U.S. DEPARTMENT OF ENERGY

REVISITING THE OFFICE OF SCIENCE LABORATORY APPRAISAL PROCESS

DECEMBER 2004

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December 2004

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Version 1.1

EXECUTIVE SUMMARY

The Department of Energy's Office of Science is steward to ten federally funded research and development centers (FFRDCs), commonly called "national laboratories[1]." Since their establishment, these internationally preeminent research institutions have made unique and often critical contributions to the Nation's national, energy and economic security while also serving as home to many world-class scientific facilities that support fundamental research across scientific disciplines in the U.S.

The DOE national laboratories exist in a somewhat unique management environment. They are owned by the federal government but operated in the public interest by contractors. Stated at its simplest, it is the role of the DOE to determine *what* the laboratories should be doing and the responsibility of the laboratories and their contractors to determine *how* to meet these goals. However, the use of public funds, federal ownership, and a body of regulatory law necessarily creates a complex system of shared responsibilities. In some instances DOE Orders still dictate how an activity must be performed at a laboratory. In others areas it is insufficient to know only that the laboratory has met its goals in the past; DOE must also assure itself that a laboratory has robust systems in place so that it has reasonable confidence in the laboratory's future performance. Thus, the laboratory appraisal process must address performance in the context of a complicated set of responsibilities. Its overriding purpose should be to optimize the relationship between the DOE and its laboratories and thus enhance the ability of the laboratories to accomplish their scientific and technological missions and contribute significantly to the Nation.

The Office of Science, through its Site Offices, annually negotiates with the relevant management and operating (M&O) contractor performance measures appropriate to each laboratory. These measures form the basis of the agreement (as an appendix to the contract) between the DOE and the contractor regarding how to assess the laboratory's performance on a year-to-year basis. Progress against these measures is assessed in a variety of ways during the course of the year. A summary assessment is performed at year-end, resulting in a formal appraisal report and a numerical score that is translated into an adjectival rating of either outstanding, excellent, good, marginal, or unsatisfactory. In some but not all instances this rating affects the fee paid to the M&O contractor.

Over the years, aspects of this process and its results have been the target of criticisms[2]. These can be summarized briefly as follows:

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[1] They are: Ames Laboratory, Argonne National Laboratory, Brookhaven National Laboratory, Fermi National Accelerator Laboratory, Lawrence Berkeley National Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, Princeton Plasma Physics Laboratory, Stanford Linear Accelerator Laboratory and the Thomas Jefferson National Accelerator Facility.

[2] See Alternative Futures of the Department of Energy National Laboratories, Secretary of Energy Advisory Board, Galvin Task Force, February 1995; Blue Ribbon Commission on the Use of Competitive Procedures for Department of Energy Laboratories, November 2003, etc.

1. The *process* used to assess a laboratory's performance is not sufficiently objective. Specifically, that the Site Offices' performance is too closely tied to the performance of their laboratory to ensure credible evaluations.

2. The laboratories' overall performance *scores* are consistently too high and thus invite questions about the objectivity of the process. In addition, an individual laboratory's performance scores may be noticeably inconsistent with the specifics of the laboratory's performance in a given year.

3. Year-end appraisal reports lack both consistency across laboratories and granularity (only two scores are reported). The appraisals do not provide adequate information for making extend/compete decisions with respect to the M&O contractor.

4. Simple, effective, *incentives* are needed to motivate the contractor toward desired patterns of behavior with respect to the management of the laboratory.

5. *Excess bureaucracy* related to DOE's management of the laboratories continues.

To better understand and address these concerns, the Office of Science undertook an internal analysis of its laboratory appraisal process. The results are presented in the following pages, and culminate in a series of ten recommendations.

The first three recommendations suggest revisions to the performance appraisal measures used to assess the contractor's performance to make them more pertinent to what is most important with respect to mission accomplishment and operational excellence, to highlight the value-added provided by the contractor, and to bring a common structure and scoring system to the SC appraisal process across all ten of its laboratories.

The next five recommendations have to do with the process SC uses to conduct and report the appraisals. Suggestions include assessing the laboratories at one annual meeting to add additional rigor to the process, adopting a report card approach rather than just reporting scores for operations and science and technology (as is done currently), dispensing with the use of the uninformative adjectival scores and reporting on a four-point rating system instead, and making the scores public on the SC web site.

The last two recommendations suggest ways to better tailor performance incentives to the type of contractor (i.e. contractors who receive fee and contractors who don't), and to make the appraisal scores more sensitive to variations in performance.

INTRODUCTION

The Department of Energy's Office of Science is steward to ten federally funded research and development centers (FFRDCs), commonly called "national laboratories[3]." Since their establishment, these internationally preeminent research institutions have made unique and often critical contributions to the Nation's national, energy and economic security while also serving as home to many world-class scientific facilities that support fundamental research across scientific disciplines in the U.S.

The DOE national laboratories exist in a somewhat unique management environment. They are owned by the federal government but operated in the public interest by contractors. Stated at its simplest, it is the role of the DOE to determine *what* the laboratories should be doing and the responsibility of the laboratories and their contractors to determine *how* to meet these goals. However, the use of public funds, federal ownership, and a body of regulatory law necessarily creates a complex system of shared responsibilities. In some instances DOE Orders still dictate how an activity must be performed at a laboratory. In others areas it is insufficient to know only that the laboratory has met its goals in the past; DOE must also assure itself that a laboratory has robust systems in place so that it has reasonable confidence in the laboratory's future performance. Thus, the laboratory appraisal process must address performance in the context of a complicated set of responsibilities. Its overriding purpose should be to optimize the relationship between the DOE and its laboratories and thus enhance the ability of the laboratories to accomplish their scientific and technological missions and contribute significantly to the Nation.

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Over the years, aspects of this process and its results have been the target of criticisms[4]. These can be summarized briefly as follows:

1. The *process* used to assess a laboratory's performance is not sufficiently objective. Specifically, that the Site Offices' performance is too closely tied to the performance of their laboratory to ensure credible evaluations.

2. The laboratories' overall performance *scores* are consistently too high and thus invite questions about the objectivity of the process. In addition, an individual laboratory's performance scores may be noticeably inconsistent with the specifics of the laboratory's performance in a given year.

3. Year-end appraisal reports lack both consistency across laboratories and granularity (only two scores are reported). The appraisals do not provide adequate information for making extend/compete decisions with respect to the M&O contractor.

4. Simple, effective, *incentives* are needed to motivate the contractor toward desired patterns of behavior with respect to the management of the laboratory.

5. *Excess bureaucracy* related to DOE's management of the laboratories continues.

