Report of the External Members
Best Practices Working Group

The Laboratory Operations Board

Management Best Practices for the National Laboratories

U.S. Department of Energy
September 9, 2003

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Executive Summary

In September 2002, the Department of Energy (DOE) asked the Laboratory Operations Board (LOB) to conduct a broadly based review of management best practices related to the national laboratories. The charge for the study asked that a working group of the LOB External Members survey management best practices at the labs and recommend those most likely to help the labs maintain their innovative edge, enhance their productivity, and motivate employees to push the DOE to a culture of excellence. The Deputy Secretary of Energy and other high-ranking DOE officials identified two areas of the President's Management Agenda—the Strategic Management of Human Capital, and Budget and Performance Integration—as significant areas in which to look for best practices.

The Working Group surveyed best practices at a number of DOE labs before deciding to visit some of the top non-DOE federal and industrial labs to identify if there were other best practices in those labs that it would be beneficial to migrate into the DOE labs. They found that the non-DOE labs were characterized by lively cultures focused on actively and aggressively pursuing excellence through a focus on mission and core values. The non-DOE labs generally were organized with a matrixed management that encouraged collaboration, partnerships, and teamwork and discouraged stove piping within sections of a lab.

Some of the best practices the Working Group recommends for migration throughout the DOE labs are benchmarking of processes and well thought out measurement of results; well-developed project management processes; well-defined employee performance assessments and reward structures; and employee assessments that ranked employees from high to low contributors and assisted less productive employees to find other employment. The Working Group's recommendations challenge the Department's leadership to play a leadership role in defining a vision of best practices to drive into the laboratories and recommends that DOE Headquarters develop a means of evaluating the scientific output of the labs independent of the assessments generated by the laboratories and management and operations contractors.

MANAGEMENT BEST PRACTICES FOR THE NATIONAL LABORATORIES

1 Introduction

In September 2002, the Laboratory Operations Board (LOB) was asked to conduct a broadly based review of management best practices both within the Department of Energy (DOE) national laboratories and with regard to their interaction with the DOE Headquarters (Appendix A). Early on, best practices were defined as strategies and tactics identified and used by enterprises noted for their managerial excellence. It was generally accepted that to be a best practice, the strategy or practice must have been demonstrated to be superior to other approaches and to deliver tangible results. If the effect of adopting a practice has not been measured, or "benchmarked," and been objectively demonstrated to be effective, it may be a valuable tactic but does not merit the label of "best practice."

The study objective was to identify management best practices used in the DOE labs, other federal or university labs, and private industry labs that have demonstrated improvements in performance and that have promoted innovation in the management of scientific research and development (R&D). The study terms of reference ask the LOB to identify those management strategies that the members believe promise the greatest improvements in efficiency, quality, and productivity to recommend as candidates for migration throughout the DOE labs.

As a starting point, a Best Practices Working Group (Working Group), made up of external members of the LOB, was formed and met with the Deputy Secretary of Energy; DOE's two Under Secretaries; Chief Financial Officer (CFO) and Director of the Office of Management, Budget, and Evaluation; and other top administrative officials to further determine the needs of the Administration.

These officials asked the Working Group to look at best practices that supported initiatives identified in the President's Management Agenda (PMA). The PMA identified five areas: Strategic Management of Human Capital; Competitive Sourcing; Improved Financial Performance; Expanded Electronic Performance; and Budget and Performance Integration.

As a result of these discussions, the Working Group settled on two PMA areas as most significant for the purposes of this review:

- Strategic Management of Human Capital; and,
- Budget and Performance Integration.

The Department asked the Working Group to examine best practices within the total institutional context. They were asked to recommend mechanisms that will help the laboratories maintain their innovative edge, particularly in terms of their potential to enhance productivity that advances the DOE's missions and that will motivate people to push the DOE to a culture of excellence.

2 Background

A significant restructuring effort was initiated in the DOE program offices during 2001-2002. At the same time, the Lawrence Berkeley National Laboratory (LBNL), under the oversight of the Under Secretary for Energy, Science, and Environment, and the Sandia National Laboratory (SNL), under the National Nuclear Security Agency (NNSA), conducted separate studies and recommended changes that affect the laboratories' relationship to the Department. Both labs recommended incorporating best practices when their contracts were renegotiated. A number of laboratory contracts were approaching time for renewal, and there was a desire to incorporate best practices into the process and the new contracts. It was intended, too, that as the best practices and restructuring proved effective in those laboratories where they were being piloted, they would be migrated to other of the DOE laboratories.

