Department of Energy
Committee Report

on the

Facility Operations Review

of the

TEVATRON

at the Fermi National Accelerator Laboratory

March 2004

EXECUTIVE SUMMARY

The Department of Energy (DOE) review of Fermi National Accelerator Laboratory's (Fermilab) research programs and business operations was conducted on March 16-18, 2004. The review was requested by Robin Staffin, Associate Director of the Office of Science for the Office of High Energy Physics. The purpose of the review was to assess Fermilab's performance and cost of operations to identify opportunities for improvement. The Review Committee was charged to examine, specifically, the Laboratory's process for setting priorities; estimating and allocating resources; identifying and managing risks; methods of self-assessment; and ES&H planning and implementation.

At present, the Laboratory appears to be well managed as judged by the Committee's overall assessment of the individual charge items. The Fermilab management team is clearly focused on carrying out the mission of the Laboratory. There is good communication within the Directorate and among the key Division/Section heads. The Laboratory managers have a good awareness of each other's issues and challenges, appear to work well together, and are sharing resources in a manner to work together to achieve the Laboratory's goals. One manifestation of this effective management approach is the improvements in the Run II performance over the seven months immediately preceding this review.

In presentations and more detailed discussions with the Committee, the Laboratory responded well to all elements of the charge. Overall, the review benefited from the managers' frank and open discussions, transparency of data and information, and willingness to more deeply explore potential issues or concerns. The Committee's major findings and comments are presented in a manner to provide a summary response for each charge item.

Charge Point 1: Is Laboratory management effectively setting priorities, tracking progress, resolving problems and communicating with key stakeholders?

Overall, the Laboratory has an effective process for establishing priorities, budgeting, and allocating resources. The Accelerator and Technical Divisions' priorities, in supporting accelerator operations, are well planned and communicated. The Particle Physics and Computing Divisions' effectiveness as a team in setting priorities and tracking progress is based on good communication and sharing of responsibilities. The adoption of project management practices and supporting

project accounting systems across the Laboratory is improving its ability to effectively track and report progress. Communications within the Laboratory are good, while communications with the collaborations are satisfactory.

Charge Point 2: Are resources sufficient and appropriately allocated with a proper mix of skill sets and optimized to meet the stated mission, goals and objectives?

The Divisions are organized in an effective manner and their activities and resources are assessed regularly to ensure the integrated luminosity goal, the Laboratory's overarching performance metric, is achieved. There is a workforce issue related to the anticipated competition from LHC that may diminish currently available resources in the CDF and D-Zero collaborations. The Business and Finance operations are lean, effective, and make clear the primary mission is to enable the Laboratory's research and major projects. The Laboratory has a substantial base of technical talent, however, there are some skill mix concerns that will make future efforts challenging.

Charge Point 3: Are there any programmatic, technical and infrastructure risks?

Significant technical (e.g., Electron Cooling in the Recycler) and programmatic (e.g., effectively responding to shifts in laboratory efforts consistent with planned but uncertain transitions from Run II to the Large Hadron Collider and B-Physics at the Tevatron projects) risks present significant challenges especially for resource allocation in Accelerator Operations. The Research Program has also identified significant programmatic and infrastructure risks including key detector components, critical engineering skills, and increasing computing demands, etc. Major risks in the business support operations are related to the limited depth for key business functions (e.g., Human Resources and information technology development and deployment). The Laboratory's infrastructure needs exceed available current and outyear funding and present significant potential risk to operations directly through unexpected shutdowns and indirectly through reallocation of programmatic funds to address the infrastructure needs.

Charge Point 4: Is there an ongoing program of self-assessment aimed at continuously improving maintenance and operations?

Fermilab is now in its third year of self-assessment. The program is not yet mature, but it appears to be steadily improving and is being seriously implemented and continuously improved

by the various divisions and sections. However, Fermilab does not have a formal program of benchmarking best practices with similar organizations in the DOE complex or with industry.

Charge Point 5: Is ES&H planning and implementation receiving appropriate attention?

The Laboratory's core ES&H program is very strong. Senior laboratory management tracks ES&H performance closely, and recent trends in safety metrics are commendable. Integrated Safety Management planning and implementation is integrated into the leadership's thinking and actions, has permeated the laboratory culture, and now reaches sub-contractors working on the site.

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1. INTRODUCTION

On January 21, 2004, the Office of High Energy Physics (OHEP) requested that the Construction Management Support Division perform an independent review of the operations and maintenance of the Tevatron complex at Fermi National Accelerator Laboratory (Fermilab). OHEP requested that the review committee examine the activities associated with facility operations to determine the funding needed to effectively support the research mission, the actual costs (especially manpower) incurred for each activity and advise on the importance of these activities, and explore possible options for reducing funding for these facilities with an evaluation of the associated impacts.

The Fermilab mission is the goal of particle physics: unlocking nature's secrets, and learning how the universe is made and how it works. In support of this mission, Fermilab has several program elements:

1. A research program in particle physics based on the Tevatron, the Laboratory's world leading 2 TeV proton-antiproton collider, operated by Fermilab as a national user facility. This program is wholly funded by the Department of Energy's (DOE) High Energy Physics program. The Laboratory is deeply engaged in Run II, a program with a "design" goal of delivering more than 8 fb^{-1} to CDF and D-Zero, with a "base" goal of at least 4 fb^{-1}. This must be accomplished before the high energy leadership passes to CERN with the commencement of Large Hadron Collider (LHC) operation.

2. Fermilab is committed to a neutrino physics program including a short baseline experiment, MiniBOONE, operating from a booster beam, and a long baseline experiment, MINOS, that will operate at Soudan and be fed by a complex developed for the Main Injector (NuMI).

3. Fermilab is planning a comprehensive detector for B Physics (BTeV), which will operate at the Tevatron. A DOE review of BTeV will be conducted in April 2004 for Critical Decision 1, Approve Alternate Selection and Cost Range.

4. Fermilab makes major contributions to the LHC machine and is the host laboratory for the U.S. CMS collaboration.

5. Fermilab has a significant program in particle astrophysics, and is a contributor to the Sloan Digital Sky Survey, Cryogenic Dark Matter Search, and the Pierre Auger project.

All of these efforts are supported by staff whose responsibilities include accelerator and detector improvements, operations and maintenance, theoretical particle and astrophysics, advanced accelerator and detector R&D, and administration and operations support. The scope of this review is limited to the Tevatron complex maintenance and operations, detectors that use the Tevatron complex, and the associated indirect costs. A DOE review of the Tevatron luminosity performance and upgrades was conducted on February 24-26, 2004, and the results of that review were also included in this review.

The review was conducted on March 16-18, 2004, at Fermilab, and was chaired by Daniel R. Lehman, Director of the Construction Management Support Division. To address the charge, the Committee was divided into subcommittees that examined the experimental program; accelerator operations; infrastructure and environmental, safety, and health activities; Business and Finance systems; and management. The Committee members were drawn from other Office of Science laboratories. The DOE area office observed the proceedings.