To better understand and address these concerns, the Office of Science undertook an internal analysis of its laboratory appraisal process. The results, along with a variety of suggestions for altering and improving the process are presented in the following pages. It is important to note that this study focused on the process used to complete the appraisals, rather than the specific measures or weightings of measures used to score the laboratories. However, because the measures are central to the appraisal process some discussion of measures was necessary and a straw set of categories for the measures is provided in Appendix A. The individual measures on this list are offered for illustration only, and do not reflect a recommendation of this report. The Office of Science is currently establishing two teams to determine the most appropriate measures and categories of measures for the laboratory appraisal process.

GUIDING PRINCIPLES

Two guiding principles were used in conducting this analysis and crafting the associated recommendations:

First, revisions to the laboratory appraisal process should keep the process focused on its specific purpose, which is:

[4] See Alternative Futures of the Department of Energy National Laboratories, Secretary of Energy Advisory Board, Galvin Task Force, February 1995; Blue Ribbon Commission on the Use of Competitive Procedures for Department of Energy Laboratories, November 2003, etc.

- To enhance the laboratory's ability to accomplish its scientific and technological missions and contribute to the Nation;

- To encourage the contractor (i.e. provide incentives) to improve and maintain the vitality of the laboratory;

- To assure that DOE is providing proper stewardship of a public asset and public funds;

- To assess the performance of the M&O contractor in managing the laboratory; and thereby

- To obtain the information necessary to inform contract extend/compete decisions.

Second, because concerns about the complexity and effectiveness of the performance appraisal process are well founded, changes to the laboratory appraisal process should simplify the process while ensuring that it is transparent, effective and fair. Both the Office of Science and its laboratories will be stronger for being able to explain clearly how SC evaluates its M&O contractors and how we are working together to continually improve the Nation's national laboratories.

CREDIBILITY OF THE LABORATORY APPRAISAL PROCESS

THE CONCERN

Some believe that the Office of Science Site Offices may not always be able to assess objectively the laboratories they oversee because their interests lie as much or more with the laboratory as they do with DOE headquarters. This "credibility problem" was recently articulated succinctly by the Blue Ribbon Commission[5]:

> *"Employees at the Operations and Site Offices develop close associations with laboratory personnel and the laboratory. Frequently they remain at the site for a long period of time. As noted below, a rating by one of these employees can be viewed as a self-rating and thus puts that person in a challenging circumstance. Such a person may not have the broader perspective necessary to assign objective ratings to a laboratory relative to work performed across the system."*

ANALYSIS AND RECOMMENDATIONS

Site Offices are responsible for developing annual performance plans and for preparing the year-end appraisals of each laboratory; SC headquarters is responsible for providing input

[5] From "Competing the Management and Operations Contracts for the Department of Energy's National Laboratories," November 2003, by the Blue Ribbon Commission on the Use of Competitive Procedures for Department of Energy Laboratories.

and for reviewing and approving the plans and appraisals. After the close of each fiscal year, the site offices prepare the formal performance evaluation of the laboratory for that year. The appraisals focus on two areas: the laboratory's scientific research and technological development (S&T), and everything else, lumped under the term, "operations." The two areas are evaluated in parallel by somewhat different processes.

Assessing S&T. Headquarters SC program managers determine their S&T goals consistent with their program's mission and then assess the laboratory's performance against this mission using four criteria: 1) S&T quality, 2) relevance to mission, 3) construction and operation of facilities, and 4) the effectiveness and efficiency of the research management. Their evaluation is based on a review of noteworthy scientific accomplishments, scores on independent peer and program reviews conducted by SC Programs, recognition by the scientific community as indicated through citations and publications in peer-reviewed journals, and their own judgment. Some laboratories provide a self-assessment of their S&T performance. These are passed to the Programs to consider as they make their evaluations. The S&T scores and comments from each SC program are collected at headquarters; scores are weighted according to the amount of funding each office supplies, and an overall score and comment summary is provided by SC Headquarters to the Site Office. Other DOE program offices (e.g., Fossil Energy, the National Nuclear Security Administration) and other government agencies are also solicited for input regarding the S&T performance of programs and projects they have funded at the SC laboratories in a similar manner.

A common misperception regarding how the DOE laboratories operate is that they receive funding in "lump sums" from the Department and which the laboratory director may allocate more or less at his discretion. Instead, the laboratory budget and research portfolio is built from the bottom up—it is the aggregate of successful individual proposals to DOE program managers and other funding entities by all the laboratory's principal investigators. Each of these successful proposals addresses a need or research thrust identified and/or approved by DOE for that laboratory and is thus directly relevant to the mission of the Department.

Nevertheless, one of the four measures against which program managers are supposed to evaluate a laboratory's performance is "relevance to mission." With the exception of LDRD funding, the laboratory *can only* perform work as selected by DOE program offices or other customers, so that asking those managers to judge the relevance of the laboratory's work to their programs or to DOE's missions seems at best useless, and at worst a judgment of their own choices. Arguably the laboratory's ability to propose and conduct work of relevance to DOE can be more easily and accurately measured by the numbers of PIs supported and dollars won.

> ► ***Recommendation:*** *To ensure that the S&T assessment is meaningful, SC should reassess and revise the existing S&T measures and eliminate the criteria of "relevance" from the S&T evaluation.*

Little training or communication is provided across SC or within programs to normalize how laboratory S&T success is scored. Each associate director presumably normalizes across their own programs when they approve the scores, and scores do seem consistent across SC program offices. It should be noted that the evaluation of the S&T performance of the laboratories is not perceived to be of concern as compared with evaluation of the laboratories' operational performance. Some of this is due to successful communication of the strong emphasis that the Office of Science laboratories and programs place on external, independent peer review of research quality; some is due to the fact that science programs can be and are readily terminated for poor performance while terminating labs and contractors is a far more difficult and involved process; and some reflects the fact that operational failures on the part of a number of laboratories have been well publicized in the press in recent months.

Assessing Operations. By contrast, the operations portion of the appraisal is developed almost entirely in the field and is based on criteria that differ in number, weighting and subject from laboratory to laboratory. The process usually starts with the laboratory providing the site office with a self-assessment of the laboratory's operations based on the measures in their performance plan. The site office reviews this self-assessment and either agrees or disagrees with their rating. If the site office disagrees, it provides a written justification in its evaluation of the laboratory's performance. The site office's decision is based on knowledge of and participation in the laboratory's self assessment procedures, the results of their own audits and reviews of the laboratory's business and operational systems and activities, the results of independent (e.g. by DOE's Office of Environment, Safety and Health; Environmental Management; Nuclear Energy; Inspector General, and/or the GAO) audits, any major (especially newsworthy) events occurring during the year, and their own judgment.