The report developed by LBNL, "DOE Best Practices Pilot Report" (February 2002), identified six best practices that the study team estimated could provide significant, although undocumented, cost savings of administrative and operational expenses. The best practices the LBNL team identified were as follows:

- Identifying a single federal official to be responsible for mission success and administrative and operational oversight;
- Adopting federal and national standards in preference to DOE contract-prescribed requirements that dictate what and how administrative and operational actions are undertaken;
- Using nationally recognized accounting firms to perform administrative and operational systems reviews in a single annual audit;
- Allowing the laboratory to exercise discretion in the implementation of Departmental directives;
- Adopting nationally standardized system requirements and practices that would allow the laboratory to benchmark its administrative and operational results against other systems; and,
- Introducing a contractor incentive system that would provide contract extensions for performance excellence.

Based on the LBNL study, discussions with an earlier LOB Best Practices Working Group that was reviewing the LBNL study report, and an Office of Science working group study, the Under Secretary for Energy, Science, and Environment, in a memorandum dated April 30, 2002, established a set of principles to be used by the Office of Science in developing the negotiation strategy for new Office of Science laboratory contracts. In the paragraph regarding oversight, the Under Secretary's memo charged the contractors to verify best in class management practices with a "focus on results and systems-based metrics to drive improved performance and increased effective and efficient management of the laboratories."

The NNSA Governance Pilot at SNL was initiated with the objective of creating a contracting environment that would

- Provide clear mission focus and accountability;

- Be based on laws, statutes, and regulations, rather than over-interpretation of those laws and regulations;
- Re-establish a strategic partnership based on mutual trust, and reinforce rather than diminish a sense of trust and respect;
- Emulate private-sector standards and "tailored best practices;"
- Replace current oversight with commercial-like oversight based on review by nationally recognized experts rather than DOE staff;
- Focus on the mission, i.e., what must be accomplished with suitable metrics, rather than on telling the contractor how to do its job, except in a few high-risk circumstances where consistency across NNSA is crucial; and,
- Clarify lines of authority to be consistent with these concepts.

These initial efforts suggested that a broad-based management best practice review of the Department would be beneficial.

The first LOB Best Practices Working Group reviewed these efforts and submitted a report through the Secretary of Energy Advisory Board to the Secretary on May 20, 2002. The LOB recommended that the proposed changes in operating strategies and practices needed to be benchmarked across the labs and against other agency and private laboratories. The first Working Group expressed concern that there was a need to document the effects of the changes to ensure that they were indeed beneficial in reducing overhead while promoting better science at the laboratories.

3 Approach

It was clear from the initial discussions with the Deputy Secretary, the two Under Secretaries, the CFO, and senior staff that there was a disconnect between the PMA criteria and the purported performance measures for the labs in general. This disconnect was two-fold. The PMAs were production-based, and the Department's scores from the Office of Management and Budget generally were low (as were the scores for most departments of the government). On the other hand, the labs, especially those dealing with the "science" end of things, had process-oriented performance criteria and their scores generally were high.

As a result of the discussions with senior DOE officials, it was agreed that this review would be focused on two of the PMAs (Strategic Management of Human Capital and Budget and Performance Integration) and the relation between those two PMA indicators and laboratory management. The Working Group would identify management best practices that in their judgment would best improve overall Departmental performance.

As a first step, the Working Group developed a questionnaire that was sent to all DOE lab directors asking them to identify areas in which there was a need to develop best practices or in which their labs already had a best practice that could be migrated to other labs. A copy of the questionnaire is found in Appendix B. With the results of the questionnaires in hand, Working Group members, accompanied by a member of the DOE staff, conducted on-site visits with the lab directors and appropriate staff. The visits were documented and the summaries were shared among members of the Working Group. The national laboratories

visited by members of the Working Group include the Idaho National Engineering and Environmental Lab (INEEL), Pacific Northwest National Laboratory (PNNL), Lawrence Livermore National Laboratory (LLNL), LBNL, Brookhaven National Laboratory (BNL), SNL, Oak Ridge National Lab (ORNL), National Renewable Energy Laboratory (NREL), Princeton Plasma Physics Laboratory (PPPL), and the National Energy Technology Laboratory (NETL). In addition, the full LOB met, throughout the period of this study, at Los Alamos National Lab (LANL), SNL, NREL, and Argonne National Lab (ANL).

From this data, the Working Group attempted to identify key and critical elements of success as demonstrated by the labs, identify best practices from labs for migration to other labs, and identify the labs' greatest needs for improvement. The Working Group was aware of the administrative problems which had surfaced at the weapons labs, with particular focus at Los Alamos National Laboratory.