The review was based on formal presentations given by Fermilab, detailed discussions with Fermilab employees, and the Committee members' extensive experience. The first day was devoted to presentations given by Fermilab. These presentations provided an overview and response to the charge letter. On the second day, members of each subcommittee met with Fermilab counterparts in working sessions to further discuss details in the functional area for their respective subcommittees. The remaining time was spent on subcommittee working sessions, Committee deliberations, and report writing. The Committee discussed the results of the review with Fermilab management in a closeout briefing on March 18, 2004.

2. ACCELERATOR and TECHNICAL DIVISIONS

2.1 Findings and Comments

Charge Point 1: Is Laboratory management effectively setting priorities, tracking progress, resolving problems and communicating with key stakeholders?

Fermilab has made considerable progress in improving Tevatron performance. Run II integrated luminosity expectations are being met. February was the best month of running to date, from the perspective of peak luminosity, and from a reliability viewpoint. Moral is high. A recent DOE review (February 2004) of Run II underscored these improvements.

Within the Accelerator and Technical Divisions priorities for Run II are carefully planned and well communicated. Near-term, immediate needs are the major focus at present. However, the longer-term operational issues are not ignored. Namely, the Proton Plan, a strategy to address both the neutrino program's need for high intensity proton operation and the aging of the linac and booster, is receiving attention. Other accelerator initiatives receive a lesser priority, but expectations are clearly communicated.

The Technical Division supports the accelerator program while meeting its obligations to the LHC and maintaining a significant portion of Fermilab's accelerator R&D program. Meetings are held at every level of the organization to ensure that priorities are managed, progress is tracked, problems are addressed, and implications of the decisions are communicated to the staff and the user community.

The Committee notes that in the two-percent-per-year increase scenario, accelerator R&D, particularly in the areas of linear collider and proton driver, ramps up in the years approaching FY 2009.

It is the Committee's view that priorities are properly established and that Fermilab's focus is consistent with the established priorities. The highest priorities are clearly Tevatron operations and Run II upgrades. In order to accomplish the laboratory goals within the divisions, the work planning is managed carefully. The setting and actual working to priorities is essential, and is what has led to recent successes. Fermilab is encouraged to maintain the focus and support level on the operational needs of the accelerator complex that has been developed recently to address Run II needs.

Charge Point 2: Are resources sufficient and appropriately allocated with a proper mix of skill sets and optimized to meet the stated mission, goals and objectives?

The Committee attempted to deal with this question on a number of different levels, and notes that effort for accelerator operation and projects is now coming from all laboratory divisions. In some cases, people are being transferred from the Particle Physics Division (PPD) and Computer Division (CD) into the Accelerator Division. A second strategy for helping the Accelerator Division is assigning projects or portions of projects to other divisions. Finally, there is a significant number of PPD and CD staff assigned to work on the accelerator during shutdowns. This final point can be a very effective way of optimizing staff utilization in a tight environment.

There is a total number of 740 full-time equivalents (FTEs) working on the accelerators (operations, upgrades, R&D). This is a significant increase from several years ago, primarily due to the redirection of effort from other divisions. The accelerator budget has increased from $58 million in 2001 to $95 million in 2004, while the number of FTEs in the division has increased by 20 (from 543 in FY 2001 to 563 at the time of this review).

A useful metric in evaluating the allocation of resources is the percent of labor as a fraction of the total. For purposes of comparison, the Committee attempted to include those activities related to "core" operational accelerator activates. With the exception of the construction project and the Neutrinos at the Main Injector (NuMI) project, all other accelerator operations, upgrades, and R&D (regardless of the where the resources have come in the organization) were included. Furthermore, the Committee did not include utilities (with the exception of cryogenics), and used unburdened numbers throughout the review. The result is 66 percent labor and 33 percent Material and Supplies (M&S)—a reasonable ratio.

When asked what the Accelerator Division would do if it received additional resources, the reply was that the need for M&S is greater than the need for additional people. The Committee noted that assistance is also being received from other national laboratories and some universities.

The Committee observed a number of areas in which skills are duplicated throughout the division, and in some cases throughout Fermilab, including: computer support, controls and software, designers and drafters, and accelerator diagnostics.

The Accelerator Division has been successful in recruiting accelerator physicists. However, there are some key areas in which the workforce is nearing retirement and strategic hires are needed. These tend to be in engineering and skilled technician areas.

Table 2-1. Resource Allocation for "Core" Accelerator Activities (in K$)

	Total	Labor	M&S
Accelerator Division	83,912	52,394	31,518
Subtract NuMI	11,364	1,484	9,880
	95,276	53,878	41,398
Technical Division	13,004	9,739	3,265
Accel Ops	3,765	3,195	570
Accel Upgrade	2,030	1,960	70
Neutrino Experiments	15	15	0
Accel R&D	7,194	4,569	2,625
Computing Division	1,540	1,528	12
Particle Physics Div.	4,918	4,798	120
Accelerators		4,077	0
Accelerator R&D		720.7	120
Total	103,374	68,459	34,915
Labor as fraction of total	66%		

The Technical Division has maintained an organizationally centralized workforce of machinists and welders that appears to function efficiently.

Based on the numbers presented, the percentage of resources (in FY 2004) going to future accelerator R&D is ten percent of the total accelerator budget and three percent of Fermilab's budget.

While the Committee finds the mix of labor to M&S appropriate, it more difficult to assess the appropriateness of the overall level of effort. There may be some inefficiency in the distribution of skills, however, this does not appear to have a large impact, and perhaps a gain could be made on the few percent level. For example, the potential gain might be the difference between cost of living increases and the two-percent-increase-per-year scenario.

A second metric is to compare these divisions with similar divisions at other laboratories. The Committee used considerable care to ensure that appropriate comparisons were made. A starting point would be to individual groups with similar groups at other laboratories (e.g., cryogenics).

The Committee applauded the effort to attract young engineers through the proposed fellowship program.

The Technical Division is organized in an intelligent and effective manner, allowing them to focus on programmatic priorities in a flexible manner.

In the face of restrained budgets, the Committee encouraged additional collaboration between Fermilab and other national laboratories and universities.

Charge Point 3: Are there any programmatic, technical and infrastructure risks?

Fermilab's accelerator infrastructure is aging and there are a number of risks, including: the vacuum tube supplier for drift tube linac (only one in the country) and the supplier is being sold; aging cryogenic system; aging and obsolescent electronics; and inadequate diagnostic systems.

Technical risks involve numerous challenging accelerator R&D projects, including: electron cooling in the recycler ring and the Proton Plan being developed to accommodate the neutrino program.

Programmatic risks exist as well. It will be challenging to manage the shifting programs and the resulting resource reallocation over the next few years. The NuMI project will be completed in FY 2004; LHC magnet production will be completed, rolling off people in the Technical Division; and the BTeV project will be ramping up. Resources will need to be made available for executing the Proton Plan that ramps up in FY 2005.

Fermilab is aggressively managing these risks. A significant portion of the Accelerator Division M&S is directed at remediating accelerator infrastructure problems. Lists of high-risk items are maintained and are addresses in a prioritized manner. The Committee encouraged high vigilance in this area.

The Committee was also encouraged to see the effort being put into high-risk technical areas. The Proton Plan is critical to the neutrino program and will need the same level of focus that has gone into the Run II Luminosity effort. The Accelerator Division was encouraged to continue to carefully manage the Proton Plan.