Despite evidence that the SC site offices exercise oversight and perform reasonable, credible reviews of the laboratories' self-assessments, the perception of bias in the site offices' appraisals continues to weaken the credibility of appraisals.[6] In addition, the lack of appraisal methodologies demonstrably applied consistently across all laboratories limits the SC in its ability to compare the performance of its contractors, encourage healthy competition, and, occasionally, defend them from "knee-jerk" reactions to individual negative events. This last point is critical: laboratories must be judged on their performance over the course of a year or multiple years, not in response to a single event, despite its newsworthiness. The SC has many examples of outstanding laboratory performance, marred at the end of the year by a sensational negative event, the initial reporting of which may or many not prove to be accurate, and followed by great internal political pressure to "set an example" either out of proportion to the transgression or in advance of all the facts. The laboratory appraisal process must be sufficiently robust to evaluate the laboratories fairly, and to provide protection against the vagaries of personality and uninformed opinion.

[6] One suggestion put forward to address this issue is rotation, or "term-limits," for Site Office Managers. While it is the expectation of the Office of Science that Site Office Managers will serve at various site offices to encourage the transfer of new ideas and best practices across the sites and to provide opportunities for career advancement, it is the opinion of the Office that mandatory limits on Site Office Manager tenure is not in the best interests of the Office of Science.

This year SC has initiated a new approach to certain management reviews that has proved enormously valuable. With respect to cyber security, for example, SC assembled a team of knowledgeable individuals from both within SC and other parts of DOE to visit all the SC laboratories to conduct a "peer review" based on common performance criteria of how each laboratory was protecting its information technology assets. This approach is similar to how SC has conducts construction project reviews and evaluates portions of its scientific portfolio. The visits were very successful in identifying weaknesses across the laboratory system, communicating best practices from one laboratory to another, and assuring SC headquarters and the larger DOE community that SC laboratories are providing secure, albeit very different, approaches to cyber security. These "peer reviews" of operational systems suggest a model that SC could and should use more extensively to bring consistency and robustness to how its site offices assess various operational performance areas. Reviews of this type are suggested as a better way to do business; they are not intended and should not be allowed to increase the number of reviews conducted at SC laboratories.

► ***Recommendation:*** *SC should use resources from across SC to staff a function, modeled on the process SC uses to evaluate construction projects (the Lehman reviews) or its scientific portfolios (Committee of Visitors reviews) composed of members from multiple site offices and other independent reviewers visiting laboratories on a rotating or as-needed basis to test laboratory systems and build cross-SC evaluation practice consistency. These reviews would augment Site Office efforts.*

► ***Recommendation:*** *SC should adopt common operational measures, often called "critical outcomes", and scoring systems (but not necessarily weighting systems) across the SC laboratories to enhance clarity and comparison across laboratories. A "straw" structure and common set of measures is provided in Appendix A.*

Value Provided by the Contractor. The government-owned-contractor-operated (GOCO) model for national laboratories was created and is maintained today because of the belief that outstanding research organizations can provide the government with more effective management, operation and stewardship of major research laboratories than would like likely be achieved in a fully federal system. Thus, for purposes of assessing the performance of the contractor and especially for informing extend/compete decisions, it is important to be able to identify the value that the M&O contractor brings to the laboratory and its programs, beyond its on-site management team. Today, this is insufficiently reflected in existing performance measures. The value-added aspect of the managing contractor can take many forms including:

- Assistance in resolving issues affecting laboratory support such as infrastructure improvements and power rates,

- Developing or improving regional or national relationships with industry, universities and state governments to enhance research programs,

- Importing management systems and processes to improve operation of the laboratory,
- Direct investment in laboratory infrastructure, both physical and intellectual, and
- Setting the proper tone and encouraging responsiveness throughout the laboratory in the face of system failures.

> ► ***Recommendation:*** *SC should reassess and revise the existing Operational measures and include more specific measures targeted to address the value that the M&O contractor brings to the laboratory.*

Overall Appraisals. Armed with both the S&T and operations evaluations, the site office calculates the appropriate annual fee award (for those laboratories that receive fees) and prepares a summary briefing paper on the laboratory's performance identifying major accomplishments and significant performance issues, including an overall performance score and adjectival rating: outstanding, excellent, good, marginal, or unsatisfactory. This is sent to the Director of the Office of Science for review and concurrence. Following any changes and approval, the local site office transmits the final written appraisal report and the fee award to the laboratory. For the most part, issues with the appraisal are worked out prior to its arrival on the Director's desk. However, changes both to the wording of the appraisal and scores have been made by the current and past Directors.

The lack of common evaluation scoring systems, appraisal practices, and inconsistent participation by the science programs funding work at the laboratories (both Office of Science and other programs) have hampered the ability to use the laboratory appraisal process as a management tool, and specifically to fully integrate S&T and operations perspectives in the final appraisal. In some cases, an inability to explain sufficiently to a laboratory the rationale behind a given score has also damaged the credibility of the process. A revised process, one that would engage the site offices and science programs in an annual, similarly structured review would be greatly beneficial. It is important that this process provide clarity and transparency both to DOE's top levels of management as well to the laboratories that are being appraised. Furthermore, for the process to be successful it must be able to withstand pressures to insert new considerations and (inadvertently) change at the end of the year the basis for performance evaluation agreed to at the beginning of the year. There must be no ex post facto changing of the rules. A beginning-of-the-year "calibration" review among all the site offices to share insight and the rationales employed for evaluating laboratory performance in different circumstances would also be advantageous.

► ***Recommendation:*** *SC site offices should present their proposed annual performance agreements and final evaluations and ratings of the laboratories for approval by the Director at annual meetings hosted by the Director of the Office of Science. Laboratory reviews at one sitting encourages consistency and fairness across the laboratory system, and will ensure engagement by the Director.*

CREDIBILITY OF THE PERFORMANCE SCORES

THE CONCERN

A serious weakness of the current laboratory appraisal process is the adjectival performance scores earned by the laboratories. As a practical matter there is: 1) concern that the laboratories' scores are consistently too high and thus lack credibility, 2) observation that an individual laboratory's scores may be dramatically inconsistent with common perception of how the laboratory is actually performing, and 3) recognition that the laboratory appraisal does not provide optimum information for making fee and/or extend/compete decisions. Again, to quote the Blue Ribbon Commission:

> *"Although five performance ratings are available (outstanding, excellent, good, fair and poor) only two (outstanding and excellent) are used. It appears that the normal state of affairs is for the laboratories to receive these laudatory ratings. Understandably, based on these ratings, contracts are routinely renewed, with certain notable exceptions, with a sole-source justification. … The performance ratings have on occasion served as an embarrassment for the Secretary when major problems have been uncovered at laboratories that received high marks for both business management and the conduct of scientific research on their annual performance evaluation."*

ANALYSIS AND RECOMMENDATIONS

As discussed previously, each of the laboratories is appraised annually on its S&T and operational performance. Scores for these two areas are developed in a variety of different ways as defined in the annual performance plan negotiated with the M&O contractor each year. The S&T evaluation is fairly simple because the programs that provide funding are asked to provide input against the same four criteria. However, the number and focus of operations measures varies substantially from laboratory to laboratory in keeping with the Site Office's desire to highlight areas for the contractor's attention. In recent years SC has encouraged limiting the number of measures in an effort to put more emphasis on the goals the contractor should meet rather than on the detail of how they should accomplish these operational goals. Nevertheless, further improvement and reduction in the number of measures can be made.