From its initial efforts, the Working Group concluded that it needed to visit other federal and industrial labs with a view of identifying consensus best practices in non-DOE labs that could transfer to the DOE labs. The questionnaire developed to guide members in interviewing industry and other agency labs is provided in Appendix C.

4 Findings

The Working Group identified several general principles from the input and discussions with the non-DOE laboratories (Intel, General Electric, IBM, DuPont, Draper, and Lincoln Labs) which have direct bearing on its observations and findings concerning the DOE labs. These principles include

- Management culture is very important. Management sets core values and expectations and then reinforces them daily. This applies to the management and operations (M&O) contractor's management as well as the lab management.
- Management should reward openness and willingness to admit a mistake. As soon as a problem is reported, analysis should be initiated to find the root cause and a way to correct the problem.
- A culture of continuous improvement is a best practice in itself with benchmarking an integral tool.
- The use of benchmarking (Box 1) as a normal way of doing business also helps develop a healthy attitude to accept processes and systems which are "not invented here," thereby overcoming the insular approach seen at many DOE labs. If there is a better way, learn about it and adopt it.

The Working Group also observed a greater drive toward innovation, continually refreshing the work force, and, in general, a greater drive for excellence at the non-DOE labs (Box 2). The Working Group attributes this drive to the fact that the non-DOE labs are "forced" to compete for projects in a more competitive environment, and this quest for excellence creates a truly innovative atmosphere.

4.1 General Observations on Driving Best Practices into Organizations

The development, benchmarking, adoption, application, and integration of new best practices into organizations are major responsibilities of management. Effective sharing and migration of best practices is a challenge for all large organizations. However, the drive for continuous improvement is essential for all that strive to be world-class. DOE contractually requires its M&O contractors to identify and institute best practices that improve management and performance, but few examples were found of reasoned oversight.

Box 1: Benchmarking (Intel)

Benchmarking entails reviewing processes, practices, policies, and operations against peers, who may even be competitors. For the laboratories, these can be other national laboratories, federal laboratories, industry corporate laboratories, and universities. Benchmarking provides an excellent opportunity to learn how others do their processes and operations at institutions similar to one's own. Benchmarking itself is a metric: it validates a process or practice.

All of the non-DOE labs the Working Group visited systematically conduct benchmarks in their laboratory operations and human resources functions with well-defined groups of similar labs. Areas of laboratory operations include the purchasing process, security, safety, facilities operations, and financial management. Human resources areas include salary and compensation, hiring, retention, and promotion. Benchmarking helps by sharing data, learning from what has worked, and by not repeating the same mistakes.

In the area of research, some labs compared their work with other labs and universities. For example: Lincoln Lab benchmarks against Johns Hopkins' Applied Physics Laboratory. IBM develops a measure of external recognition based on evaluating if the work is world class.

Draper also emphasized the importance of having outside evaluations. It has committees of outside peers for each of its strategic areas to evaluate its programs and output.

At Intel, benchmarking is part of the everyday business agenda. Bob Gasser, Vice President, and Director of Components Research at Intel, stated the company has a culture of benchmarking. If someone sees something in another company that looks "cool," then Intel will look at and understand the activity. The company will then attempt to assimilate it as long as Intel's core values remain intact.

LBNL benchmarked its contracting and reporting processes in 2001 against the Jet Propulsion Laboratory and the University Corporation for Atmospheric Research. This activity led to changes in the Office of Science, which are currently being implemented.

Mutual interest brings groups together to share and keep up with the latest improvements. DOE labs have established many groups for collaboration and coordination. There are annual or more frequent meetings of DOE lab groups that focus on specific interests, e.g., the Laboratory Energy Research and Development Working Group, Human Resources (HR), Compensation Staff, Office of Science and Technology Innovation Leads, Training Staff, Labor/Employee Relations Managers, Accounting Managers, Budget Officers, Procurement Managers, Lab Business Managers, Attorneys, Facilities Managers, Equal Opportunity Offices & Diversity Officers, Science Education Directors, Lab Communications Council, Public Affairs Groups, and many others. Only a few groups exist for forums that deliberate a broader and more integrated agenda; these include Lab Director Meetings, National Laboratory Improvement Council (NLIC), Energy Facilities Contractors Group (EFCOG), and National Non-Profit Laboratory Council (NNLC), among others. It is these broader based groups that

Box 2: Drive to Excellence

The Lincoln and Draper Laboratories at the Massachusetts Institute of Technology most resemble the intensely competition-driven culture exhibited at Intel's Components Research Lab. Both the Lincoln and Draper labs have as a driving value a determination to complete projects on time and on budget while exhibiting the very highest quality of work.

