Department of Energy
Committee Report

on the

Facility Operations Review

of the

B-Factory
at the Stanford Linear
Accelerator Center

June 2004

EXECUTIVE SUMMARY

The Department of Energy (DOE) review of B-Factory operations at Stanford Linear Accelerator Center (SLAC) was conducted on June 15-17, 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 B-Factory performance and cost of operations, and also 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 B-Factory at SLAC 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 accomplish some of the most important projects in the future. SLAC has been under fiscal constraints for a number of years. This has led to a very lean but still effective organization. It has also resulted in a high level of demands on the professional staff that may not be sustainable long term.

B-Factory is operating extremely well; performance of the facility and delivery of science by BaBAR has been outstanding. This reflects well on the management and staff at all levels.

In presentations and more detailed discussions with the Review 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. Priority setting at SLAC is science driven and effectively flows down from the Director. The Research Division strongly aligns its resources to Laboratory priorities. The Laboratory has a process that effectively sets priorities for Business and Finance operations. Laboratory management is actively engaged in setting Laboratory-level ES&H goals.

It is clear that the B-Factory is the Laboratory's highest priority. The result of the Laboratory's priority setting is manifest in the excellent operation of the B-Factory in FY 2004. Nevertheless, as SLAC moves into other areas of research and potential sponsors (other than DOE) they may want to investigate and consider more formalized resource planning, risk assessment, and prioritization processes.

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-wide focus of the Associate Directors (AD) assist the management team by working together to shift resources throughout the Laboratory as needed and the flexibility to respond to unexpected events. Overall, resource sharing is a strength of the Laboratory.

Division-level management does resource planning across the Laboratory and cooperates in sharing resources to address problems and needs. The successes of the B-Factory luminosity improvements and the BaBAR detector attest to the appropriate allocation of resources. Management has adjusted program elements and their relative priority to ensure success of the B-Factory, while protecting, as much as possible, user-based initiatives.

SLAC's diverse workforce is comprised of many individuals skilled in accelerator technology. Because of SLAC's ability to share among various programs, the allocation of resources from a skill mix perspective is made easier. For the current research program that mainly operates BaBAR, the skills mix seems correct. However, the high level of demands on the professional staff, as being currently provided, may not be sustainable long term.

The lack of depth in the Business Services Division raises doubts about sustaining effective, real-time support for the higher priority science missions in the long term.

The ES&H staff works in a centralized fashion, as well as embedded within the programs. Because this ES&H model appears to have evolved over a number of years through individual management decisions, the Committee suggests the balance between the ES&H centralized and embedded staff be reviewed.

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

Programmatically, SLAC management views the uncertainty in year-to-year high energy physics funding levels as their greatest overall source of risk. Running B-Factory under

essentially flat budgets (no increases for inflation) has left management with little flexibility or maneuvering room to address new issues.

Technically, a number of risks exist in the accelerator and research programs. The program necessary to upgrade luminosity contains challenges in equipment design, fabrication, and installation. The research programs' major risks stem from lack of depth of personnel in operations, computing and mechanical, and electrical engineering disciplines.

Risk to business operations is primarily lack of depth in key positions. Infrastructure risks include insufficient DOE funding for recapitalization of facilities and utility systems. The upcoming increase in electric power expenses, estimated to cost an additional $6 million beginning in FY 2005 and another $6 million in FY 2007, represents a major risk as it is forcing management to find savings in other areas.

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

There is no formal laboratory-wide self-assessment, but a cross-section of technical and support organizations regularly conduct performance evaluations that meet a general definition of self-assessment, including: assessment of laboratory ES&H performance; assessment of laboratory contract performance; assessment of management controls to develop the annual federal assurance memorandum; and assessment of activities necessary to prepare an "annual report" for the local DOE site office.

A significant number of program reviews are also periodically performed, including: reviews conducted by the Internal Procedures and Practices Committee; external and internal programmatic peer or advisory panel reviews; and project-specific assessments, like the PEP-II Run lessons learned sharing and related workshops on performance.

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

ES&H clearly has the attention of the University, senior laboratory managers, ES&H staff and laboratory employees—that is everyone pays attention to ES&H. ES&H roles and responsibilities are well articulated and embraced by all levels in the organization. The AD of the ES&H Division has developed an ES&H Five Year Plan that integrates SLAC's strategic goals and identifies specific ES&H performance targets.

Implementation is driven by management actions based on laboratory-wide goals and steps to address trends identified in regular institution reports. Management actions are visible in
the delivery of ES&H training, frequent walkthroughs, and one-on-one employee workplace hazard analysis and mitigation sessions.

In summary, the Laboratory's performance is good, but the organization is lean, which creates vulnerabilities as it balances future programmatic growth with the known programmatic, technical, and infrastructure risks.

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1. INTRODUCTION

On January 21, 2004, the Office of High Energy Physics (OHEP) requested that the Department of Energy (DOE) Office of Major Systems Assessment (formerly Construction Management Support Division) perform an independent review of the operations and maintenance of the B-Factory complex at the Stanford Linear Accelerator Center (SLAC). The Committee was requested to examine the activities associated with facility operations to: determine the funding needed to effectively support the research mission; evaluate the actual costs (especially manpower) incurred for each activity; comment on the importance of these activities; and assess the potential impacts of reduced resources for facility operations.

The SLAC mission addresses the primary goals of particle physics: learning the make-up of the universe, how it works, and what its future holds. In support of this mission, SLAC has a few key program elements:

1. A research program in particle physics based on the B-Factory (SLAC's electron-positron collider) operated by SLAC as a national (and international) user facility. This research program is funded entirely by OHEP, with a long-term physics goal to understand why there is a preponderance of matter (as opposed to antimatter) in the universe. SLAC is engaged in an extended physics run to accumulate a very large data set that can address this question. There is intense competition with a Japanese accelerator built to address the same scientific goals.

2. There is an evolving program of particle astrophysics activities that exploits high energy physics technology and addresses fundamental questions at the intersection of astrophysics, cosmology, and particle physics. There is a major project—in partnership with the National Aeronautics and Space Administration (NASA)—to build a high-energy gamma-ray telescope that is scheduled to launch in 2007, and several small R&D efforts directed towards possible new experiments.

3. A major R&D effort has been underway for some time to develop a next-generation, electron-positron collider (The Linear Collider), based on accelerator technology developed at SLAC. This effort has met many significant development milestones and is working with international partners to develop a detailed conceptual design in the next few years.

4. A program of advanced accelerator R&D aimed at developing new particle acceleration technologies for the long-range future.

All of these efforts are supported by staff whose responsibilities include accelerator and detector improvements; operations, maintenance, and general technical support; other areas of experimental and theoretical physics research; and administration and operations support. While the scope of this review is limited to 1) B-Factory operations and maintenance, 2) detectors that use the B-Factory complex, and 3) the associated indirect burdens; and given the integrated nature of the SLAC research program, the interrelationship of these efforts to B-Factory complex operations were an important context for this review.