Scoring System. The numeric scores for S&T and Operations are ultimately translated into adjectival scores. Most of the laboratories use a four-point scoring system and make the translation to adjectival rating according to the following formula:[7]

- **Outstanding** (3.5 to 4.0) – significantly exceeds average standards of performance; achieves noteworthy results; accomplishes very difficult tasks in a timely manner.
- **Excellent** (2.5 to 3.49) – exceeds average standards of performance, although there may be room for improvement in some elements; better performance in all other elements more than offsets this.
- **Good** (1.5 to 2.49) – meets average standards of performance; assigned tasks are carried out in an acceptable manner; timely, efficient, and economical; deficiencies do not substantially affect performance.
- **Marginal** (0.5 to 1.49) – below average standard of performance; deficiencies require management attention and corrective action.
- **Unsatisfactory** (0 to 0.49) – significantly below average standard of performance; deficiencies are serious and urgently require senor management attention.

The S&T and operations values are also combined for an "overall rating" in which the science score counts for at least 50 percent of the total. In the past the operations portion of the appraisal counted for more than the science portion—an effort to place greater emphasis on operational problems facing the laboratories. Most recently, however, the science portion of the evaluation has been mandated to count for at least 50 percent of the appraisal, in recognition of the primary mission of the laboratories to produce valuable science and technology.[8] The challenges of effectively balancing incentives for S&T and operations are discussed later in this paper.

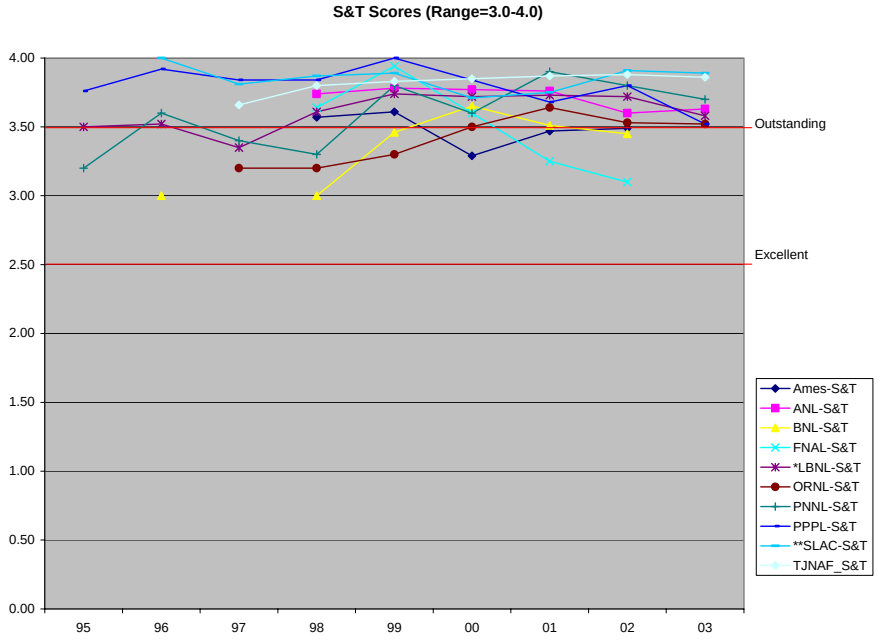
A review of SC laboratory appraisal scores since 1995 yields a few observations: The laboratories typically score higher and vary more narrowly in their S&T scores (range 3.0 to 4.0) than they do in their operations scores (range 0.9 to 4.0) although only two laboratories over three years accounts for most of this variation. There is no obvious indication of grade inflation over the eight years that records have been kept. Both operations and S&T scores viewed over time do seem to track well with SC's informal perceptions of how the laboratories are performing. This is important because it means that SC is, at least, using its measures consistently from year-to-year, and that these measures do seem to be capturing what SC management feels is laboratory performance. It suggests that if SC reported S&T and Operation measures individually with a little more granularity, and numerically as is suggested later in the report, the scores would show a far greater range of variability than the overall adjectival scores used currently.

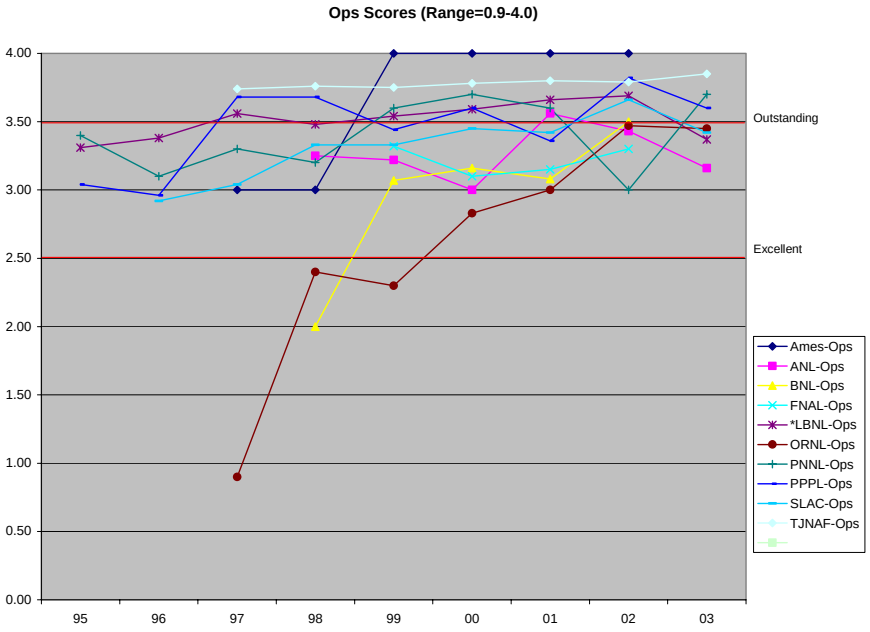
Because of the large number of operations measures, which include everything from safety and security to business management systems (e.g., property control and financial

[7] Not all site offices calculate the scores the same way, or set the same numerical thresholds for outstanding, excellent, etc.

[8] Recent indications from DOE's Procurement Office suggest that the pendulum is swinging back and that they will recommend that the operations scores be given greater impact again.

management), a laboratory can perform very poorly (get a zero) in one area but because that area only counts for a very small percentage of the overall grade, the effect is all but non-existent in the final score. This, and the fact that S&T performance accounts for the majority of the overall score, explains how laboratories can have very high overall scores and their performance can be rated as "excellent" for example, even in the face of a major operational issue.





