress in emerging from the Tevatron era and developing a new strategic plan that advances the P5 vision
- More work is needed to integrate the lab's activities and develop a common view of what risks needs to be handled first
- Recent innovations will continue
  - Using Early Career Award recipients to help drive annual planning process
  - Incorporating weekly risk monitoring into work planning
  - Analyzing trade-offs and priorities within the lab when faced with issues

## #6 -- Optimization

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- The facilities-refurbishment plan will be of enormous help alongside the Campus Master Plan.
- We are analyzing the overall operations output-vs-input scaling.
  - For instance, the Fermilab Accelerator Complex runs nine months per year. What are consequences and cost savings if we ran eight months one year?
- We are examining opportunities to attract other work that uses our core capabilities and would subsidize the “cost of doing business”

# Outlook

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- Fermilab is the largest single-purpose lab in DOE complex and is also the largest fraction-of-a-single-program budget across DOE
  - We need to continue to seek ways to make this a competitive advantage for the community. HEP should be at an advantage for new dollars.

# Bottom line at the bottom

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  - We support the findings, comments, recommendations
- “Operations” is a distinguishing feature of a DOE national laboratory...requires the combination of scientists, engineers, technicians, computing professionals, and “back office” to reliably operate & manage state-of-the-art capabilities for broader community
- Review found many good things about Fermilab and its support of P5 objectives
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