The review was conducted on June 15-17, 2004, at SLAC, and was chaired by Daniel R. Lehman, Director of Major Systems Assessment. To address the charge, the Committee was divided into subcommittees that examined accelerator operations; the research program; infrastructure and environmental, safety, and health activities; business and finance systems; and laboratory management. Committee members were drawn from other Office of Science laboratories and program offices. The DOE area office observed the proceedings.

The review was based on formal presentations given by SLAC staff, detailed discussions with SLAC employees, and Committee members' own extensive experience in laboratory operations and management. The first day of the review was devoted to presentations given by the SLAC, which provided an overview and response to the charge. On the second day, members of each subcommittee met with their SLAC counterparts in working sessions to further discuss details and identify any issues in the areas relevant to their respective subcommittees. The remaining time was spent participating in subcommittee working sessions and deliberations, and report writing. The Committee, as a whole, discussed the results of the review with SLAC management in a closeout briefing on June 17, 2004. This report provides a record of the Committee's findings, comments, and recommendations.

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?

SLAC management has made key decisions with respect to the operation of the B-Factory. It is clear that the B-Factory is the Laboratory's highest priority. Several explicit decisions were made in FY 2003-2004 in order to ensure the excellence of the B-Factory program. Among these was the high-level (Laboratory Director) PEP-II Evaluation Group to bring in resources from throughout the Laboratory to work with B-Factory staff to solve difficult technical problems. Another was the decision to decrease the End Station A program.

SLAC has a thorough program of tracking B-Factory operational progress. The essence of the program allows management to focus on reliability issues and direct resources at those issues that will have the greatest impact. This centralized activity ensures that high-level management has access to the data. Machine upgrade projects are well planned and contribute to yearly predictions of integrated luminosity per month.

Accelerator issues (scheduling, expectations regarding performance, enhancements, etc.) are extremely important to the user community, as well as to other stakeholders. SLAC has numerous cross cutting committees, both management and external. Laboratory Associate Directors (AD) comprise the "Directorate", which collectively has responsibility for SLAC as a whole, thus ensuring that responsibility is taken for areas outside of the division managed. This, no doubt, contributes to good communication. A visible example of this is that the Research Division AD talked about accelerator issues during this review. External committees include the Scientific Policy Committee, the Experimental Program Advisory Committee, and several Machine Advisory Committees.

The result of the priority setting is manifest in the excellent operation of the B-Factory in FY 2004. The challenging integrated luminosity goal of 100 fb^{-1} will evidently be exceeded, and outstanding physics has been coming from BaBar.

Looking into the future, the Committee felt that priority decisions for luminosity upgrades are being made from a detailed analysis of the risks to machine components.

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?

B-Factory effort comes from a variety of sources. The core group is in the Accelerator Department (in the Technical Division) consisting of 74 people. The next layer of support comes from other departments in the Technical Division. The effort comes primarily from the support departments, but can also come from the other programmatic department, such as the Next Linear Collider Department. Beyond this, the Laboratory can redirect resources to the B-Factory from other divisions if needed. This has been done during FY 2004. The Committee was told that the total support for B-Factory operations is 360-376 FTEs; thus, there is considerable support beyond the 74 people in the Accelerator Department.

The "two percent increase per year" plan provided to the Committee showed the number of full time equivalents in support of the accelerator dropping to 351 in FY 2005.

SLAC has a diverse workforce of many individuals skilled in accelerator technology. The voluntary layoff in FY 2003 resulted in the loss of some critical people; however, the depth of expertise across SLAC is deep enough that this did not impact SLAC as much as it would have impacted other laboratories. It is reasonable to say that SLAC's ability to accomplish its full suite of activities has been impacted; however, the expertise remains (as evidenced by the positive impact of efforts such as the PEP-II Evaluation Group, which brought in this expertise from around SLAC). There are several areas in B-Factory where expertise is thin, including:

- Experimental accelerator physicists: This has several implications—it is the limiting factor for machine development (elsewhere called machine studies). The Committee felt more time is needed for machine studies to fully characterize and implement the luminosity upgrade program.
- Mechanical engineers: Key components of the luminosity upgrade program, the vacuum chambers will not meet schedule unless further engineering is made available. Additional designers are also needed.
- Electrical and radio-frequency (RF) engineers: Several slots have been created for key needs in RF. These are identified as day-to-day operational support, and longitudinal feedback modeling.
- Technicians: To assume day-to-day operational responsibilities of new hardware.

Because of SLAC's ability to load share between various programs, the allocation of resources is likely to be right. It is thin; however, due to the demands coming from other programs and the limited number of people. Although the B-Factory is the SLAC's highest priority, it still must contend for resources with other programs. They are allocated if the need becomes serious enough.

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

The Accelerator Department is aware that there are both technical and programmatic risks that must be overcome in order to reach the PEP-II luminosity goals. The program to increase the luminosity includes a plan to add RF stations to the PEP-II storage ring, and to replace the vacuum chambers in the interaction region (IR) and in certain other areas that have to withstand the higher order mode heating that comes with the higher luminosities. In addition, achieving higher luminosities also requires a substantial program of accelerator studies in order to improve the lattice and investigate the instabilities that will likely be present in the machine.

SLAC has built many RF stations in the past. As a result, the Committee did not feel that the addition of RF represents a significant risk of success. On the other hand, the vacuum chambers in the IR do represent risk because they are challenging objects to build, and it would represent a substantial downtime if they were to fail. With increasing luminosities these chambers must be replaced; therefore, it is important to design new chambers and have them ready to be installed in the 2005 shutdown. The Accelerator Department has completed a detailed plan to accomplish this work. After examining the plan, the Committee found that there is presently insufficient engineering assigned to the task in order to ensure that the new chambers are ready for the 2005 installation.

The Committee felt that SLAC needs to place adequate priority on physicist manpower in the Accelerator Department to ensure that the machine development studies are accomplished, in order that the full luminosity can be achieved once the RF and vacuum upgrades have been completed.

There are further risks to the luminosity upgrade program if out-year funding is less than the two percent per year increase that was presented; however, the Committee was encouraged to see that SLAC has made these upgrades the highest priority should this funding not be realized.

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

SLAC has an aggressive and formal program of assessing operational issues. Fault analysis evaluating—mean time to faults/mean time to repair (MTTF/MTTR)—is thorough and well documented. Data is tracked against subsystems (technical disciplines) and areas (different parts of the accelerator complex). As noted above (Charge Point 1), this analysis is monitored by

high-level laboratory management so that resources can be redirected to issues trending to be problems. An Oracle database system, the Accelerator Remedy Trouble and Maintenance Information System (ARTEMIS), is used to track these problems until resolutions are implemented.