When this occurs, the SC Director may choose to use the "conditional payment of fee clause" to penalize the laboratory in a way that is commensurate with the perception of the severity of the issue. While field managers have occasionally used this clause, SC Headquarters has been somewhat hesitant because its application is viewed as arbitrary and has therefore reserved its use for very major transgressions. Although personal judgment—the judgment of the site offices, the scientific programs, SC headquarters and the Director of the Office—is rightfully a crucial part of the evaluation process, the Office of Science should not rely on a unilateral reduction approach such as the "conditional payment of fee clause" as a primary or even customary method for determining a final performance score or fee determination.

The adjectival scores are problematic not only because they create such a mismatch between expectation and reality (most people's connotation of "excellent" operations does not leave room for major operation difficulties) but because they are fundamentally uninformative—too blunt a description of laboratory performance to help inform contract extend/compete decisions.

► ***Recommendation:*** *SC should dispense with the adjectival scores in their entirety and rely on a numerical four-point rating system.*

► ***Recommendation:*** *SC should adopt a report card approach, measuring the laboratory against a handful of criteria (e.g., S&T/mission accomplishment, safety, security, business systems, laboratory leadership/management and value-added provided by the contractor), rather than a two-part and overall scoring system. A notional report card is provided in Appendix B.*

All of the laboratories are challenged each year to provide exceptional performance. In the S&T arena, competition among the laboratories and with universities for funding generates pressure to be among the best in the country, if not the world. Operational performance, however, lacks a similar competition. To the extent that such pressure on operations has existed it has often been defined as the desire for "continuous improvement," with a typical goal being "X% better than last year." This is now changing with the adoption of some national standards, for example benchmarking SC safety performance against Standard Industrial Classification 873 companies. Nevertheless, the use of comparisons and competition with respect to operational performance are unused incentives in the SC toolbox.

Two additional ideas for increasing competition among M&O contractors have been considered. First, those not in the scientific field underestimate the extent to which reputation and the esteem of peers drive the performance of the scientists who constitute the largest proportion of the employees and management of the laboratories. Receiving any rating short of "outstanding" in science has been a source of great embarrassment to the laboratories, and is among the reasons that these ratings have not been made easily available to the public. Annual, side-by-side, publication by DOE of laboratory performance scores

and rankings, especially in operational areas, would be a fairly simple way to incentivize performance.

A second and far more radical approach considered as part of this review is the idea of assessing and rewarding laboratory operational performance not just against the laboratory's own goals, but against the performance of all the other laboratories. Arguably, part of what keeps the laboratories at the top of their respective scientific fields is the fact that they compete with each other for science program dollars. No such competitive pressure exists with respect to operational performance. However, SC could choose to determine a laboratory's operational score in whole or in part by how it performs in relation to the other laboratories. This approach, however, has its disadvantages. SC is not able to assess each laboratory's operational performance as compared to its sisters with enough precision to justify rank-ordering. Furthermore, this much competition could increase the risk that operational failures will not be reported, rather than encourage solutions to underlying operational deficiencies.

Integrating the Scores. Another fundamental problem with SC's laboratory appraisal process is the difficulty of balancing or "integrating" operational performance with that of science. From the management perspective, integrating S&T and Operations perspectives on performance should be accomplished by integrating the perspectives in a process that requires participation by both science program managers and site offices in setting the performance goals and assessing success. The Office of Science considers outstanding operations essential for successful laboratory performance, irrespective of S&T performance. Accordingly, the current appraisal process, wherein an increase in the total points a laboratory can receive for S&T performance has the direct effect of reducing the amount of impact of low scores in operations, is unsatisfactory.

One potential solution to this dilemma (implemented by PNNL in 2003) involves imbedding operational measures in the S&T measures so that any operational deficiencies necessarily result in lower S&T performance scores. The advantage of this approach is that it reflects in the appraisal system the philosophy that a laboratory cannot perform good science if it is not performing safe, secure, etc., science. The disadvantage is that it becomes very difficult to identify and communicate clearly the laboratory's strengths and weaknesses as illustrated in its performance appraisal.

The alternative solution, recommended here, is to use the report card approach to describe the laboratory's performance in key areas, and *not to integrate the scores* in an overall score except for the purpose of calculating fee or other performance awards. When integration of scores is necessary (to calculate fee, for example) SC should use a "gateway model" that would use the S&T score to determine the maximum fee within the total available fee set by the contract, and then use the Operational score to determine how much of the maximum fee is actually awarded. This model is discussed in more detail in the following section on aligning performance incentives.

► ***Recommendation:*** *Make public an annual laboratory appraisal report that provides the scores of all SC laboratories in one place, for example on the SC website.*

► ***Recommendation:*** *Adopt a "gateway model" to integrate S&T and operational performance in the calculation of performance incentive fees for the contractors that are awarded fee.*

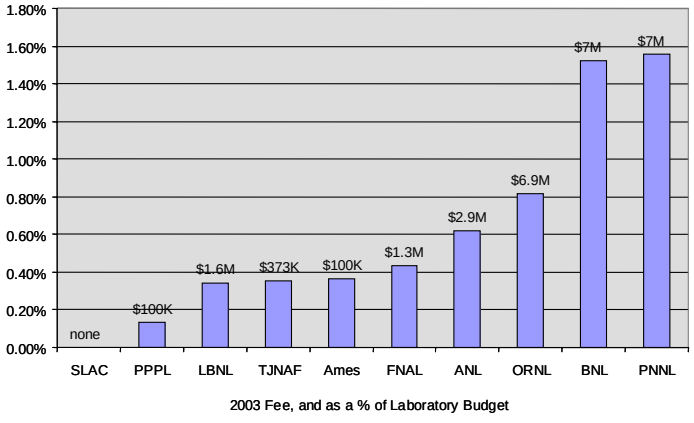
ALIGNMENT OF INCENTIVES

THE CONCERN

DOE and the Office of Science are perceived to have inadequate tools (incentives and disincentives) to motivate the laboratory M&O contractors toward desired behaviors. The Blue Ribbon Commission addresses this issue and frames it as the "ineffectiveness" of incentives, pointing out that the small fees enjoyed by many of the laboratory contractors, particularly the university contractors, "provide little motivation to the contractor." They also mention other possible incentives, such as no-bid extensions of the contract and the prestige of operating a national laboratory. They do not provide any specific recommendations, but seem to suggest that stronger incentives would be useful.