The Committee also considered electron cooling to be a technical risk. Electron cooling with the performance needed for the recycler has yet to be demonstrated. Furthermore, there are yet unsolved problems in the electron cooling mockup at the Wideband Laboratory. Fermilab is directing additional resources (both effort and M&S) at this problem.

The Committee noted that all areas of risk (infrastructure, technical, and programmatic) are related, and that remediation in one area will impact the others. Future activities (e.g., Proton Plan, BTeV, accelerator R&D) are structured in such a way that reprioritization will be needed if significant infrastructure or technical problems need to be addressed.

In the material presented to the committee, we were shown base level funding for Accelerator R&D increasing from $9.6 million in FY 2004 to $19.3 million in FY 2009 (two percent per year increase scenario). The primary increases are in the areas of Linear Collider and New Proton Driver. These projects are vital to Fermilab's future. The Committee noted that there is significant risk to Fermilab's future if this funding is not provided, either because of the need to mitigate infrastructure problems, or if this funding is not made available (as is the case in Fermilab's proposal for flat-flat funding).

Charge Point 4: Is there an ongoing program of self-assessment aimed at continuously improving maintenance and operations?

The recent period of improved Tevatron performance is evidence of a program that is focused on operation and maintenance, which has come in part by reduction or elimination of some aspects of accelerator R&D and other research activities. Additionally, the program involves supplementing the Accelerator Division staff with personnel from PPD and CD, particularly during work intensive accelerator shutdowns. Accelerator Division management is reevaluating this program regularly to best utilize available resources to achieve the integrated luminosity goal.

The Committee felt that it is important to recognize that the additional resources coming from PPD and CD during shutdowns may be critical to the ongoing success of Run II and the ultimate success of the neutrino program.

Charge Point 5: Is ES&H planning and implementation receiving appropriate attention?

There is a centralized ES&H group that supports the entire Laboratory. Additionally, each division has a group that supports the division. The expertise in the divisions is well aligned to the division's unique needs.

In both the Accelerator Division and the Technical Division, the Committee observed a rigorous and thorough implementation of safety in terms of training, work planning, and management involvement. Integrated Safety Management appears to truly be a part of the culture.

2.2 Recommendations

1. Explore areas where efficiencies can be gained by consolidating skill sets.

2. Maintain an active risk assessment program in all areas.

3. RESEARCH

3.1 Findings and Comments

Charge Point 1: Is Laboratory management effectively setting priorities, tracking progress, resolving problems and communicating with key stakeholders?

In the CD and PPD, the Committee saw an effective team for setting priorities and tracking progress. Communication and transfer of labor and responsibilities among the divisions seems very good. Problems are systematically uncovered and addressed.

Principal challenges for research in FY 2004-FY 2009 are managing the program transitions (examples include: CDF/D-Zero → LHC → BTeV, MINOS → operation, etc.).

The Committee found that planning in the Directorate for the period FY 2004-FY 2009 was well articulated for CD and PPD through FY 2006. In both cases, some changes in the staff mix will be necessary.

The decision to focus on the Open Science Grid for Fermilab's program is a wise investment of resources.

Fermilab has demonstrated commitment to a strong relationship with its user community. It is important that this continue during the multiple transitions of the FY 2004-FY 2009 timeframe.

There are concerns about the manpower available from the collaborations for CDF/D-Zero in the future due to competition from the LHC.

Charge Point 2: Are resources sufficient and appropriately allocated with a proper mix of skill sets and optimized to meet the stated mission, goals and objectives?

Where the Committee could check, resources to support the program seem adequate but not excessive. There seems to be a skills-mix issue—a shortage of high-level staff and perhaps a surplus of low-level staff. For example, there are needs for more database experts, high-level grid developers, high-level engineers, and less need for limited skills technicians.

A significant and recognized challenge for both CDF and D-Zero is the continuous requirement for training of their rapidly changing short-term scientific collaborators.

The operation of the MINOS data acquisition system from the United Kingdom is a good demonstration of the forward thinking taking place in the PPD.

The CD's work on the Accelerator Beam Position Monitors appears to be going well and demonstrates close coordination between the divisions.

Within a few months, the CD will achieve "lights-out" operation of all of its media servers. This improves access for the users and allows for the redirection of manpower.

With Run II data rates 20-30 times those in Run I, the CD has put in place an advanced data management and storage system for scientific users.

Funding from sources such as SciDAC, which is beyond the base program level, plays a critical role in support of key programs such as Lattice QCD and advanced accelerator modeling.

The project management budgeting function is a positive development. This was evident in the Work Breakdown Schedule (WBS) budget tables and FTE skills breakdown seen from the various divisions. The fact that people at the department level were using these same tools showed it was useful.

The Committee applauds the creation of an engineering fellowship to target the increase in critical skills.

While the Kerberos implementation for cyber authentication has been useful, the approach has not been adopted by the wider community. A more aggressive move to PKI based solutions may be appropriate.

Consider the evaluation of centralized computer and engineering support vs. the current distributed situation. Consider evaluation of centralizing the root/systems management of all desktops and work group servers.

Charge Point 3: Are there any programmatic, technical and infrastructure risks?

There are significant risks in the research program. The management is well aware of these risks, both programmatic and in the infrastructure. Examples include: the silicon detectors, the CDF central drift chamber, critical engineering skills such as in power supplies, or demands for serving Run II data escalating to a point where the central storage and caching systems fail to scale. In most cases, mitigation plans have been developed and are being enacted.

The "Flat-Flat Scenario" strawman budget for FY 2004-FY 2009 showed a significant delay for the BTeV project and accelerator R&D.

The Committee is concerned about how the program would respond if there were major, unanticipated resource needs in the accelerator complex in FY 2006-FY 2007. Would this mostly affect BTeV?

The large fixed commitments in the program complicate the ability of Fermilab and DOE to manage the program during this period.

Fermilab should evaluate how to ensure that the stakeholders are not surprised should evolution and adjustment of the program be necessary.

Charge Point 4: Is there an ongoing program of self-assessment aimed at continuously improving maintenance and operations?

The Committee sees an active and successful program of self-assessment in place. Assessment items are developed through a "bottom-up" procedure resulting in assessment studies directly useful to the program.

It was unclear how the "lessons learned" will survive the various research program transitions over FY 2004-FY 2009—where is the reservoir of "corporate" knowledge? Lessons learned from ES&H are aggressively transmitted to the staff. The same should be considered for key self-assessment findings. More comparisons with other high energy and nuclear physics laboratories may be useful. Other areas for assessment should be considered, including: Staff Diversity, Staff Development, and Workplace Life issues.

Charge Point 5: Is ES&H planning and implementation receiving appropriate attention?

ES&H planning and implementation in the CD and PPD has the attention of the divisions' leadership and appears to have been integrated through the line managers and staff in the divisions. There are proactive incentive programs for outstanding suggestions, and their current DART metrics indicate success of their activities. The most recent near miss in decommissioning some equipment in the PPD is leading Fermilab to take a more inclusive approach to what is considered work.