PEP-II conducts numerous meetings ranging from daily to "per run" to assess problems and plan solutions.

SLAC has developed a strategy for accelerator luminosity improvements. SLAC intends to increase the peak luminosity to 2.4×10^{34} by accelerator improvements running through FY 2006. Forecasts are made for "integrated luminosity per month" a year in advance. These forecasts are coupled to scheduled accelerator improvements.

External review committees provide important input in evaluating machine upgrades.

The Accelerator Department has done an excellent job in assessing operational problems and making continuous improvements. Accelerator improvements are well planned and managed.

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

Embedded ES&H planning and implementation is well integrated in the Accelerator Department Operations. The safety officer and deputy form the Accelerator Department Safety Office, and serve as the coordinators for the department. They work with the Accelerator Operations Group to maintain the relevant procedures concerning safety. They also work with the Radiation Physics Department to create the proper level of rigor in the Beam Authorization Sheets. These Beam Authorization Sheets dictate procedures items and activities to be performed prior to beam turn-on. They also indicate the required initial checkout within the initial turn-on of the beam and the running conditions that must exist under operation.

All of the accelerator operators are trained in safety. Formally controlled procedures and checklists exist for interlocks, searches, entry and exit, and safety inspection. These procedures undergo a regular review and approval process and are updated as conditions change. The signed up-to-date procedure is the paper copy, but electronic versions are available on the Accelerator Department web-page.

The area managers, project managers, and safety coordinators all have explicit safety responsibility that appears to be generally understood throughout SLAC. Coordinators may be

designated by the AD, department head, group leader, or project manager. They must stay informed of work processes in their area of responsibility and must assist in identifying ES&H concerns. They are also the primary contact between the line organization and ES&H.

Safety walkthroughs are regularly done by management (Technical Division Director, Accelerator Department Head).

The Accelerator Department demonstrates concern and attention to ES&H in the operation, maintenance, and upgrades of the accelerators under its responsibility. Procedures appear to be well controlled, current, and documented. The safety officer and leadership team within the Accelerator Department evidence a close working relationship with regard to ES&H issues.

2.2 Recommendation

1. Continue to make appropriate resources available to the B-Factory to meet the reliability and upgrade needs.

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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?

The Programmatic Resource Planning is excellent. The new Research Division organization strongly aligns the resources to SLAC's priorities. Draft budgets are communicated to departments, the departments evaluate the impact of the draft budget, and there is effective communication and iteration. There is a mid-year budget review process. The Experimental Facilities Department's detailed tracking of the tasks of each person is useful.

The BaBar Collaboration is very appreciative of the wonderful luminosity growth, greater than 99 percent operational efficiency in the past year, and the exceptional cooperation with SLAC.

The high level of physics output from BaBar indicates an outstanding performance by the SLAC and the Collaboration in this area.

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 commended BaBar and the SLAC Computing Services for initiating the new Computing Model (CM2) and the use of Tier A analysis sites in France, Germany, Italy, and the UK, which optimizes resources. The Committee also commended the BaBar Collaboration on the Physics Analysis tracking system.

For the current program that mainly operates BaBar, the skills mix seems correct. BaBar operational experience, based on FY 2001-2002, has given the level of personnel needed and this level needs to be maintained through the end of the decade. (There are additional FTEs for the upgrade installation this and next summer.)

The Committee observed that the level of responsibilities based on "you build it/you maintain it" results in some complicated arrangements between SLAC and the Collaboration but it is working well.

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

There is a lack of depth of people in many locations both in BaBar Operations and Computing. The new BaBar CM2 has to be maintained until the end of the decade. Many of the people who implemented CM2 were postdocs who will not be there long term. Perhaps the Collaboration will deal with this. There is also a lack of depth in engineering—both mechanical and electrical—junior to senior.

The infrastructure for computing requires upgrading. Power and cooling are not sufficient for the next five years. It was unclear how this is being included in SLAC's infrastructure upgrades. Cyber-security is being handled but is a potential future risk. Backgrounds and radiation damage to the BaBar detector are being studied by a group.

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

There is no formal self-assessment process in the Research Division. However, there have been numerous reviews on specific targeted areas, for example, an ongoing study of the downtime resulted in improved running efficiency. The Collaboration should analyze the current (approximately) 150 FTEs per year needed to operate BaBar over the next five years with the aim of reducing the number in order to add any surplus personnel to physics analysis tasks.

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

There has been extensive planning for the installation of the Instrumented Flux Return Upgrade. A Safety Watch has been instituted for each operation this summer. The BaBar Technical Coordinator and Deputy Division Director are intimately involved in the safety planning. Also, BaBar will train or retrain each individual working on the detector this summer. However, the formal documents viewed by the Committee do not have visibility of senior management (such as the Deputy Division Leader and the BaBar Technical Coordinator).

3.2 Recommendation

1. Consider making a bottoms-up outyear resource plan that supports the program elements, including technical staff skill requirements.

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?

Yes, the Laboratory has a process that works to effectively set priorities for the Business and Finance areas and track progress, resolve problems, and communicates, with the key stakeholders in support of B-Factory operations.

The SLAC Business and Finance functions provides the main operational support essential to meeting the needs of the scientific programs and enables the science mission to be realized to its fullest extent. The support organizations recognize and understand this role while trying to meet the administrative and operational requirements set by the prime contract. Senior management (the Directorate—a term used by the Laboratory Director to define the senior leadership team of the Laboratory) has an informal process of operational meetings to exchange information and to begin to set targets for budget formulation. This process takes place over several months and involves all the major stakeholders needed to accomplish SLAC's scientific mission. Priorities are established in a top-down (senior management defines expectations), bottoms-up fashion (managers and subject matter experts have the opportunity to raise issues). Laboratory-wide priorities are established by the Directorate based on guidance from DOE, DOE Advisory Panels (such as the High Energy Physics Advisory Panel or HEPAP), the Experimental Program Advisory Committee that advises the Director (indirectly from Congress based on the budget), and peer reviews. These program priorities are "flowed down" to the Division and functional heads by the ADs, both in discussions and through budget allocations. The functional leaders then use them as a guide in establishing operating priorities.

Budgets have been, and continue to be, constrained. However, critical issues are evaluated and considered during the annual funding allocation process. This informal process gauges risk to the scientific mission and involves senior laboratory management. Issues are brought forward and decisions are made on how best to allocate resources to effectively resolve operational problems. This process was used when the Director's Task Force reviewed the B-Factory project. After the project was evaluated, it was decided that a reallocation of resources from other parts of the Laboratory was necessary for its continued support, and the decision was made to significantly

curtail the research on the End Station A program. Budget requests are also considered during the year to address potential critical issues that may arise in the operation of the Laboratory.