Like the DOE laboratories, Lincoln Lab is a government-owned, contractor-operated Federally Funded Research and Development Lab (emphasis at Lincoln Lab is on the engineering side). Draper Lab is an independent, not-for-profit engineering laboratory. Although Lincoln Lab is a small line item in the DOD budget (5%of the lab's operating budget), both laboratories see themselves as surviving solely because of the quality of the work performed.

Both labs attempt to cultivate employee collaboration and networking through the management structure. Draper uses a matrixed management system with eight directors and no middle managers; Lincoln describes its management structure as "federalized," believing this creates fewer boundaries, or "membranes," between work groups. The labs identified several key elements in their success including the narrow focus on core competencies and finding employees who have high technical competence and teaming abilities, who are looking for next generation technologies in the lab's core competencies, who can manage their own careers with no assurance of life-time employment, and who focus on the customer.

The Lincoln and Draper lab managers, like those at Intel, use laddering schemes to identify high-performing employees to reward with bonuses and new, more challenging assignments, and to winnow out those whom they will assist in finding better opportunities elsewhere. Both labs seek to have a constant influx of new technical staff. Lincoln Lab boasts its greater than 50% turnover every 10 years. Draper attempts to select out 5-10% each year. At both labs, there is a strong sense that no employee should view either bonuses or employment as an entitlement, and everyone lives by those same rules. The average age for the technical staff, as at Intel, is in the low 40's.

should undertake an integrated management approach to address common issues, share lessons learned, and promote opportunities for improvement.

Non-DOE labs demonstrated that they are quite good at establishing strategic goals and driving new practices into their operations. Only a few DOE labs demonstrated this innovative and competitive drive. Success will require that DOE management values and assesses, against comparable baselines, the improvements that are achieved from the application of new practices in the labs. Committed DOE leadership and an effective partnership between DOE and the Federally Funded Research and Development Center (FFRDC) M&O contractors should drive all organizations to significant improvements in quality, productivity, and innovation.

4.2 Budget and Performance Integration

4.2.1 Planning

Within DOE, there was a common complaint that the strategic planning process between Headquarters and the labs is inconsistent and somewhat at odds. While the schedule for the labs to develop their strategic plans is set, the analogous process at Headquarters does not follow a schedule which would allow the Department's plans to "feed downward" to the labs for their planning cycle. The national labs' planning and assessment process would work better if the laboratories had better knowledge of DOE's strategic plan when developing their Laboratory Agenda. It is widely held that the Headquarters' planning process is not stable, formal, or consistent across the program secretarial offices (PSO), or as efficient as it should or could be. In industry in particular, the planning cycle is set corporately and all departments or divisions keep to this schedule with timely input from corporate headquarters.

Also, within DOE, strategic planning is tied informally to the budget cycle. The Working Group believes that NREL could have a best practice in Integrated Planning (followed closely by ORNL). It may be a best practice for NREL because it enables the lab to follow through from planning and budgeting into the actual activities being conducted and measured in this process. The strength of this practice is that the DOE customer at the Golden Field Office is kept current on the expected outcomes of the operational and strategic planning effort. In other words, NREL plans, manages, measures, and interfaces with the customer using the same process and tools (Box 3).

Box 3: Integrated Planning (NREL and ORNL)

NREL and ORNL have evolved the integrated planning effort to best comprise all level of input (PMA, DOE strategic guidance, site office input, project customer inputs, Board of Director inputs, etc.), and the resultant outputs are customer metric review and key element evaluation.

While NREL is a more single focused lab, the process they use is a best practice, evolved and improved from other labs by Battelle and others. The system takes all inputs, evaluates key elements of success, creates a common set of metrics to be evaluated by customers and the M&O governance board, and validates the "string" of requirements from input to strategic plan, to lab agenda and yearly work assignments, measurements, and personnel assignments and rewards.

ORNL uses a similar approach, but the NREL effort follows the same monthly review of critical success criteria used by the M&O contractor to manage the lab, down to the Golden Field Office quarterly. There is a sense of validation: PMA and DOE strategic guidance finds its way to the lab agenda, which is then used strategically and tactically to run and measure the lab.

4.2.2 Project Management

The Working Group found that the non-standard use of the terms "project management" and "program management" has resulted in a great deal of confusion within DOE and its M&O contractor ranks. Therefore, a distinction needs to be made between *project and program management*, generally carried out at the labs, and *project and program oversight*, which is carried out by the DOE, the labs' customer. Furthermore, generally the term "project management" is used in reference to capital projects (construction, cleanup, etc.) and "program management" is used in reference to longer term programmatic thrusts which may include a multiplicity of efforts. As a result, the Working Group found some ambiguity in the interpretation of best practices in project management since some labs restrict their use of project management to construction projects while other labs are applying the principles of project management to all "projects."