3.2 Recommendations

1. Implement two-year rolling Memorandums of Understanding with the CDF/D-Zero collaborations in the FY 2004-2009 era to be reviewed by the Research Director. This will facilitate Fermilab in matching the support of the operations to the needs of the experiments.

2. Extend the "bottom-up" manpower analysis for the period FY 2005- 2009 to determine the required skills mix and staffing levels needed for the anticipated program. Divisional management should perform this exercise with a view of the needs across Fermilab.

4. BUSINESS and FINANCE

4.1 Findings and Comments

Charge Point 1: Is Laboratory management effectively setting priorities, tracking progress, resolving problems and communicating with key stakeholders?

The Administration Sections of Fermilab provide the operational support essential for the forefront scientific research. The challenges of flat budgets have placed stress on the entire Laboratory to achieve all of the desired research goals for the programs in Accelerators, CDF/D-Zero, and the BTeV project. Support organizations recognize that their primary mission is to enable research while meeting requirements set by the contract.

Senior management (Laboratory Director and Deputy Laboratory Director) use information obtained through operational awareness and the many meetings throughout the year to establish the first cut of the budget. The full budget-setting process occurs over several months to allow full and open discussion of issues. The first step of the process provides target level budgets for each of the sections. Sections have the opportunity to discuss how they will meet the target and areas/services that will have to be reduced based on the target level. There is an open discussion of budget requirements and needs in the Business and Finance areas. Budgets are presented to the Laboratory Director for final approval and division/section heads are an integral part of the review process.

The process used for establishing laboratory goals in the business systems is based largely on the use of a prime contract (Appendix A and B of the prime contract). Business system goals are identified through that process.

Stakeholders are fully engaged in the planning and budgeting process.

While the budget is constrained, critical issues are evaluated and considered for funding. A balanced approach to the budget setting process, including risk assessment, is evident.

Division/section heads are an integral part of the review process. Priorities are set and there is an opportunity to discuss financial and operational issues. Sections are provided open access to the Directors Office to bring forward critical operational issues (e.g., upgrade costs for Oracle, obtaining Visas for visiting scientist).

It is not clear the establishment of section goals includes full participation of the operations managers.

Corrective actions identified during audits and external reviews are captured in data bases and are monitored for progress on a monthly basis.

Goals, that state laboratory vision and laboratory expectations, should be identified and shared with stakeholders. Goal setting will help to focus the importance of the laboratory vision and ensure that the necessary services are provided in concert with the vision. Service deliverables can then be better aligned with laboratory goals.

Charge Point 2: Are resources sufficient and appropriately allocated with a proper mix of skill sets and optimized to meet the stated mission, goals and objectives?

Flat budgeting is putting stress on the entire Laboratory. However, the senior leadership is providing appropriate management and operations for a balanced approach to research and operational support at Fermilab.

Succession planning is an area that needs attention and has been identified in the past (e.g., DOE and URA reviews). A formal "bottom-up" analysis for budget planning is not done in the Administration sections. Several administrative functions have limited staff depth for key positions (e.g., visa processing, labor relations).

Human resources recognized the need for workforce planning for the appropriate skill mix in the divisions; however, this process has not been implemented.

Lessons learned from the NuMI project have been identified and action is being taken in the Procurement Section to mentor and train the employees. Another area for concern is the demographics of the procurement section, which indicates succession planning is required.

The budgeting process reviews the skill sets for the Administrative area and details are reviewed as part of the annual process. Fermilab management recognized that there are many areas that have a single point (staff member with subject matter expertise) of failure.

The current year budget has been reviewed for risk impact and is adequate to meet the needs of the organization. Outyear projections are largely based on the current year budget and will rely on continuous cost efficiency improvement to ensure that customer needs are met. The

budget projections seem to be reasonable, based upon those tasks and services identified in the current year budget. "Bottom-up" budget planning is not essential for the successful budget allocation in the administrative organizations.

It is essential that the support organizations meet contractual requirements and identify opportunities for improvement in critical areas and cost reduction where possible. Investment in systems can pay off in reduced labor requirements in the future.

The current leadership can provide the management for the administrative areas. However, a plan needs to be developed and executed to make sure that the right leadership is in place for the future of the Laboratory.

The Directorate needs to pay attention to the "lean" support services functions. While the organization is now capable of meeting the needs and demands, the budget process needs to ensure that appropriate consideration is given to properly staffing and funding the Business and Finance section.

Charge Point 3: Are there any programmatic, technical and infrastructure risks?

Fermilab senior management ensures that a risk-based and balanced budget allocation process is used to meet the research goals.

Oracle will soon announce a planned change to their pricing model that will affect the business system in March 2005. Due to lack of detailed knowledge, this price change is not included in the current budget forecasts. Cost increase for this important system that supports the indirect activities could be in the few hundred thousand dollar range.

An area of concern is the difficulty in bringing visiting (foreign) scientists to Fermilab due to the complex Visa processing. The Visa administration is handled by one person with limited backup support.

Nationally, medical costs are projected to increase at a rate higher than the two percent budget increase assumptions. This increase is not included in the budget forecasts.

A single person in human resources is providing support for the increasing number of retirees.

Construction subcontracting for large projects (NuMI) has identified the need for

improvements. The lessons learned from NuMI have been evaluated and corrective actions are in place.

When the cost of the Oracle software algorithm is known and the cost increase is identified, the budget needs to be revised to account for this change.

Charge Point 4: Is there an ongoing program of self-assessment aimed at continuously improving maintenance and operations?

Self-assessment is a part of Fermilab's continuous improvement process. The self-assessment process is used in Business and Finance. It is one of the tools used for budget formulation and immediate corrective actions. Contract metrics and balanced score cards in procurement, property management, and human resources are additional tools.

There is not a formal benchmarking process used for the administrative areas (e.g., human resources, finance, procurement). However, informal processes are used to match against national standards and other laboratory standards. Workload statistics are tracked (e.g., taxi use) but used only for future budget and service demands.

A balanced scorecard for human resources, property, procurement, and finance is used.

Laboratory-wide benchmarking is potentially hampered by the distributed nature of services and functions (IT and effort reporting are examples).

The Laboratory Director communicates the overall budget picture to the management team. Employees are provided information on the overall budget in "FERMI Today".

The distributed services model does not easily lend itself to external bench marking; however, the Business and Finance areas are encouraged to find external bench marks to ensure that services delivered are right sized.

Continued interaction with the DOE Site Office will improve the formal self-assessment process identified in the prime contract. Additional management metrics for self-assessment, risk management, and opportunity to identify areas for continuous improvement are encouraged. These metrics should be discussed with DOE for inclusion in the formal self-assessment process.

Charge Point 5: Is ES&H planning and implementation receiving appropriate attention?

The Laboratory Director has clearly established the importance of a strong safety culture at Fermilab. ES&H issues are appropriately addressed in the Administrative Sections. Each section completes an individual needs assessment and it leads to a tailored training program. The use of the medical organization is encouraged and first aid cases are recorded. Under reporting does not appear to be an issue. Walk-around activities are required, properly planned, and completed. Safety gets high attention in the organization.

Fermilab has the necessary element to apply for the DOE or Occupational Safety and Health Administration, Voluntary Protection Program (VPP). Fermilab is encouraged to evaluate the value for obtaining the external certification of VPP.