A bottoms-up priority setting approach is used for the review of new initiatives, starting with the functional leaders and their staff defining the need. The request is then "flowed up" the chain where, if additional funding is required, the Directorate is able to make the determination for appropriate funding allocations. The process involves the functional leader identifying the initiative to the AD and justifying it operationally (benefits versus cost). Once the AD is convinced that the initiative is worthwhile, it is discussed with other stakeholders and the appropriate Division leadership. When all involved are satisfied the initiative is worthwhile, it is taken to the Directorate level. If the Directorate is convinced the initiative is worthwhile in the context of SLAC's mission and priorities, it is supported and funding is allocated for its implementation. An example of this type of initiative is the Data Warehouse Project that oringinated in the Laboratory Support Services IT Group and eventually to the Directorate.

The formality of the process used to track the initiatives progress and to communicate with stakeholders is dependent on the complexity of the initiative. This process can be as informal as the functional leader keeping the AD informed of the initiatives status, to as formal as establishing a steering committee to guide the project and using external peer reviews to periodically assess its progress and provide suggestions for addressing problems.

The current year plan is monitored throughout the year and mid-term course adjustments are made, as necessary, based on the changing priorities of the Laboratory. A recent example would be the DOE-imposed requirement for Unclassified Foreign Visits and Assignments. The imposition of this requirement on the Laboratory required a reprioritizing in the form of a mid-year budget reallocation. The AD for Business Services brought this issue to the Directorate, its operational and financial implications were discussed (as were a possible process for addressing the requirement), and finally a course of action was decided upon and the necessary Laboratory resources were allocated.

Laboratory goals are established by senior management and flow down to the managers and functional leaders, who then develop their respective division goals that integrate into the overall goals and objectives of the Laboratory. A set of specific goals is then established for the staff that directly relates to the division goals and are made part of their performance evaluations.

As SLAC moves into other areas of research and multiple sponsors, they may want to investigate and consider a more formalized resource planning, risk analysis, and prioritization process to assist in the decisions for the important operational resources of the Laboratory.

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?

No, resources are not sufficient for sustainable long-term success in the Business Services Division (BSD). A few areas of concern include: many single points of failure (staff) in the BSD and Human Resources; limited implementation of cross training and succession planning; multiple funding sources beginning to overload BSD staff; and slow development of a standardized process for Grants/Work for Others.

Laboratory budgets have been challenging for the last few years and it is evident by the additional stress on the entire Laboratory. Budgets have generally been flat or reduced and have not kept up with inflation. This has required great care in establishing Laboratory priorities and allocation of resources. The highest priority operational needs have been funded to maintain an adequate operating or service level. Because of this, budget needs that have less impact on the high-priority scientific initiatives of the Laboratory may not receive adequate funding, project scope may subsequently be reduced, and schedules and milestones are stretched out or dropped altogether.

Human capital is also an issue. Many functions within BSD lack depth and there are substantial single points of failure. Any additional reductions of force (human capital) will result in a situation where they must be considered inadequate unless some currently provided services are scaled back or eliminated altogether. This puts a substantial strain on the ability to sustain customer expectations and reduces the ability to respond to ad hoc tasks and requests, possibly further increasing overall risk to the Laboratory.

Human Resources recognize the need for better workforce planning to accommodate the appropriate skill mix within SLAC. However, they have no formal process to ensure they are addressing this issue, and no implementation plan (currently) exists. As the workforce continues to age and increasing retirements are experienced, there will be an immanent need to address this issue. It appears the BSD is addressing this issue by way of attrition where opportunities present themselves, however attrition is not the solution.

To relieve some of the stress on the current staff, the Laboratory could seek improvements in utilization of any tools available to streamline work processes and seek ways of

doing business in a different way to create efficient and effective processes. For instance, the Laboratory could consider investing in increased utilization of the functionality offered by the PeopleSoft products that are continually evolving and providing enhanced capability. Additionally, the Laboratory could consider exploring the use of University employees, where practical, to temporarily relieve the short term need for resources, and rotate staff on a more frequent basis to provide better succession planning and coverage for the lack of depth.

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

Yes; however, they are recognized by the BSD and Human Resources Division.

There are risks associated with the BSD and the Human Resources operations, and both areas indicated they understand their respective potential risks. Where there are sufficient resources, these risks are being addressed. The primary risk the Committee identified is the stress on the BSD staff due to insufficient personnel to meet long-term customer expectations. The Committee recommended addition of staff to the organization. Without the added staff, customer expectations (both internal and external) will not be met. Other risks, over which SLAC has some control, can be managed once the resources are provided, or the customer expectations are reduced (reevaluated).

BSD has identified the need for disaster recovery for business operations (software information). They are currently working on a mirror-site for automated operations. However, it was not made clear if there is a documented disaster recovery plan, or if there is a clear path forward to develop such a plan.

SLAC staff identified several risks over which the Laboratory has little control, such as potential rapid increases in medical costs, salary, and benefit constraints leading to higher turnover, etc. These are monitored such that the Laboratory will not be surprised and hence will have the opportunity to manage the risks should they develop.

Another strain on the organization that exacerbates personnel stress levels is the steady increase in outside audits and reviews.

The Committee identified the “Certificate and Supervision Program” as a best practice that should mitigate potential workplace grievances and enhance SLAC’s respectful workplace policy.

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

Yes, self-assessment is part of the SLAC management continuous improvement process. The current system is designed primarily to meet DOE requirements for annual performance reviews. Use of the self-assessment data provides opportunity to identify areas requiring improvement, and for the annual performance measurement negotiation process with DOE.

The use of a "Balanced Scorecard" (or other recognized self-assessment process) approach is successfully applied in procurement and property management. It is recognized that this approach provides a rigorous evaluation of processes, customer satisfaction, and performance.

As part of the self-assessment program the BSD and Human Resources gain external operational awareness by attending professional meetings, through membership in the National Laboratory Improvement Council (NLIC), support to DOE Independent "Lehman" Reviews, the SC Laboratory Business Managers Meeting, and peer reviews at other laboratories.

It was observed that the business and human resource areas had limited resources to implement formal benchmarking processes.

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

Yes, the Laboratory Director has set clear expectations for the management and staff on the importance of having a strong safety culture at SLAC. Safety responsibilities are appropriately addressed (on a daily basis) by the BSD and Human Resources Division. Examples of specific actions the line managers of these two organizations use to promote a strong safety culture include the discussion of safety at staff meetings, sharing of lessons learned, and use of office walk-throughs. Safety gets high attention in these organizations.

One of the primary safety challenges in the business and human resource organizations are issues concerning ergonomics. Best practice recognition is given to the management team in these organizations for the proactive investment in a new software tool that signals staff to take appropriate breaks during extended sessions of computer use to limit potential ergonomic injuries. The Laboratory has also invested in new voice recognition software.

Line management must maintain and encourage the safety culture through continued communication, annual training, and frequent walk-throughs.