In any event, a tailored approach is recommended and several best practices were identified. In each case, the Working Group found the need for baselines and useful metrics as keys to good cost and schedule control. The INEEL best practice demonstrated that the tailored approach for construction/cleanup projects is not only practical, but also is easy to apply. While DOE envisions the use of a graded approach, their definition is much more narrowly construed, i.e., they will only recognize a two-step gradation. SNL is proposing a more generalized graded approach to their DOE area office and is hopeful that DOE will accept this broader scale approach than the one currently envisioned by DOE. This is important in several ways: not only does it define

Box 4: Project Management (INEEL)

The INEEL has implemented a graded approach to the execution of INEEL Line Items, general plant projects, and program projects. This approach involves the development and implementation of a suite of management tools that are available to project managers to implement on a graded basis between the Mission Need definition phase of the project [Critical Decision (CD) 0] and the establishment of the project baseline (CD 3). A project execution plan (PEP) is developed in draft after CD 0 is approved. This draft PEP is used to establish the specific tools from the suite that the project will be implementing and the time line for implementation. The selected tools are used throughout the life of the project as established in the PEP.

The suite of tools includes progress and performance measurement tools for engineering and regulatory deliverables, performance and measurement tools for physical construction activities, operations activities, mission critical maintenance work, and scheduling tools such as P-3. Data that is generated can be evaluated and updated weekly, biweekly, or monthly to provide an Earned Value for pre-defined deliverables (examples of deliverables include drawings, specifications requisitions, waste characterization, yards of concrete, feet of pipe, etc). The data generated were also used to generate staffing and de-staffing plans, cost and commitment reports, and material and equipment status reports. Based on the size and complexity of a project, the project manager in conjunction with the project team are required to identify which tools from the suite it will use to manage the project. The team's decisions are reflected in the draft PEP and endorsed by functional and project operations management for implementation. The PEP becomes the blueprint for project execution as well as an orientation tool for all project team members.

The graded approach described above was used on the Glovebox Excavator Method Project (GEM). GEM was a design/build/ operate project that completed construction several months ahead of schedule and within the approved budget. INEEL metrics for this and other projects that are now implementing this graded approach are reflecting an approximate 15 % improvement in cost and schedule performance. The improvement is attributed to the team having deliverable-based execution plans, schedules that track the deliverables against planned production values, and a method of obtaining real time status on performance against the plan. The real time data and resulting analysis allow the team to optimize good performance and mitigate performance that is not meeting predicted values.

At one extreme, the Department has very large, one-of-a-kind scientific machines. A current case in point is the Spalation Neutron Source (SNS) at Oak Ridge. Once the project is completed, the techniques developed and to be developed at the SNS project can be documented and serve as a "lessons learned/best practice" template for future similar projects across the lab complex. Documenting these lessons and migrating them to other labs is a must. DOE HQ facilities leadership in pressing these lessons down to the next project is a must.

the gradations to be used; it also speaks to the roles and responsibilities of the interested parties.

One of the most publicized problems that DOE has experienced in recent years is the cost and schedule overrun on the National Ignition Facility project at LLNL, a large-scale construction project based on advanced science and technology. The Working Group believes that for the Spalation Neutron Source (SNS), ORNL has developed a practice for the construction of a large-scale (inter-lab) construction project that may become a best practice and used on future large-scale science projects (Box 4).

While the Working Group was able to identify best practices in project management at the DOE labs, the area, it was not universally put forth as a best practice. This is clearly one of the most needed best practices at each and every lab. Serious attention needs to be placed on this issue by DOE leadership as it pertains to the lab complex migrating best practices.

4.2.3 Management Information Systems (MIS)

The Working Group did not include MIS as part of its questionnaire on Budget and Performance Integration. However, this is an important area for DOE and the labs. There are several initiatives underway to

Box 5: Assessment of Scientific Output (Draper and Lincoln Labs)

Draper and Lincoln labs need to raise very significant funding each year (100% for Draper Lab and over 90% for Lincoln Lab). Each lab emphasized that it survives because the lab delivers high quality work and the people at the lab have excellent reputations in their fields. The lab directors identified the following principles as key to their success. First, the lab must focus on its mission, core competencies, and goals for major projects. Second, each scientist must be excellent in his or her subject, be excited about the work, make progress on major projects, and clearly see how his or her work fits into the mission of the lab.