Line management must maintain and encourage the safety posture and culture to ensure continued success in having all staff and visitors to return home without injury.

Fermilab should submit a best practices white paper to DOE's Office of Environment Safety and Health for the Safety Statistics Website.

4.2 Recommendations

1. Develop and communicate Business and Finance goals.

2. Develop a succession plan for the administrative sections.

3. Develop a laboratory-wide workforce plan to ensure the appropriate skills mix for the future (human resources can provide the resources for this task).

4. See recommendation for staff planning in charter #2.

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5. INFRASTRUCTURE and ES&H

5.1 Findings and Comments

Charge Point 1: Is Laboratory management effectively setting priorities, tracking progress, resolving problems and communicating with key stakeholders?

Yes, it is—it includes a WBS and associated project identification numbers that capture most of the ES&H and infrastructure costs, for roll-up to the Directorate through the budget process. The Deputy Laboratory Director is an advocate for these requests and the Directorate uses management judgment against several criteria in making choices. These criteria include:

- Risk that a critical device will fail, shutting down a program;
- Technological and schedule risks on projects and R&D;
- Risks to environment, safety, health and security;
- Risk of non-compliance with laws or DOE Orders; and
- Risk of damaging Fermilab's reputation.

These criteria are well matched with similar criteria used in roll-up documentation. For example: safety, vulnerability, reliability, and redundancy are considered in deriving a probability of failure in the strategic facilities plan. The strategic facilities plan feeds the institutional plan. Infrastructure and ES&H needs are prioritized by the Facilities (FESS) organization and rolled-up as part of the budgeting exercise. This process works well because of the size of the site, its single purpose nature, and the emphasis on communication through various management meetings; e.g., the weekly scheduling meeting and other management meetings (weekly to monthly). The Committee was impressed with how effectively the senior management team communicates. What was not as clear, was whether "bottoms-up" communications on infrastructure needs is as effective. It may very well be, but the Committee did not have time to review that area.

Fermilab management needs to continue to effectively redirect effort within Fermilab, as they have been doing. However, this will become more challenging as the infrastructure needs become more acute due to the age of the facility.

Facilities and laboratory management might consider a single program survey, as well as multi-program laboratories regarding the efficacy of a space charge.

Charge Point 2: Are resources sufficient and appropriately allocated with a proper mix of

skill sets and optimized to meet the stated mission, goals and objectives?

The total Fermilab budget is flat, but (to date) effort has been effectively redirected within the Laboratory. Infrastructure needs exceed currently available and outyear funding (general plant project or GPP); although ES&H resources appear sufficient. Infrastructure resources are split among Facilities (FESS) and program organizations. With the outlook for a constrained budget into the future, the challenge in redirecting effort and resources will only grow.

Fermilab deserves recognition for working off $60 million in electrical distribution system upgrades through an innovative Utilities Incentive Program (UIP) with Commonwealth Edison. Fermilab is currently looking at alternatives for $12 million of remaining upgrades needed. A third-party agreement with the City of Batavia is being considered and Fermilab has submitted a GPP budget that would grow from $4.3 million total (for all infrastructure needs) in FY 2004 to $13 million in FY 2007. This is not a realistic growth projection for GPP, so Fermilab will need to find a way to work some of this $12 million project over five to six years so as not to affect the next phase of their experimental program (BTeV). Since Fermilab is a single purpose laboratory, this will require a skillful balancing of infrastructure and program needs. Other infrastructure liabilities on the horizon will only exacerbate this challenge. These liabilities include the age of the potable water distribution system and the condition and capacity of the industrial cooling water system. To date, allocation has been well balanced between infrastructure, ES&H, and the scientific program.

Laboratory infrastructure and ES&H skill sets are adequate but there is little depth in some important areas (FESS mechanical engineers; some crafts areas). The ES&H downsizing of recent years is commendable and ES&H staffing appears adequate. There may be some opportunities for strategic outsourcing in ES&H. Fermilab should review possible vulnerabilities in FESS staffing depth.

Charge Point 3: Are there any programmatic, technical and infrastructure risks?

Since Fermilab infrastructure was largely built within the same decade, recapitalization (replacement) needs are likely to be closely spaced in time. Recent examples include: the Wilson Hall safety improvements, upgrades to the electrical power distribution system, potable water main replacements, and upgrades to the industrial cooling water system. Additional recapitalization needs are likely to emerge through the facility condition assessment survey

process over the FY 2004-FY 2009 period. Although these risks are well understood by management there has already been some disruption to Tevatron operations from electrical feeder faults.

Price escalation associated with utility contracts for electricity and natural gas is an outyear risk; Defense Energy Supply Center (DESC) is currently being used for utility procurements. Alternative plans to address the other known recapitalization needs should be developed.

Charge Point 4: Is there an ongoing program of self-assessment aimed at continuously improving maintenance and operations?

Yes. Performance measures are utilized to assess infrastructure and ES&H performance. Progress is tracked through the self-assessment program (which is still maturing), contract and other performance measures, and a series of management meetings and ES&H metric reporting. There is effective communication through FESS-Program Landlord interactions, building managers, and central and embedded ES&H professionals. FESS and ES&H participate in the laboratory-wide self-assessment program. Problems are resolved through senior management intervention and senior management redirection of resources.

Fermilab has been quite innovative in the proposals for this year's infrastructure and ES&H contract performance measures. They are fewer in number but more strategically meaningful in the context of the Fermilab mission. They are also more integrated with the scientific performance measures. This should drive all effort in a common direction; delivering on the mission of the Laboratory.

In reviewing recommendations from several previous reviews (2002 Peer Review of Administrative and Operations Support Functions, 2003 Administrative Peer Review, 2004 Overall Review of Fermilab Radiological Control Program) it is clear that Fermilab has been responsive to external assessment recommendations.

Charge Point 5: Is ES&H planning and implementation receiving appropriate attention?

The CORE ES&H program is strong and Integrated Safety Management appears to be well embedded in the program areas. Fermilab injury rates are the lowest ever! Senior management tracks ES&H performance weekly and ES&H data is available to all managers in real time. This is one of two ES&H "best practices" noted by the Committee. The other, is the fact that a Director's ES&H letter is a part of all contract bid packages. There have been recent

improvements in the construction safety program, for example: all task managers, construction safety coordinators, and construction managers are required to take construction safety courses. Contractors' ES&H performance is evaluated and used in selection and can be used in local debarment. These improvements are still maturing and are not yet uniformly applied.

Radiation waste is shipped to Hanford regularly and not allowed to accumulate as a future liability. No legacy environmental clean-ups remain and the surveillance and maintenance consists only of environmental monitoring, with a cost of only a few thousand dollars per year. No problems have been identified. The Illinois Environmental Protection Agency performs annual inspections, the last of which had no findings. Hazardous wastes have been reduced from about 66 metric tons in 1993 to 33 metric tons in 2003, a 50 percent reduction. Fermilab has a meta, plastic, and paper recycling program and landfill wastes have been reduced from over 1,000 metric tons in 1993 to 300 metric tons in 2003, earning Fermilab an Office of Science "Pollution Prevention and Environmental Accomplishment" award.