4.2 Recommendations

1. Consider additional support for BSD and explore opportunities to:

   a) use staff from Stanford University to provide backup;
   b) use staff rotation to address the lack of depth; and
   c) invest in increased utilization of the functionalities offered in the “PeopleSoft” system.

2. Consider using a Balanced Scorecard in other business areas.

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, SLAC management is actively engaged in setting laboratory-level ES&H goals through the ES&H Coordinating Council process. Goals are based on input from Departments and Divisions. Line management is responsible for ES&H at SLAC, and laboratory-level goals are flowed down.

An Infrastructure Review Committee (IRC) is used to solicit and evaluate infrastructure and ES&H project needs from across all Laboratory organizations—ADs approve all requests. ES&H projects are formally ranked using the DOE risk prioritization model. Site Engineering and Maintenance (SEM) management, as well as the Laboratory Deputy Director, evaluates the infrastructure project proposals. The process is used annually to make allocation decisions for General Plant Projects (GPP), line items, including Science Laboratory Infrastructure (SLI), and operating funds provided by the Laboratory for infrastructure and ES&H projects.

ES&H progress against established goals is tracked by the Laboratory Directorate through an ES&H Quarterly Report and at lower levels through Division- and Department-specific review and reporting mechanisms. The IRC Chair, the Technical Division AD, and the Deputy Director track progress of all active infrastructure and ES&H projects monthly.

Communication of infrastructure and ES&H issues, concerns, and progress is integrated into the Laboratory's overall communications processes and is effective. The SEM organization has recently implemented an automated Service Request system that has significantly enhanced customer communications and satisfaction.

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?

ES&H professionals in a central ES&H Division are available to assist line management in meeting their ES&H responsibilities, and many line managers have opted to add ES&H professionals to their organizations directly (embedded ES&H professionals). The embedded ES&H professionals are highly regarded and provide significant added value. Radiation and

environmental protection support services are also well-respected by laboratory organizations. The distribution of embedded versus central appears to have evolved through individual management decisions over a number of years rather than by a laboratory-level evaluation of optimum resource allocation.

Project management resources are appropriate for larger projects, particularly programmatic projects. The project management process used for smaller infrastructure and ES&H projects is less robust, and more informal. The design review process has, to a large extent, been under the control of the assigned project engineer. ES&H reviews are performed by construction safety professionals in the central ES&H organization before the project documents are released for construction. The SEM organization has recognized the need for increasing the rigor and formality of the design review and project management processes, and is developing internal procedures and supporting documents.

Infrastructure planning for buildings is the responsibility of several individuals in SEM and the BSD. In general, infrastructure planning has not been kept current, but work is now in progress on the Ten Year Site Plan required by the DOE Real Property Asset Management (RPAM) Order. Specific responsibilities for RPAM implementation have not been established.

Construction oversight is performed by personnel within the Departments and Divisions. These "University Technical Representatives" (UTR) are typically not engineering and construction professionals, but receive training and a UTR Manual. SEM staff are made available for consultation as the need arises. The central ES&H group is responsible for providing ES&H and inspection oversight during construction.

A series of eleven "Citizens Committees" provides additional ES&H technical support to line management.

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

ES&H planning for the BaBAR Instrumented Flux Return Upgrade project was well done. A number of ES&H issues are being appropriately addressed, including air emissions and other design safety concerns. The execution phase of the project will place significant demands on the staff and is likely to result in fatigue and a higher probability of accidents and injuries.

Infrastructure risks include insufficient DOE funding for recapitalization of facilities and utility systems. In particular, the need to revitalize the variable voltage transformers and substations will be key to reliable operations after FY 2008. Seismic risks also remain to be addressed.

Laboratory management has been addressing the most critical infrastructure issues through allocation of laboratory operating funds for infrastructure projects and judicious use of GPP funds. The Laboratory is depending on funding from the SLI program to address many of these needs. However, there are uncertainties in the overall funding of the SLI program, which are likely to negatively impact the Laboratory's ability to secure the necessary funding.

Higher power costs are expected, beginning in January 2005, due to expiration of the electric power supply contract between PG&E and WAPA and the consortium of DOE, Lawrence Livermore National Laboratory, Lawrence Berkeley National Laboratory, and SLAC. In addition, PG&E will no longer be obligated to wheel power to SLAC at wholesale transmission rates. Overall, this is expected to double the cost of power to the Laboratory, resulting in an estimated increased cost to high energy physics facilities of between $6-7 million per year FY 2005. In addition to impacting the Laboratory's scientific facilities, infrastructure operations and projects will likely feel budget impacts as well.

Laboratory management is working with DOE to secure new contracts to obtain electrical power at the lowest possible cost.

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

A variety of self-assessment approaches, varying in structure and formality, are in use in the infrastructure and ES&H areas. The stated objective of self-assessment is to "Find and Fix" problems.

The Site Engineering and Maintenance organization's self-assessment program relies heavily on the contract measures negotiated into the DOE M&O contract. Assessment of the condition of infrastructure buildings is accomplished on a five-year cycle through the use of a subcontractor.

In 2001, the Laboratory utilized an Administrative Peer Review similar to that used annually at Fermi National Accelerator Laboratory, Thomas Jefferson National Laboratory, and other laboratories, to assess support functions. The process has not been repeated to date, though there is an intent to continue.

ES&H self-assessment activities are accomplished across all Laboratory organizations, at various levels. The Scientific Policy Committee provides independent assessment on an ongoing basis at the institutional level. Various reviews are conducted by line managers, the ES&H Citizen's Committee, the ES&H Division, and the system of Citizen Committees. The annual "Talk, Walk, and Clean" program provides a framework for worker involvement in self-assessment of ES&H. A Voluntary Protection Program/Integrated Safety Management review was conducted in 2003.

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

The AD of the ES&H Division has developed an ES&H Five Year Plan that integrates the Laboratory's strategic goals and identifies specific ES&H performance targets.

As part of a Congressional mandate to examine the feasibility of placing Office of Science laboratories under Occupational Safety and Health Administration (OSHA) and the Nuclear Regulatory Commission (NRC), OSHA and NRC inspections were conducted at the Laboratory. The OSHA inspection yielded 1,142 preliminary findings primarily in the areas of electrical safety and elevated work surfaces. These findings are similar to those at other Office of Science laboratories. The liability to address all of these is estimated to be $3.1 million including contingency; $300K of Health and Safety Improvement funding was provided to SLAC as part of the DOE SLI program.

The NRC inspection yielded eight findings (in the areas of licensing, emergency planning and formation of a radiation committee) with an estimated cost of $1.4 million to address.

5.2 Recommendations

1. Consider using best practices from other laboratories in the development of design review and project management processes.

2. Consider reviewing the effectiveness of the UTR approach to construction management.

3. Clarify RPAM implementation responsibilities and establish a champion with appropriate authority.

4. ES&H workforce planning should be conducted to ensure the most efficient skill mix between embedded and central ES&H staff.