Using this framework, the labs can asses their scientific output by (1) comparing the work and reputation of the science with the science of other highly regarded labs and (2) assessing the contribution of the new ideas and innovation from the science to the work performed by the lab.

Box 6: Six Sigma (General Electric, Honeywell, DuPont)

Six Sigma is used not only to drive behavior in manufacturing, but also to drive efficiency in many of the administrative and research parts of companies. The Design for Six Sigma (DFSS) aspect of Six Sigma is being used by engineering and corporate research laboratories. General Electric (GE) stated that "it is more than an initiative, it is the way we work."

Six Sigma is a systematic, data driven approach to developing and building robust technology maps. It focuses on customer issues, improvements to internal processes, and improvement in the flow of high-tech products and services to the marketplace. Training can even bring positive cash flow. Honeywell's Federal Manufacturing and Technologies (FM&T) Business Unit provides four weeks of training for Black Belts over a four-month period. To be certified, the employee must complete one or more significant projects which result in greater than $75,000 in savings or an equivalent business impact. The FM&T HR department, using Six Sigma, eliminated redundant requirements and automated notifications resulting in labor savings of $126,000 annually and improvements to new hire recruiting processes that saves $240,000 annually.

Six Sigma can apply to all enterprises, including weapons and science labs that have goals of delivering products that better satisfy their customers (higher reliability, faster delivery, more features) at lower cost. While the metrics and their relative importance vary (e.g., cash flow many not be important, but high reliability is), the principles and processes apply to all.

improve (or modernize) Enterprise Architectures and Management Information Systems and replace old, legacy systems which diminish the effectiveness of the labs in carrying out their administrative and scientific missions. As a consequence, the Working Group believes that this area will need to be reviewed for best practices in the not too distant future.

4.2.4 Assessing Scientific Output

The Working Group recognizes that the scientific efforts at the labs range from basic science to applied technology efforts and demonstrations.

Thus, its efforts to sort through best practices as applied to these activities must be considered along this spectrum.

When the DOE labs were probed on their efforts to assess and measure the scientific efforts within the labs, the Working Group was told that in these areas the labs are dealing with processes and not products. The labs' conclusion is, therefore, that they cannot find appropriate metrics or best practices to employ. The Working Group's discussions with non-DOE labs provided evidence to the contrary. In the discussions at both Draper and Lincoln labs, it was clear that the laboratory management is convinced of their ability to assess the scientific output and results of a lab as well as describe their cumulative benefits against the mission and goals of the organization (Box 5).

Box 7: Individual Performance Goals and Laddering (Draper, Lincoln, GE, Honeywell, Intel, IBM)

At the non-DOE labs visited by the Working Group, employees develop their own annual performance plans, with individual goals and activities, in coordination with his/her manager at the beginning of the year. A year-end assessment of how he/she performed against the plan is conducted. Having a performance plan allows the lab to align goals for individuals with the goals of the lab. It also helps individuals see how his/her goals contribute to the goals of the lab as well as what is expected and how he or she is performing.

The non-DOE labs also use laddering, or ranking individual performances from high to low. As labs need to hire in new areas and reduce staff in areas that are no longer viable, laddering provides a process to replace low contributing staff while restructuring the workforce. The labs can also offer re-training opportunities.

Box 8: Employee Rewards (Intel, Draper)

At Intel, management of human capital is based on results. At the beginning of each year, the employee negotiates a set of metrics for his performance standards for the year with his supervisors. These standards include the major values of Intel: safe work environment; quality sustaining, innovative, and useful results; and flexibility. If the employee exceeds the agreed upon standard, a set number of points are awarded. If the employee meets the standard, a lesser number of points are awarded. The points convert to a dollar amount.

Draper Lab's personnel appraisal system is designed to reward the top performers and select out weak performers. There are five levels in the rating hierarchy, from excellent to needs improvement. Between 5-10% are put in the "needs improvement" category each year and will be assisted in finding employment elsewhere. The next 10% know they are heading into the lower category. For the staff, 1.5% of the annual budget is awarded to the 25% who are identified as the year's top performers. Other rewards include ability to move around, rewards related to being assigned to the good projects, and recognition awards. There is an effort to ensure that the same people are not rewarded every year to avoid the perception of entitlement.

Furthermore, the Working Group visited laboratories in which processes such as Six Sigma have enabled laboratories to achieve growth and productivity objectives. Such processes can be applied to research laboratories as well as to production operations. In the former case, they help decision makers understand and optimize internal R&D activities, both in the design of experiments and for repetitive processes, so that research productivity is enhanced and the R&D investment is maximized (Box 6).