The radiation exposure data for 2003 is under review. Although the maximum individual exposure was less than 500 millirem, the person-rem approximately doubled, due to the maintenance/upgrades during the 11-week shutdown. It should be noted some of these upgrades will reduce future exposure from the Booster.

As part of a Congressional mandate to examine the feasibility of placing Office of Science laboratories under OSHA and Nuclear Regulatory Commission (NRC) regulation, OSHA and NRC inspections were recently performed at Fermilab. The OSHA inspection yielded 1,400 preliminary findings, not dissimilar from findings at other Office of Science laboratories. The liability to fix all of these is $500K; $400K was provided to Fermilab by the DOE Laboratory Infrastructure Division.

The NRC inspection had several findings associated with access controls, signage, decommissioning plans, and several administrative findings related to the granting of a NRC license. The liability to address all of these, if necessary, is estimated at $1.7 million.

Of concern is the cost of complying with the NRC license, should that become required. Another concern is the possible reaction by stakeholders, including some parts of DOE, to the doubling of the person-rem.

On the issue of outsourcing, it is noted that the security force and radiation badge analysis are already outsourced. A make/buy analysis on the fire department was performed by Fermilab ES&H staff with a recommendation to the Laboratory Director that no savings would be realized by outsourcing the $1.5 million-a-year fire department. The main argument was that the department was trained to do many other tasks besides fire fighting, including: mine rescue, radiation contamination response, alarm testing, hydrant and fire extinguisher maintenance, and other safety related training.

The ES&H Section maintains a healthy contingency.

5.2 Recommendations

1. Evaluate potential for savings by grouping procurements of similar infrastructure projects currently being done by individual facility landlords.

2. Evaluate, using a laboratory-wide team, outsourcing potential in ES&H.

3. The Fermilab Area Office should seek authority to exploit alternatives to DESC for future utility procurements.

4. Notwithstanding the previous outsourcing study by the ES&H Section, a laboratory-wide committee on strategic sourcing of ES&H should be considered.

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6. MANAGEMENT

6.1 Findings and Comments

Fermilab is managed through a performance-based management and operation contract by the Universities Research Association (URA) for DOE. The Fermilab Director reports to the President of URA.

The mission of the Directorate is to lead Fermilab into the future. The Directorate is comprised of the Director, Deputy Director, and four Associate Directors.

The Associate Director for Accelerators leads the Accelerator and Technical Divisions; the Associate Director for Research leads the PPD and CD; the Associate Director for Administration leads the Business Services and Laboratory Services Sections; and the Associate Director for Operations Support leads the Facilities Engineering Services and the Environment, Safety, and Health Sections.

The Fermilab Director, Michael Witherell, has announced his intention to step down in June 2005, and the URA has formed a search committee, chaired by Neal Lane, to identify the next director. DOE has also announced its intention to open the Fermilab management contract (now held by URA) to competition. These two factors introduce an atmosphere of uncertainty into the laboratory environment; fortunately, they appear, as yet, not to have impacted the staff morale.

The Fermilab Director is advised by a number of groups including a URA Visiting Committee, Administrative Peer Review Committee, a Physics Advisory Committee, an Accelerator Advisory Committee, a Board of Overseers, and a Run II Advisory Committee. The director commissions Directors Reviews, which have recently focused on NuMI, BTeV, U.S./CMS, and the Run II accelerator improvements. In addition, DOE conducts approximately four major annual reviews and five semiannual reviews per year.

Fermilab has established a well-defined process for annually planning and budgeting project, operations, and support activities. The Directorate initiates the process by issuing guidance, based on DOE planning levels, to the divisions and sections on initial funding targets and laboratory priorities. These groups respond by preparing bottoms-up, detailed cost estimates and justifications to support their annual requirements. These requests are presented to the Directorate in a lengthy planning session that includes an in-depth assessment of projected needs,

quality of plans to satisfy the needs, readiness to perform the proposed work, impacts of not doing work, and major issues or concerns. The Directorate aggregates the input and prioritizes the total laboratory needs. Final funding decisions are made based on criteria that seek to optimize the overall physics program at Fermilab. Meetings are held with the division and section heads throughout the year to update the work plans.

Overall, Fermilab is well managed. The management team is very able, and is dedicated to carrying out Fermilab's mission. Various standing meetings have been established to assure continual good communication among associate directors and among division and section heads. They work well together, are aware of each other's issues, and share resources to achieve laboratory goals. One manifestation of the effectiveness of this management approach is the turnaround in the Run II performance during the past seven months.

The management team is very cognizant of the challenges facing Fermilab in the future, both due to the current funding climate for basic research with its severe constraints on High Energy Physics funding and to the end of the energy dominance of the Tevatron when LHC begins operation. The Director and management team are making realistic assessments and working hard to steer the Laboratory through these uncertain times, delivering the needed accelerator operations and support to the experimental program while trying to preserve the essential core competencies and other capabilities that are vital to the mission of the Laboratory and to the Nation.

Charge Point 1: Is Laboratory management effectively setting priorities, tracking progress, resolving problems and communicating with key stakeholders?

At a high level, Fermilab sets long-range priorities at the time of choosing projects. There is a rigorous multi-year process that starts with the Physics Advisory Committee (PAC), moves through Director Reviews and HEPAP subpanels/P5, and ends with Critical Decision 0, Approve Mission Need. An annual retreat with the PAC and the Long-Range Planning Committee are used to look at the whole program over several years.

On an annual basis, the priorities are reflected in the plan of work. Currently, high priority is given to meeting the project goals of NuMI in FY 2004 and to follow the Run II plan; levels of support for other activities (e.g., analysis of data, R&D on future accelerators, and experiments), are adjusted to match Fermilab priorities. Resource allocations are made accordingly.

Finally, throughout the year, problems are identified and communicated through various regular meetings:

Weekly:	Directors, All Experimenters, and scheduling meetings;
Biweekly:	Division Heads and Scientific Advisory meetings; and
Monthly:	Project Management Groups (for the various projects), Run II Strategy, and Run II Task Force meetings), and adjustments to resource allocations are made accordingly.

Laboratory management is clearly focused on meeting Run II goals. The Si-detector upgrades of CDF and D-Zero were canceled by the Director (after due stakeholder consultation) to free resources for Run II. Manpower was shifted from other programs to support the Accelerator Division, and the other divisions have contributed significant numbers of personnel to help during the shutdowns. The Director has also significantly reduced other projects, such as removing one side of BTeV and reducing muon R&D, to free resources for the main physics program.

Improvements in Run II operations are encouraging. Communications within the Accelerator Division seems good. Communications with the experiments seems satisfactory. The Committee was impressed by the comprehensive grasp by the Directorate of the concerns of the collaborations, and the fact that the directorate seems to be optimizing the physics potential of the Laboratory over the full range of time scales.

The new "Project Accounting" accounting system seems to be very useful in tracking progress and cost control

While the ordering of laboratory priorities seems reasonable, budget pressures may force more of the lower priority projects to be cut.

Charge Point 2: Are resources sufficient and appropriately allocated with a proper mix of skill sets and optimized to meet the stated mission, goals and objectives?