5. Develop contingency funding plans for the variable voltage substations.

6. Consider institutionalizing the Administrative Peer Review process.

7. Consider expanding the institutional self-assessment program to include a measure of ES&H management system effectiveness.

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6. MANAGEMENT

6.1 General Findings

SLAC is “single purpose” laboratory managed as an M&O contract between Stanford University and the DOE. The DOE high energy physics program is the DOE site “landlord”.

The Director of SLAC reports to the Stanford University President for the administration and operation of SLAC, and to the Provost of the University for academic matters. SLAC is organized into five divisions: Technical Division, Research Division, Stanford Synchrotron Radiation Laboratory (SSRL) Division, Business Services Division and ES&H Division with each division being headed by an AD reporting to the Laboratory Director.

Under the direction of the Laboratory Director, the ADs are expected to have collective responsibility for the operations of the full laboratory and so their responsibility extends beyond their respective divisions. This collective responsibility is formalized by a weekly Director’s Meeting and staffing of key oversight committees (e.g., salary review, ES&H Coordinating Council) by the ADs.

External review and audit by peer and expert groups complements self-assessment and self-audit. This external review includes Program Reviews by the cognizant DOE Program Office and DOE project reviews (“Lehman” reviews). In addition, the SLAC Scientific Policy Committee reports to the President of Stanford University and provides the highest level of laboratory oversight of policy, the scientific health of the Laboratory, management performance, and ES&H.

Proposals for the use of SLAC accelerator facilities, including improvements and extensions for ongoing experiments are reviewed by program committees that report for high energy physics to the SLAC Director and for synchrotron radiation to the SSRL AD.

The B-Factory is overseen and guided by Machine Advisory Committees reporting to the Laboratory Director. The design, construction, and commissioning of large experiments, including BABAR, are guided by Technical Review committees reporting to the Laboratory Director.

The Laboratory’s ES&H program operates under the Integrated Safety Management System. Safety is a line responsibility, but with special resources and personnel available to line

managers from each division including the ES&H Division.

Stakeholders of the Laboratory include the users, Stanford University, DOE, neighbors of the Laboratory, local government, local and Federal regulatory agencies, the national and international scientific community, etc.

B-Factory operated with an average efficiency of about 88 percent over the past four years (efficiency defined as delivered beam-time for research compared to promised beam-time for research). The yearly performance goals are tracked on a daily, weekly, and monthly basis in order to spot trends and to help identify actions to improve efficiency.

The Research Division is responsible for the research program utilizing the B-Factory and the Technical Division is responsible for operating the B-Factory.

Within the Research Division there are positions for both a BABAR Collaboration Manager and for the BABAR Program Manager. Both report to the head of the Research Division. BABAR accounts for $23.5 million of the $61 million Research Division budget and 138 of the total 419 full time equivalents.

The Technical Division is responsible for the operation and development of accelerator systems including the B-Factory. It also has responsibility for the integration of operations and planning with all relevant departments in both the Technical and Research divisions.

For the B-Factory, the Technical Division also provides mechanical design, fabrication, and metrology (e.g., magnetic measurements and alignment) support, site engineering, maintenance and site facilities support, electronics and software engineering support, accelerator physics personnel, as well as special technical expertise, and development functions.

B-Factory accounts for about 55 percent of the $95.7 million Technical Division budget and about 55 percent of the total 657 FTE in the division.

BABAR is an international collaboration involving ten countries, 77 institutions, and about 600 physicists. BABAR is managed by the spokesperson operating under a Collaboration Council. The Spokesperson is also a member of the SLAC Research Division reporting directly to the Research Division head. Under the spokesperson is the physics analysis coordinator (advised by the physics analysis coordination team); the technical coordinator (advised by the technical Board); and the computing coordinator (advised by the Computing Executive Board). Generally the institutions that constructed a component of the detector are responsible to maintain that component.

BABAR operational efficiency is impressive with 97 percent of the delivered luminosity being logged on tape and used for analysis in past years rising to 99 percent in FY 2004.

Computing at SLAC for BABAR is handled as part of the overall SLAC computing operations and support under an Assistant Director of the Research Division.

6.2 General Comments

SLAC management philosophy is driven by its history and by the relatively small size of the Laboratory, which allows top management to be cognizant and involved in all aspects of the Laboratory on a day-to-day basis.

The management team approach involving the Director and ADs is effective in coordinating and optimizing resource utilization across the laboratory and minimizing duplication or inefficiencies. This approach allows flexibility in setting and acting on priorities in the context of an unpredictable and changing funding environment. Recent difficult decisions at the laboratory-level (terminating the End Station A program and focusing additional resources on the B-Factory at the expense of other programs) show the commitment to the B-Factory.

Demonstration of success of the management approach is in delivery of the product. The B-Factory luminosity keeps increasing and is now well above design level. In the past year the B-Factory has responded successfully to the Laboratory Directors' challenge to deliver 100 pp-1 with over 90 pb-1 delivered thus far. The B-Factory operates with 88 percent efficiency in delivering beam time compared to planned beam delivery, a very high efficiency for a high energy physics accelerator.

The Director sets clear priorities that are effectively communicated to the staff. The management at the highest level is cognizant of day-to-day status throughout the organization.

The Laboratory has been under fiscal constraints for a number of years. This has led to a very lean, but still effective, organization, but it has resulted in a high level of demands on the staff that may not be sustainable.

6.3 Findings and Comments Related to Charge Points

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

Laboratory priorities are determined by the Directorate based on peer reviews (HEPAP, Scientific Policy Committee, Experimental Program Advisory Committee, Machine Advisory Committees, etc.) and budget realities. Internal and external reviews are used to routinely evaluate progress against the priorities.

Priority setting at SLAC is science driven and effectively flows down from the Director. Priority and focus on B-Factory operations has shown good results.

Communication between divisions at the AD and Department Head levels is excellent. A very effective tool in tracking progress for the B-Factory is the daily 8:00 a.m. (seven days/week) Accelerator Progress meetings and the 8:15 to 8:30 a.m. (five days/week) discussion of repairs and maintenance and short term operating plans. These meetings, which are attended by the highest levels of management, provide an excellent mechanism both for resolving problems and communicating with key internal stakeholders. Other standing meetings are:

- Weekly Accelerator Plans meeting where the past week's performance is reviewed and the short-term program is discussed.
- Weekly Project Review meeting where Accelerator Improvement Project and other accelerator project status, cost and schedules are reviewed.
- Weekly Directors Meeting where any cross divisional B-Factory problems are raised and resolved.
- Weekly Downtime Planning meeting (starting three months before, and continuing through the down period).
- Weekly meetings of BaBAR Spokesperson with AD of the Research Division
- Weekly one-on-one meetings of ADs with Laboratory Director.