ANALYSIS AND RECOMMENDATIONS

Not all the M&O contractors that operate Office of Science laboratories receive a fee for their services. Initially, few of the contractors received more than a nominal fee for operating these laboratories. Rather, contractors such as Stanford University, the University of Chicago, and the University of California served as managing contractors because the scientific capabilities at the laboratories were a good match for the scientific skills and interests of their own faculty and students, and because it was a service they could provide for the Nation (most laboratories were established during or subsequent to World War II.) More recently, DOE and some of the M&O contractors have encouraged larger fees for managing laboratories, bringing a more "private sector" as opposed to "university" philosophy to the endeavor. The result: the Office of Science has a wide range of management models in their M&O contracts. Incentives that may work at one laboratory may not work at another laboratory.



Fee-based incentives. The Department provides fee to its contractors for several reasons. A comparison to other DOE fee-award contracts is illuminating. The Department most

typically uses fee to incentivize large, very-risky clean up contracts such as Hanford in Washington State or Rocky Flats in Colorado or Mound in Ohio. In these contracts the fee typically runs at least 7-9 percent and often up to 14 percent, the work is far riskier for the contractor than for the government (no one knows for sure at the outset of the effort what will be found at the specific site, so the contractor does not know, in effect, what they are signing up for), and is fairly straight-forward operational work with a definable end-state. The risk to the government is relatively small—if the contractor fails, the situation is unlikely to be worse than it was at the outset. For these scenarios it makes sense to pay the contractor an incentive fee to get the job done as fast as possible, and it is worth setting aside enough money for the fee to give the incentive teeth.

By contrast, operating a national laboratory has no definable end-state and offers very little risk to the contractor because the contractor is unlikely to meet with any surprises unforeseen in the contract, and is indemnified against the most serious operational risks. Relatively more risk rests with the government because failure by the contractor can easily leave the laboratory and thus the public good worse off than before.

Government contracting guidelines suggest that fee-for-performance contracts are most appropriate in situations in which the contractor is bearing the larger portion of the risk. By contrast, fixed-fee contracts are most appropriate when the risk to the contractor is low, and the risk to the government is relatively high. By this argument, it would make sense to translate the SC existing fee-bearing contracts into fixed-fee contracts (with smaller fees) and remove fee entirely from the incentive system. And, in fact, a review of past fee reductions at SC laboratories shows that with three exceptions[9] all laboratories have received between 97% and 100% of their fee each year—making them effectively fixed fee contracts. It seems that the Office of Science uses fee not so much as a performance incentive, but rather as an incentive to attract some types of contractors who might otherwise not be interested (e.g. Battelle or Lockheed Martin) to bid to be M&O contractors of its laboratories. This type of incentive is important to maintain.

The strongest argument against the use of fee as it is currently configured as a performance incentive is the fact that the contractor's fee is generated from the laboratory's indirect funds (laboratory overhead). A small portion of each dollar that comes into the laboratory from the hundreds of individually funded projects and programs is collected in an overhead account from which fee is paid the contractor each month based on best estimates of what the total laboratory revenue will tally at the end of the Fiscal Year. If the contractor is awarded less than the maximum allowable fee, some monies are returned to the overhead account. The laboratory's overhead rate is adjusted downward and more funds are then available for research and infrastructure. This presents the laboratory director with a fundamental conflict: if the laboratory is graded as doing well, the contractor fee is larger and thus reduces the funds in the overhead account that can be used to address the laboratory's operations, infrastructure and scientific programs. If the laboratory is appraised as doing

[9] The three exceptions: a 12 percent fee reduction at LBNL in 2002 for financial mismanagement, a 5 percent reduction at PNNL in 2002 for financial mismanagement, and a 5 percent reduction at BNL in 2002 for assorted reasons.

poorly, more funds are available to the laboratory director to use to strengthen the laboratory and do research. It is a zero-sum game and a very poorly aligned incentive.

Fee-based incentives have a number of weaknesses beyond the fact that not all laboratories receive fee. Even for the labs that are awarded fee, the fee for operating SC laboratories is arguably too low (1-1.6% of total budget) to make much difference in most cases, a point made by the Blue Ribbon Commission. It is not evident that increasing the fee by a few million dollars, for example, would provide much in terms of increased performance by the contractor (some SC contractors return all the fee they are awarded to the laboratory they operate), but would necessarily increase the expense to the taxpayer and, in all likelihood, would decrease the funds available for research because Congress is unlikely to increase its appropriations for research to cover the increase in fee.

In addition, reductions in fee for less than perfect performance can be too small to catch the contractor's attention. Currently, for example, the difference between an "outstanding" and an "excellent" rating (the largest difference we see under the current system) at Argonne National Laboratory counts for $308,000.00, or 10%, of a potential $3.08 million in fee for the University of Chicago.

A variety of methods for increasing the sensitivity of the fee to the operational performance of the laboratory were considered. A threshold model in which failure to achieve minimum acceptable levels of performance in a small number of key programmatic or operational areas would result in negative adjustment to the composite score and fee was rejected because it perpetuates the problems created when operational and S&T scores are additive. In addition, there was concern that this approach, which would rely heavily on the Department and the SC Director to make unilateral adjustments to scores and fees, would exacerbate the year-to-year fluctuations in how to appraise the laboratories, make the process more sensitive to "single event" pressures, and increase the tendency to game the system around the scoring of these thresholds.

Another option, a gateway model for calculating fee as suggested on page 12 of this report, would allow the S&T score to determine the maximum fee earnable within the total available fee set by the contract, and would then use the Operational score to determine the final amount to be awarded. In 2002 Oak Ridge National Laboratory (ORNL) scored 3.53 (out of 4.00) for S&T and 3.47 (out of 4.0) for Operations. The M&O contractor was awarded 97 percent of the available fee. In 2001 ORNL scored 3.64 and 3.00 for S&T and Operations respectively, also winning 97 percent of the fee. In the table below a sample of actual S&T and Operations scores achieved by laboratories in the past have been translated for use this way—Operations scores are expressed as a number between zero and 1.0 and S&T score are expressed as a number between zero and 100. When multiplied, they represent a percentage of the total fee that could have been earned. Using this approach, fees awarded to M&O contractors would have been substantially lower: In 2002 ORNL would have received 77 percent of their fee, and in 2001 they would have received 68 percent of their fee as opposed to the 97 percent they did receive. In 1997 the M&O contractor would have received only 18 percent of the fee.