The Laboratory is involved in many activities in Particle Physics and, when resources are not sufficient, priority decisions are made by the Director to eliminate or postpone activities as necessary. The Committee was not able to get into detail on the mix of skill sets, but based on discussions with the Associate Directors and the Division and Section Heads, the Committee believes that they are anticipating skill set needs and correcting (through attrition and retraining) as opportunities arise. Adiabatic corrections to the skill mix of the staff through attrition and retraining may not be sufficient in a time of declining budgets.

Fermilab does not have a formal program of benchmarking best practices with similar organizations in the DOE complex or with industry. While many laboratory operations are unique, there are components of programmatic operations and activities (e.g., accelerator operations, cryoplant operations, data analysis computing) that could benefit from comparison with others. The situation appears to be similar at the other High Energy and Nuclear Physics laboratories.

The CD and PPD are engaged in strategic planning for the transitions from predominantly CDF and D-Zero support to CMS and then to BTeV. The collider experiments are well aware of the anticipated first beams at LHC in 2007 and are concerned that their university collaborators are already redirecting manpower towards the LHC program. The collider experiment European collaborators are heading towards LHC and are planning to start decreasing support of the detectors starting in 2006. CDF and D-Zero appear to be losing postdocs due to competition for effort on ATLAS and CMS in a time of rather stressed budgets. This is a significant concern for the detectors.

The neutrino experiments have a strong interest in more protons on target than previously planned. Fermilab has completed a study of "proton economics" (Finley, et. al.). The neutrino program challenges the laboratory in its ability to provide the proton flux desired by the neutrino experiments. A Proton Plan is under development. Funding for this plan is included in Fermilab's budget planning. This is a prudent approach to avoid expectations that may exceed technical capabilities.

Fermilab has a substantial base of technical talent including scientists, engineers, and technicians and is concerned about the challenge of maintaining this talent base in the face of both declining budgets and fewer interesting projects. There are an impressive number of engineers with advanced degrees, as seems appropriate for the complex and novel problems that need to be addressed. The Committee believes the engineering fellowship program should be encouraged to ensure an influx of new talent.

Engineering, computer support, and building maintenance are distributed among the divisions. Enhanced efficiencies may be achieved by centralizing appropriate aspects of computer support, building maintenance, and engineering that are currently distributed across the divisions and sections of Fermilab.

Charge Point 3: Are there any programmatic, technical and infrastructure risks?

There are significant risks to the Run II program as described by the DOE Review Committee that met earlier in 2004. These risks, which are primarily technical, could jeopardize the Run II physics program. The Committee believes that the Run II organization is quite effective.

Fermilab has an aging infrastructure, and there are risks from failure of aging equipment (e.g., transmission line poles and underground electric feeds), however, the Laboratory is aware of these risks and folds them into the priority process. Fermilab had attempted to implement the improvements with the UIP and then the Science Laboratories Infrastructure programs (but these plans were thwarted by legal concerns and DOE budgetary constraints) and is now exploring other options. The aging laboratory infrastructure is going to require a steady commitment of funds for capital renewal. If new funding sources cannot be found, Fermilab will have to allocate some programmatic funds to these issues.

The Laboratory is facing flat to flat-flat budgets. The laboratory plan for flat-flat budgets maintains the Run II program, delays BTeV construction, and severely cuts R&D for future accelerators and detectors. Cutting the R&D threatens the Fermilab leadership position.

The Committee noted that the laboratory staff spends substantial time preparing for and participating in a broad spectrum of reviews.

Charge Point 4: Is there an ongoing program of self-assessment aimed at continuously improving maintenance and operations?

Fermilab is now in its third year of self-assessment. The program is not yet mature, but it appears to be steadily improving and being incorporated into the various divisions and sections.

Charge Point 5: Is ES&H planning and implementation receiving appropriate attention?

In discussions with the Directorate and the Division and Section Heads, it is clear that ISM planning and implementation is integrated into the leadership's thinking and actions, and has permeated the laboratory culture and now reaches subcontractors working on the site. The emphasis on improved ES&H performance has clearly paid off, as seen by the downward trends in Lost Work Day and Recordable Injury metrics.

Summary

The Fermilab mission is a key part of the Nation's high energy physics program. Fermilab is well managed, with a high quality staff, and is producing first rate science while maintaining important technical capabilities and expertise that will be needed to carry out some of the most important projects in the future.

The current funding for Fermilab is sufficient for meeting the mission of the Laboratory and for maintaining effective utilization of its facilities. Fermilab is also home to a number of core competencies that are important to the Nation's high energy physics program and that will in all likelihood benefit the scientific and technical community as a whole. In addition, Fermilab is investing in the studies and R&D needed to position itself for undertaking partnership in a future Linear Collider.

The demands of Run II have resulted in an increased stress on technical components. This increases the need for maintenance of technical systems without which there is an increased risk of interruption of facilities operations. In addition, an increasing maintenance backlog of buildings and other structures also involves risk to the Laboratory's mission.

6.2 Recommendations

1. Institute a formal benchmarking program with other high energy and nuclear physics laboratories to assess the efficiency of laboratory operations.

2. Implement rolling two-year Memorandums of Understanding among the collider collaborations, their university collaborators, and Fermilab that define their responsibilities and commitments for support, so that the Fermilab Directorate can anticipate future manpower needs.

3. Explore trade-offs in centralizing common support activities.

4. Develop a realistic plan for infrastructure renewal. "Pay now or pay more later."

APPENDIX A

CHARGE MEMORANDUM

DOE F 1320.8
(08-93)

United States Government **Department of Energy**

memorandum

DATE: January 21, 2004

REPLY TO ATTN OF: SC-20

SUBJECT: Operations Reviews of the Tevatron and the B-Factory Facilities

TO: Mr. Daniel Lehman, Director, Construction Management Support Division, SC-81

The High Energy Physics program supports the operations of two major national user facilities: the Tevatron at Fermi National Accelerator Laboratory (FNAL) and the B-Factory at Stanford Linear Accelerator Center (SLAC). These facilities are supported to develop and provide capabilities that can be utilized to carry out world-class research programs.

This memorandum is to request that you organize and conduct reviews of the Tevatron and B-Factory facilities to evaluate their present performance and cost of operations, and the funding that is needed to effectively support their research missions. In order to do this, your review committee should examine all the FNAL/Tevatron and SLAC/B-Factory activities associated with facility operations supported by the High Energy Physics program, determine the actual costs (especially manpower) incurred for each activity, advise on the importance of these activities, and explore possible options for reducing funding for these facilities with an evaluation of the associated impacts.

Based on the mission of the facility provided by the laboratory, it is requested that your review committee evaluate the Laboratories' maintenance and operations plan for FY 2004 – FY 2009 with an assumed funding profile and address the following questions:

1. Is Laboratory management effectively setting priorities, tracking progress, resolving problems and communicating with key stakeholders?
2. Are resources sufficient and appropriately allocated with a proper mix of skill sets and optimized to meet the stated mission, goals and objectives (bottoms up analysis)?
3. Are there any programmatic, technical and infrastructure risks?
4. Is there an ongoing program of self-assessment aimed at continuously improving maintenance and operations?
5. Is ES&H planning and implementation receiving appropriate attention?