In other cases, the lab may negotiate the terms under which it will carry out its R&D program with its internal customer.

4.3 Human Resources

In this PMA area, the Working Group found a wide variety of practices in place among the laboratories. In most labs, the evaluation and renewal processes were cited as key drivers. Again, the Working Group found that a good deal could be learned from non-DOE labs. The practice of ranking employees (for example, within each division ranking employees from best to poorest performing contributors) is carried out at all the non-DOE labs the Working Group visited. This ranking allows more effective communications with employees on performance expectations and training. Furthermore, it provides a mechanism by which the staff can be continuously renewed by moving out the bottom 5-10% of the work force. All of the labs interviewed said that this was an important approach to keeping the workforce current and keeping innovation alive (Box 7).

Some of the non-DOE labs were less aggressive in moving people out, but

Box 9: On the Job Training (BNL)

The Facilities Operations and Project Management directorate at Brookhaven National Lab has a culture of mentoring while training on the job. For example, new hires start by teaming with more experienced employees on projects, then leads small project teams before being assigned to lead and manage larger projects. Every project manager reports on progress and concerns during monthly meetings led by the Director. Project managers' reports are critiqued so they can get feedback on how to improve. This practice encourages mentoring and also focuses attention on results and improvement.

Box 10: Human Capital Management (SNL)

There is little doubt that if the laboratories are to maintain their reputations as world-class research centers, they must recruit and retain a bright and highly motivated workforce. Human capital remains the primary resource of the laboratory complex, and the world-class leadership and management of this resource must be a best practice and key element of any lab's success.

SNL has been active in developing and sharing a number of human resource programs with other labs, including the following:

- Ombudsmen Program;
- Integrated HR Strategies;
- Total Rewards Strategy;
- HR Information Systems/Tools;
- Student Internship Programs;
- Diversity Program;
- Mentoring;
- Succession planning;
- Leadership Development program; and,
- On-line Training and Information Technology/CS Training Program.

The lab has won national recognition for its innovations in human resource planning and management. SNL's effort to work with other organizations is in itself a best practice that reaps benefits in terms of new innovative practices at other institutions. Sharing information has been a key to the lab's success in this area.

they still have a practice of encouraging the non-contributors to find employment elsewhere. In contrast, the DOE labs have a tendency to treat employment as "entitlements," like civil service. The Working Group believes it is important to be able to "fire" low performing employees.

Another aspect of performance expectations of employees is basing the management of human capital on results. In industrial labs, bonus levels are forecasted and tied to performance metrics agreed upon between the employee and the program director. Employees are also rewarded on observed and measurable behaviors (Box 8).

The culture of training and mentoring must be tied closely to the performance measures cited above and must permeate the organization. For example, new hires start by teaming with more experienced employees on projects, then lead small projects, then larger projects. Management should hold periodic meetings where each project manager (PM) reports on progress and concerns, and critiques are made so the PMs can get feedback on how to improve (Box 9).

Within the DOE laboratory complex, the Working Group did find that one lab has consistently been recognized for its best practices in the arena of human resources. Given the fact that human capital is the number one resource of the laboratory complex, the world-class leadership and management of this resource must be a best practice and needs to be recognized (Box 10).

4.4 Culture

Box 11: Openness as an Element in Lab Culture

Bob Gasser of Intel described non-ego based behavior as key to Intel's management approach and a key ingredient in the company's culture. The Intel management rewards openness and willingness to admit a mistake. All employees are encouraged and trained to act for the good of the company, to admit and alert management to problems, and to participate in analyzing problems and understanding root causes. As soon as a problem is reported, the team leader convenes a quality management meeting attended by the division director to determine the root causes and find a way to correct the problem. If an employee has made a mistake, the analysis becomes an opportunity to learn. There is tolerance of errors; however, if an employee repeatedly makes the same mistake, the person will not remain at Intel.

Several lab directors emphasized the importance of establishing a unique culture. For example, PNNL emphasizes finding and adopting best practices to be a part of the lab culture. The lab maintains a database accessible by all employees devoted to lessons learned and best practices adopted at the lab and management encourages employees to use the automated database. Intel's Bob Gasser stated that Intel's management culture drives the focus on results and quality from the top down. This focus is reinforced through key meetings with management and exemplar behaviors exhibited by management. Intel management has set core values and expectations, which are reinforced daily. The goals at every level are improved products, reduced product cycle time, and so on. Part of this culture is encouraging openness and a willingness to admit mistakes and to learn from them (Box 11).