				Current Formula				Gateway Model		
	S&T Score	Ops Score	Available Fee	Fee % Won	Fee Awarded	S&T Value (calculated out of 100)	Ops Value (calculated out of 1.0)	% Fee Awarded	Fee Awarded	Lost $$
ORNL 2002	3.53	3.47	6,860,000	97	$6,654,000	88.25	0.87	77	$5,251,802	$1,608,198
ORNL 2001	3.64	3.00	6,860,000	97	$6,654,000	91.00	0.75	68	$4,681,950	$2,178,050
ORNL 1997	3.20	0.90	6,925,000	100	$6,925,000	80.00	0.23	18	$1,246,500	$5,678,500
PPPL 2002	3.82	3.80	100,000	100	$100,000	95.50	0.95	91	$90,725	$9,275
LBNL 2002	3.72	3.69	1,600,000	99	$1,577,000	93.00	0.92	86	$1,372,680	$227,320

Such extreme fee sensitivity to performance may be excessive; DOE and the Office of Science are interested in attracting a wide variety of contractors for the management of the national laboratories and putting this much fee at risk might hamper that goal. This, and the desire to remove the incentive fee from the overhead account argues strongly for a *modified gateway approach* to awarding fee that would combine a fixed fee portion collected from overhead with an incentive fee that is both directly funded, and far more sensitive to fluctuations in performance. Such a fee would preserve the interests of the contractor, make some portion of the fee genuinely at risk and more clearly reflective of the contractor's performance, and create a dynamic in which the laboratory director and contractor's best interests are consonant, not conflicting.

Contract extension (award-term) incentives. The ability to avoid the expense and turmoil of re-competing for an M&O contract is a great incentive to all M&O contractors—estimates suggest that it costs a contractor $2-3 million to engage in a competition—and was the subject of one of the major Blue Ribbon Commission recommendations. While some specifics of the BRC recommendation outlining a five-step process for awarding contract extensions may be problematic, the over-all idea that contractors would "win" additional years on their contract for superior performance up to some maximum (the BRC recommends 20 years) holds great promise because it affects fee-bearing and non-fee bearing contractors alike, because it represents a significant incentive, and because it can be exercised at little or no additional cost to the tax-payer.

In 2004 Sandia National Laboratories included an award term incentive (as well as incentives for fixed-fee work and at-risk fee work) in its newly negotiated "model contract" by which the laboratory contractor can earn additional years on the contract one year at a time through outstanding performance, and can also lose years on the contract for unsatisfactory performance. This was a "first of its kind" approach in any DOE or NNSA contract, although it has been used in the past by the Department of Defense. A similar approach with different details was suggested, although not adopted, as part of the Pacific Northwest National Laboratory contract extension in 2003.

The strength of award-term as an incentive depends on the likelihood that a real competition to manage and operate a given laboratory would occur. Some argue that contracts for laboratories that are co-located on M&O contractor property, as is true at some universities and at Pacific Northwest National Laboratory for example, are unlikely to be sought after by other M&O contractors. However studies of this question have made compelling arguments

that competition and the issuance of contracts to new M&O contractors would be far less problematic than might be first thought.[10]

Research Funding Incentives. The SC laboratories are, first and foremost, research institutions with outstanding scientific reputations. For those working at the laboratories or considering joining the laboratory staff, the greatest motivators are the ability to work at forefront of their field, peer recognition, the quality of their colleagues, and the quality of the facilities available to them.

The ability to provide more dollars for research and equipment would be a powerful incentive for both fee-based and non fee-based contractors. Currently, however, with the exception of Laboratory Directed Research and Development (LDRD) funds which vary by laboratory but run approximately 2-4 percent of the SC laboratories' budgets, neither the M&O contractors nor SC has any ability to reward performance in this way due to legal prohibitions on mingling funds from different programs and on spending funds from one program on research in another area, as would be done, for example, if funds from the Biological and Environmental Research Program were mingled and then awarded to the Princeton Plasma Physics Laboratory. Furthermore, each HQ Science program allocates funds, as appropriated by Congress for their program, to the laboratories based on who can do the best science, not who has the best safety record or financial management system. The ability to develop a new pool of funds that could be used to reward performance by taxing the science programs would require Congressional approval and would likely be very susceptible to direct pressure from Congress in the event of single noteworthy events at laboratories.

Increasing (or decreasing) LDRD—the only research funds under the control of the laboratory director—is often considered as a possible incentive and punishment, but has a similar drawback to increasing or decreasing fee: LDRD is funded from overhead; increasing LDRD funds drives up the overhead rate and decreases the competitiveness of the laboratory without increasing the total dollars available to do research. Decreasing LDRD funds, while a punishment to the contractor, also hurts the laboratory's ability to stay strong and well-positioned for the future and thus ultimately hurts the tax-payers' investment.

Thus, although it seems clear that the ability to award additional research funds for desired performance would be among the strongest possible incentives for improved laboratory performance, it is unclear how to put such a system in practice effectively.

Construction and Infrastructure Funding Incentives. Construction and infrastructure dollars also are designated by Congress and cannot easily be converted from one to the other or into research dollars. Because there is a significant backlog of infrastructure projects at all the laboratories, SC has developed a rigorous system for prioritizing needs. Taking funds away from high priority needs in order to award high-performing laboratories is a possibility,

[10] For example, see *Recommendation for Noncompetitive Extension of the Pacific Northwest National Laboratory Contract DE-AC06-76RL01830*, U.S. Department of Energy, Richland Operations Office, January 2001.

but one with obvious drawbacks. Construction project funds are determined by the needs of the project—additional funds would not be appropriate as a reward.

Executive Bonus Pool. A financial incentive that would affect both fee receiving and non-fee-receiving laboratories is the executive bonus pool. In addition to salary, DOE sets aside at some of its laboratories funds for an executive bonus program that the laboratory director may use to reward outstanding performance among his top managers. Making this pool of funds sensitive to performance using a formula similar to the gateway model described earlier has a number of advantages: it demonstrates the importance of line responsibility for good performance, it is not lost in a large fee pool, if done properly it creates substantial peer pressure for top performance, and it does not hamper the laboratory in its ability to pursue its goals.

It is unlikely that this would provide any performance incentive, for example on the safety behavior of rank-and-file scientists and other employees. Office of Science Associate Directors have considered reducing the funding to individual principle investigators as a management tool/incentive/punishment, but decided that this would constitute micromanagement of the laboratory and that such actions are most appropriately decided by and taken by the laboratory's senior management. It is the Office of Science's responsibility to provide incentives to the contractor and senior laboratory management and leave incentives/punishments for the rank and file to the laboratory management and the contractor.

Importance of Tailoring Incentives. Because the Office of Science has a wide variety of management models reflected in its M&O contracts it is very clear that effective use of performance incentives will require tailoring these incentives carefully to each laboratory-contractor situation. The use of award-term (additional years on the contract for good performance) is the most underutilized and perhaps the most effective incentive SC can bring more fully to bear on its M&O contracts. Additionally, SC should explore ways to balance incentives, for example offering contractors the choice of fee or award-term, or levels of each, as the contracts are negotiated.

► ***Recommendation:*** *Use a variety of incentives tailored to each type of contractor, specifically including increased use of award term and executive bonus pools, to encourage good performance and punish poor performance by SC M&O contractors. Investigate ways to offer balanced incentives as the contracts are negotiated.*

► ***Recommendation:*** *Change the method for calculating fee from an "additive model" in which operational performance is a minority percentage of the overall score to a "gateway model" in which the S&T score sets the maximum winnable fee within the total available fee defined by the contract, and the Operational score determines how much fee is actually awarded.*

CONCLUSIONS AND SUMMARY RECOMMENDATIONS

A summary list of the recommendations presented in this report follows:

1. To ensure that the S&T assessment is meaningful, reassess and revise the existing S&T measures and eliminate the criteria of "relevance" from the S&T evaluation.