We appreciate your assistance in this matter. As you know, these reviews play an important role in our program. I look forward to receiving your Committee's formal report within 60 days of the review.

Robin Staffin
Associate Director
Office of High Energy Physics
Office of Science

cc:
R. Orbach, SC-1
J. Decker, SC-2
L. Dever, SC-80
A. Byon-Wagner, SC-20
M. Procario, SC-20
J. Monhart, FAO
J. Muhlestein, SSO
M. Witherell, FNAL
J. Dorfan, SLAC

APPENDIX B

REVIEW PARTICIPANTS

Department of Energy Operations Review of the
Tevatron at Fermi National Accelerator Laboratory
March 16-18, 2004

Daniel R. Lehman, DOE, Chairperson

SC1
Accelerator

* Rod Gerig, ANL
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Ronald Lutha, DOE/FSO

LEGEND

SC Subcommittee
* Chairperson
[ ] Part-time Subcommittee Member
Count: 18 (excluding observers)

APPENDIX C

REVIEW AGENDA

Department of Energy Operations Review of the
Tevatron at Fermi National Accelerator Laboratory

AGENDA

Tuesday. March 16, 2004—Comitium

8:00 am	DOE Executive Session	D. Lehman
9:00 am	Welcome and Laboratory Overview—**One West**	M. Witherell
10:00 am	Break	
10:15 am	Physics and Experimental Program Overview	H. Montgomery
10:45 am	Experiment Operations and Support	J. Cooper
11:15 am	Computing Operations and Support	V. White
11:45 am	Accelerator Program Overview	S. Holmes
12:15 pm	Lunch	
1:15 pm	Accelerator Operations	R. Dixon
1:45 pm	Technical Division Operations	R. Kephart
2:15 pm	Administration	B. Chrisman
2:45 pm	Facility Operations Overview	D. Nevin
3:15 pm	ES&H	W. Griffing
3:45 pm	Break	
4:00 pm	Breakout Sessions	
5:00 pm	DOE Executive Session—**Comitium**	
6:30 pm	Adjourn	

Wednesday, March 17, 2004—Rooms TBA

8:30 am Breakout Sessions
- Physics and Experimental Program
- Accelerator Programs
- ES&H
- Business and Finance

12:00 pm Lunch

1:00 pm Breakout Sessions
- Management and Budget
- Technical Programs
- Computing Programs
- Infrastructure

2:30 pm Subcommittee Executive Session

3:00 pm Summary

3:30 pm DOE Executive Session

Thursday. March 18, 2004

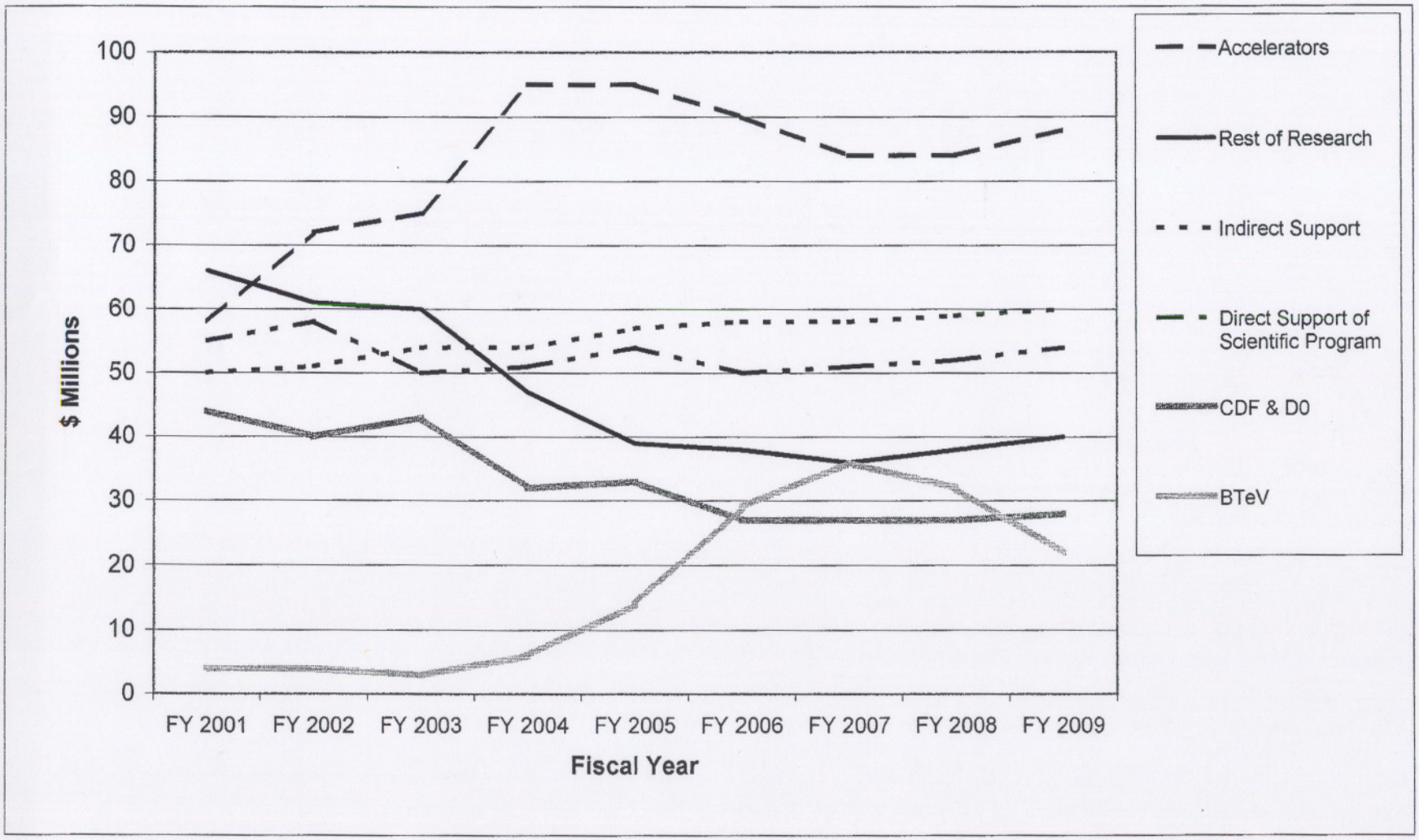
8:00 am	Subcommittee Working Sessions
9:30 am	DOE Full Committee Executive Session Dry Run
1:30 pm	DOE Summary and Closeout with Laboratory Management
2:30 pm	Adjourn

APPENDIX D

FUNDING TABLE

Funding Profile by Major Activity and Year - Flat Budget Scenario

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
Accelerators	58	72	75	95	95	90	84	84	88
Rest of Research	66	61	60	47	39	38	36	38	40
Indirect Support	50	51	54	54	57	58	58	59	60
Direct Support of Scientific Program	55	58	50	51	54	50	51	52	54
CDF & D0	44	40	43	32	33	27	27	27	28
BTeV	4	4	3	6	14	29	36	32	22
Total	277	286	285	285	292	292	292	292	292



APPENDIX E

MANAGEMENT TABLE

The Directorate

Fermilab Directorate Organization Chart

Last Update 02/27/04