Another important and effective tool for minimizing downtime and optimizing machine performance is the ARTEMIS tracking system in which all machine and equipment failures are recorded and tracked. This tool is used extensively to identify problem areas and make optimum use of limited resources to optimize machine performance.

It is clear that the Laboratory management is strongly focused on B-Factory operation and performance. In addition to the standing activities mentioned above, the Director led a task force during FY 2004 to focus on improving the luminosity for the B-Factory. Resources from throughout the Laboratory (especially Next Lineear Collider) and from the BaBAR Collaboration were brought to bear on this problem. The fruit of this effort was a spectacular doubling of the monthly integrated luminosity.

The relationship between the BaBAR collaboration and SLAC management is excellent.

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 successes of the B-Factory luminosity improvements and the BaBAR detector attest to the appropriate allocation of resources. Management has adjusted program elements and their relative priority to ensure success of the B-Factory, while protecting, as much as possible, user-based initiatives. Nevertheless, some good programs with lesser scientific impact have been either shut down or greatly reduced.

Division-level management does resource planning across the laboratory and cooperates in sharing resources to address problems and needs; however, budgets have been very tight for a number of years, and it appears that the operations staff is stretched very thin; in some cases there is only one in particular skill sets.

The constrained budgets have also stressed infrastructure support, and there are elements of the infrastructure that are in urgent need of maintenance or replacement. The Laboratory has increased GPP funding to $5 million/year and is allocating $1 million/year of operating funds to address the most urgent issues. They are also counting on $16 million of SLI funding during FY 2004-2006 to refurbish mechanical underground utilities and for seismic improvements to buildings.

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

SLAC management correctly views the uncertainty in year-to-year HEP funding levels as their greatest overall source of risk which cross-cuts all three of the above areas. The laboratory has had to deal with difficult funding situations in the recent past, especially in FY 2003 when lower priority research activities (e.g., End Station A) had to be curtailed and the staff was asked to make significant financial sacrifices (including leave without pay, and no salary raises in FY

2004 which was a University-wide policy). Running B-Factory under essentially flat budgets (no increases for inflation) has left management with little flexibility or maneuvering room to address new issues. Future plans include an average annual salary increase of three percent.

The Committee did not identify any programmatic risks per se. There has been a good deal of programmatic scenario planning done, where it is assumed that the PEP-II/BABAR program will have a clear future to approximately 2010. Thus, in all cases, SLAC management has protected the B-Factory and has given it top priority. SLAC has done a very good job in cooperating with and supporting the BABAR collaboration.

The upcoming increase in electric power expenses, estimated to cost an additional $6 million beginning in FY 2005 and another $6 million in FY 2007, represents a major risk as it is forcing management to find savings in other areas. SLAC management presented their plans for addressing the increase, which will leave B-Factory annual run time intact through FY 2009.

The detailed technical risks associated with operating and maintaining B-Factory/PEP-II/BABAR appear to be well understood. There are spare parts on hand to support most components, although the inventories are determined more by available funding than by a bottoms-up analysis of requirements. Klystrons have proven to be surprisingly reliable and some spares exist, but over one year of lead time is required to produce (in-house) a new replacement klystron. It is recognized that a major transformer/substation fault could have significant adverse impact, especially to the computing systems that support B-Factory data collection and storage.

Staffing in several areas (Technical Division's engineering and metrology, IT, BSD) is lean and may be further stressed when the LCLS Division is formed starting in FY 2005. Although morale and retention have generally not been a problem and the staff has performed admirably, it is under a level of strain that may not be sustainable.

The funding situation has made it difficult to bring in many young people to SLAC and much of the Technical and Research Division staff is approaching or beyond the age of retirement eligibility. If the Bay area economy improves dramatically in the years ahead, there is a risk that some categories of SLAC personnel will be drawn away by higher salaries offered elsewhere. The computing staff within the Research Division was the only group to grow in the past few years and that has leveled off. For the funding scenarios that were presented to the Committee,

management plans to handle future staff reductions mostly through attrition. The Human Resources Office provides analytical tools to the ADs for their use in evaluating various demographical aspects of the SLAC labor force.

Overall, the SLAC infrastructure that supports the B-Factory facility is about 40 years old. Management has been successful in maintaining the reliability and availability of B-Factory to its user community at a commendably high level. A formal risk prioritization process is used to rank infrastructure projects, and priority has been given to addressing infrastructure items related to life threatening hazards, as well as seismic remediation. Senior SLAC management is actively involved in setting these priorities through an Infrastructure Resource Committee. The general condition of the SLAC infrastructure from the standpoint of supporting B-Factory operations appears to be adequate, but there is a sizable backlog of infrastructure revitalization items. The largest infrastructure upgrade in recent history was a $12.4 million Master Electrical Substation Upgrade completed in FY 1999. SLAC has an effective system (ARTEMIS) for recording, prioritizing, and tracking accelerator maintenance items. There is an annual external audit of ES&H and an annual building inspection, both done by outside contractors. The anticipated level of infrastructure funding for the foreseeable future comes mainly from GPP and the Office of Science SLI program. If realized, it should be adequate to address the most important needs (e.g., underground utilities) over the next two to three years.

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

A cross-section of technical and support organizations in the Laboratory conduct many types of performance evaluations in response to external requirements or internal needs that meet a general definition of self-assessment. The examples made available to the Committee in plenary presentations or breakout sessions, include: self-assessment of laboratory ES&H performance; self-assessment of laboratory contract performance; self-assessment of management controls to develop the annual federal assurance memorandum; self-assessment of activities necessary to prepare an “annual report” for the local DOE site office; reviews conducted by the Internal Procedures and Practices Committee; a large number of external and internal programmatic peer or advisory panel reviews; and project-specific assessments, like the PEP-II Run lessons learned sharing and related workshops on performance.

The Laboratory does not formally benchmark its programmatic or business activities with similar organizations or organizations that perform similar functions and activities. The practice of benchmarking is useful not only for identifying potential areas for improvement based on

others' practices and performance, but also for the inward scrutiny (self-assessment) necessary to understand internal practices well enough to make meaningful comparisons with benchmarking partners. While many laboratory operations are unique, there are programmatic components, operations, and activities that could benefit from comparison with others. The situation appears to be similar at the other high energy and nuclear physics laboratories.

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

ES&H clearly has the attention of the University, senior laboratory managers, ES&H staff and SLAC employees—that is everyone pays attention to ES&H. ES&H roles and responsibilities are well articulated and embraced by all levels in the organization.

Implementation is driven by management actions based on laboratory-wide goals and steps to address trends identified in regular institution reports. Management actions are visible in the delivery of ES&H training, frequent walkthroughs, and one-on-one employee workplace hazard analysis and mitigation sessions.

ES&H professionals reside both in the ES&H Division and in the programmatic divisions. The balance between these deserves a review.