2. Use resources from across SC to staff an operational systems review function, modeled on the process SC uses to evaluate construction projects (the Lehman reviews) or its scientific portfolios (Committee of Visitors reviews) and composed of members of multiple site offices and other independent reviewers to visit laboratories on a rotating or as-needed basis to test laboratory systems and build cross-SC consistency in evaluation practices. These reviews would augment Site Office review.

3. Reassess and revise the existing Operational measures and include more specific measures targeted to address the value that the M&O contractor brings to the laboratory.

4. Adopt common operational measures, often called "critical outcomes", and scoring systems (but not necessarily weighting systems) across the SC laboratories to enhance clarity and comparison across laboratories. A "straw" structure and common set of measures is provided in Appendix A.

5. SC site offices should present their proposed performance plans and final evaluations/ratings of the laboratories for approval by the Director at one annual meeting. Allowing the laboratories to be reviewed in one sitting will encourage comparability and fairness across all laboratories, and will ensure the engagement of the Director.

6. Dispense with the adjectival scores in their entirety and rely on a numerical four-point rating system.

7. Adopt a report card approach, measuring the laboratory against a handful of criteria (e.g., S&T, safety, security, business systems, laboratory leadership/management and other value-added provided by the contractor) rather than a two-part and overall scoring system.

8. Make public an annual laboratory appraisal report that provides the scores of all SC laboratories in one place, for example the SC website.

9. Adopt a "gateway model" to integrate S&T and operational performance in the calculation of performance incentive fees for the contractors that are awarded fee.

10. Use a variety of incentives tailored to each type of contractor, specifically including increased use of award term and executive bonus pools, to encourage good performance and punish poor performance by SC M&O contractors. Investigate ways to offer balanced incentives as the contracts are negotiated.

11. Change the method for calculating fee from an "additive model" in which operational performance is a minority percentage of the overall score to a "gateway model" in which the S&T score sets the maximum winnable fee within the total available fee defined by the contract, and the Operational score determines how much fee is actually awarded.

APPENDIX A: "STRAW" STRUCTURE AND SET OF COMMON MEASURES FOR LABORATORY APPRAISALS

In keeping with the philosophy of OneSC, and the recommendation of the Team assembled to suggest revisions to the laboratory appraisal process, Office of Science (SC) is interested in developing a common set of performance areas that could be used across all SC laboratories as the basic structure for the annual performance plans. **The following is offered as illustration only, and should not be construed as guidance to Site Offices, nor should the measures or categories of measures identified here be considered as anything close to a final recommendation.** The Office of Science is currently establishing two teams to determine the most appropriate measures and categories of measures for the laboratory appraisal process.

The top level of this structure would be consistent across all the SC labs and would provide the basis for developing and presenting an annual "report card," summarizing the laboratory's performance. Each site office will be expected to provide a grade or numerical score out of (100 points) for each of the level-one performance areas.

The second level represents a menu of issues that we believe all site offices and laboratories should consider in arriving at a score for the level-one grades, but it would be left to each site office to determine the importance/weighting of each item at this level. Thus, for example, BNL might weight community relations much more importantly than Ames Laboratory, but both laboratories would consider community relations as part of their performance plan.

The third level would capture how the site office and laboratory plan to assess the success of the items under level-two. Both the wording of these and the weighting would be at the discretion of the site office and laboratory.

We are considering the use of a "report card" approach to reporting laboratory performance which would not involve reporting an overall laboratory performance score. In this scenario the weightings would be used only to determine fee or other benefits. Each Site Office would be allowed to determine the appropriate weighting of the level one grades; the S&T scores would be combined to set the fee bar, the Operations grades would determine the fee award.

● Level One - Report Card Grade – wording consistent, weighting variable

- Level Two – wording consistent, weighting variable
  - Level Three – wording variable, weighting variable

• Mission Accomplishment /S&T Quality and Productivity

- Publications, Citations in Peer-reviewed Journals
- Results of Independent Peer-review Panels
- External Awards to Scientists
- Staff in National Academy of Sciences (Fellows of APS, ACS, AAAS, etc)
- HQ Program Judgment

• S&T Facility Construction and Operation

- On schedule, On-budget
- Scientific Output of User Facilities

- Operational Reliability and Efficiency
- Appropriate Responsiveness to User Community

• S&T Management

- Strategic Planning and Development of Initiatives
- Success Meeting S&T Objectives
- Response to S&T Review Findings, S&T Scores and Recommendations
- Recruitment of Key Positions
- Leadership in Collaborative Initiatives with Other Institutions, Including Other Laboratories
- Stewardship and Growth of Existing Capability
- Leverage Of Existing Capability (Including Facilities) For New Initiatives And Direction
- Effective Use and Management of LDRD

• Laboratory Management

- Strategic Vision and Effective Planning
  - Resource Management
  - Laboratory Leadership/Responsiveness/Accountability re Systems Failures
  - Employee Morale
- Corporate Involvement
  - Corporate Leadership/Responsiveness to Systems Failures
  - Joint Appointments
  - Partnerships
  - Innovative Financing (3rd party)
- Community Relations
  - Communication
  - Public Outreach
  - Education
- Technology Transfer/Intellectual Property

• Environment, Safety and Health

- Success in Preventing Incidents
  - DART
  - TRC
- Laboratory Responsiveness/Leadership in the Face of Incidents/Culture
- Integration of Safety in ISM
- Hazwaste Management

• Security

- Cyber-security
- S&S
- Laboratory Responsiveness/Leadership in the Face of Incidents/Culture

• Business Systems

- Financial Management
- Human Resource Management

    - Diversity
    - Succession Planning
- Personal Property Management
- Information Systems Management
    - Network Reliability and Availability
- Administrative Systems Management
- Indirect Cost Containment

• Facilities and Infrastructure

- Planning/Real Property Management
- Infrastructure & Construction Management
    - MII
- Maintenance & Energy Management

APPENDIX B: "STRAW" REPORT CARD FORMAT FOR LABORATORY APPRAISALS

U.S. Department of Energy, Office of Science 2003 Annual Laboratory Appraisal Scorecard

Laboratory: Lawrence Berkeley National Laboratory

Performance Areas	Grade
S&T Performance	A-
Laboratory Leadership	C+
Business Systems	B+
Infrastructure	A
ES&H	A

Fee Percentage Earned: 76.4%

Comments

The laboratory is doing well at/should be commended for…

The laboratory needs to focus on improving…