6.4 Summary

The SLAC mission is a key part of the Nation's high energy physics and x-ray science programs. SLAC 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 Director sets clear priorities that are effectively communicated to the staff. The management at the highest levels is cognizant of day-to-day status throughout the organization.

The ADs laboratory-wide focus gives the management team the ability to shift resources throughout the Laboratory as needed and the flexibility to respond to situations. Resource sharing is a strength of the Laboratory. Planning is done in a coherent laboratory-wide manner.

The laboratory has been under fiscal constraints for a number of years. This has led to a very lean but still effective organization, but it has resulted in a high level of demands on the professional staff that may not be sustainable. The staff may be stretched too thin, potentially

leading to problems in the future.

There are more funding pressures on the horizon: the cost of electricity is expected to rise dramatically and there is a considerable and increasing backlog of important infrastructure revitalization items. These constitute a risk to the Laboratory's mission.

B-Factory is operating extremely well; performance of the facility and delivery of science by BABAR has been outstanding. This reflects well on the management and staff at all levels.

6.5 Recommendations

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

2. Evaluate the full scope of activities (research and support) at SLAC to identify opportunities to generate budget for needed additional staff.

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APPENDIX A

CHARGE MEMORANDUM

DOE F 1325.8
(08-93)

United States Government **Department of Energy**

TO: Mr. Daniel R. 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 program.

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
B-Factory at the Stanford Linear Accelerator Center
June 15-17, 2004

Daniel R. Lehman, DOE, Chairperson

SC1
Accelerator

* Rod Gerig, ANL
Roger Dixon, FNAL
Kem Robinson, LBNL

SC2
Research

* Jim Siegrist, LBNL
Howard Gordon, BNL
Roy Whitney, TJNAF

S
Business

* Don Boyd, PNI
Mike Bartos, A
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SC4
Infrastructure and ES&H

* Dave McGraw, LBNL
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John Yates, DOE/SC

SC5
Management

* Jay Marx, LBNL
Klaus Berkner, consultant
Jeff Hoy, DOE/SC
Steve Meador, DOE/SC

Obs

Aesook Byon, I
Glen Crawford,
John Muhlestei

LE

Subcommittee
SC Chairperson
* Part-time Subc
[ ] **Count: 18** (ex

06/22/2004:q:sc\heet1

APPENDIX C

REVIEW AGENDA

Tuesday. June 15, 2004—Research Office Building (Bldg. 048), Quad. Conf. Room

8:00 am	DOE Executive Session	Lehman
9:00 am	Welcome and Laboratory Overview	Dorfan
10:15 am	Break	
10:30 am	Physics and Experimental Program Overview	Drell
11:00 am	BaBAR	TBD
11:30 am	Computing Operations and Support	Mount
12:00 pm	Lunch	
1:00 pm	Technical Division Organization and Operations (Including Accelerator R&D)	Paterson
1:45 pm	B-Factory Operations and Plan	Seeman
2:15 pm	Infrastructure Support	Loew
2:45 pm	ES&H	Boczek
3:15 pm	Break	
3:30 pm	Administration	Jobe
4:00 pm	Summary	Dorfan
4:30 pm	Breakout Sessions	
5:00 pm	DOE Executive Session	
6:30 pm	Adjourn	

Wednesday, June 16, 2004

8:30 am	Breakout Sessions
12:00 pm	Lunch
1:00 pm	Breakout Sessions
2:30 pm	Subcommittee Executive Session
3:30 pm	DOE Executive Session

Thursday. June 17, 2004

8:00 am	Subcommittee Working Sessions
10:30 am	DOE Full Committee Executive Session Dry Run
12:00 pm	Lunch
1:00 pm	DOE Summary and Closeout with Laboratory Management
2:00 pm	Adjourn

APPENDIX D

FUNDING TABLE

STANFORD LINEAR ACCELERATOR CENTER

Funding Profile FY 2004-2009*

Table 3A: HEP Financial Planning Profile (K$) - Approx. 2% Increase in Budget Per Year

		FY04	FY05	FY06	FY07
B-Factory	Accelerator Operations [1]	47,892	54,016	55,921	61,153
	Accelerator Improvements	5,639	4,976	4,976	4,976
	BaBar Operations, Computing & Physics	18,347	19,021	19,177	19,530
	BaBar Detector & Computing Improvements	5,143	4,198	5,163	4,791
Others	Non-Accelerator Physics	13,969	17,203	16,526	16,868
	Theory	2,396	2,633	2,665	2,739
	Linear Collider	15,050	11,283	11,490	11,730
	Future Accelerator R&D	6,568	5,266	5,261	5,347
	Experimental Beams	2,885	2,728	2,274	2,234
	Astro Beam Studies	910	799	791	784
Direct Support		19,401	18,014	18,235	17,785
Indirect Support [1]		35,002	34,727	35,884	34,714
Total		173,202	174,865	178,362	182,651
Running Weeks Per Year		41	32	30	41

Note 1: Beginning in FY05, electrical power costs will be significantly higher than FY04 (approx. $7M in FY05 to approx. $1
to the expiration of a favorable agreement that WAPA has with PG&E for the supply of power at cost.

*Funding Profile is based on FY2005 President's Request (including an additional $6M in FY 20(
projected 2% annual increase

APPENDIX E

MANAGEMENT TABLE

STANFORD LINEAR ACCELERATOR CNTER ORGANIZATION

DIRECTOR
J. Dorfan

DEPUTY DIRECTOR
G. Loew

DIRECTOR OF THE SLAC OFFICE FOR COMMUNICATIONS
N. Calder

HUMAN RESOURCES DIRECTOR
L. Lyon

RADIATION SAFETY OFFICER
S. Rokni

ASSISTANT TO THE DIRECTOR FOR ADMINISTRATION
E. Mitchell

AFFIRMATIVE ACTION OFFICE
S. Gee

HEAD, ES&H COORDINATING COUNCIL
K. Kase

TECHNICAL DIVISION

ASSOCIATE DIRECTOR
J. Paterson

ASSISTANT DIRECTORS
D. Burke
R. Larsen
J. Seeman

RESEARCH DIVISION

ASSOCIATE DIRECTOR
P. Drell

DEPUTY ASSOCIATE DIRECTOR
S. Williams

ASSISTANT DIRECTOR
C. Chang
S. Kahn
L. Klaisner
R. Mount

SSRL DIVISION

ASSOCIATE DIRECTOI
K. Hodgson

DEPUTY ASSOCIATE DIRECTOR
J. Stöhr

ASSISTANT DIRECTOR
D. Dungan
J. Galayda
J. Hastings
B. Hedman
R. Hettel
P. Pianetta

BUSINESS SERVICES DIVISION

ASSOCIATE DIRECTOR
J. Jobe

ASSISTANT DIRECTORS
M. Chang
D. Kreitz

STAFF COUNSEL
R. Claus