Asked how DOE could improve the efficiency of its labs, Mr. Gasser noted that the labs must have a results focus and a strong vision statement that bodes well for the security of the nation. The Director of the Lincoln Lab brought up the lab's culture at the beginning of the visit and mentioned the lab's mission of service and education to the nation and humanity as important values accepted by all lab employees.

4.5 General Observations

In the course of the interviews, the Working Group found areas in which DOE labs showed little interest in best practices. Among these were best practices related to governance and organizational development. Also, interest is "medium or low" in the areas of management of innovation, the development of an innovation culture, and partnering. Lack of interest in these areas seems disturbing for R&D enterprises. As mentioned above, the Working Group found the opposite was true in the case of non-DOE labs, where best practices to encourage innovation were deemed to be key best practices.

4.5.1 Key Elements of Success

The fundamental building block in finding and defining best practices is identifying Key Elements of Success, sometimes referred to as Critical Success Criteria. A limited number of outcome statements allows an entity to define expected results over some

period of time (generally a year) and reflect guidance, direction, and metrics which allow the measurement of progress.

Additionally, defining the Key Elements serves to illuminate which best practices are to be developed and defines the "as is now" and "desired to be" (or objective) states, which need to be benchmarked and measured (see Box 1). This focuses work teams around what is important, declares the "now" and objective states, keeps the main thing the main thing, and measures and rewards teams on strategic successes that are mission critical. Spending resources on items which do not relate to the mission success, developing best practices for elements that are not on the success path, and measuring processes which are not key to the core success waste time, talent, and treasure.

4.5.2 Governance

The subjects of governance, roles, responsibilities, accountability, and authority of a lab and its M&O contractor are at the forefront today as missteps are regularly reported and criticized. The role of the local DOE site/field office and the role of the parent M&O contractor in terms of accountability and governance is a matter that must be elevated to improve the Department's laboratory governance structures.

There has been a sizable improvement in accountability and governance at some labs, where the management chain of the M&O has stepped-up to holding the lab team responsible for the operations of the lab as well as the lab team's results. The trend to participate more visibly in the migration of best practices and to improve the governance of the lab should be encouraged for participating corporations that run labs or that wish to bid on M&O work. The NNSA and Office of Science, as noted earlier in this report, have made (or are in the process of making) changes in their laboratory governance structures. It is too early to evaluate the impact the changes will make on performance at the laboratories.

Box 12: Standards-Based Management System (SBMS) at PNNL

SBMS is an on-line information system that gives PNNL staff access to up-to-date policies, standards, and procedures relevant to the work they perform. The creation of SBMS replaced thousands of copies of printed manuals and illustrated how basic laboratory functions can be automated using electronic media. The development of SBMS was funded through shared (DOE and Battelle) overhead funds. Acceptance of SBMS was achieved through engaging researchers in the initial development of the tools. The laboratory tracks the number of user sessions per 1000 hours worked, percent of staff using the system one or more times, length of user sessions, and user demographics.

Metrics of success include improved staff performance and productivity, which are reflected in the laboratory's environment, health, safety, and security statistics; cost and productivity metrics; and workplace engagement assessments. SBMS was first adopted by Battelle affiliated labs and then by INEEL. PNNL has also given a presentation on SBMS to the National Laboratory Improvement Council (NLIC).

4.5.3 Self-Assessment/Six Sigma

The Working Group found that the use of self-assessment and the development of performance-based metrics varied greatly from lab to lab. The Working Group did find several examples of corporate/parent best practices being translated to the lab(s). In the case where a contractor operates more than one laboratory, that

contractor's labs should be operated as a "system" in order to introduce and rapidly transfer management practices and lessons learned among the labs under their purview. Also, such a situation would allow for the "cross training" of people by moving them among the different laboratories. Battelle does this successfully.

For example, the Standards Based Management System (SBMS) developed at PNNL has been adopted by the Battelle affiliated labs and INEEL. The SBMS puts guidelines, manuals, and standards online to provide employees immediate access to the latest information. This has had a great impact on governance and organizational development (Box 12). It is important to point out, however, that the treatment of laboratories as a system should not be restricted to the case in which one contractor has several labs; it should also be done among labs with different contractors with the objective of obtaining the same results. In fact, PNNL made a presentation about SBMS to the NLIC for consideration of it on a broader basis.

Box 13: Performance Metrics

Benchmarking implies metrics or measures; yet in visiting the labs to learn about best practices, the Working Group members discovered few metrics of any kind. It seems difficult to understand how a lab can determine how or where improvements are needed without valid measures based on well-defined goals and objectives. In comparison to the DOE labs, the non-DOE labs utilized metrics and benchmarking on a scale ranging from extremely formal at DuPont, to more relaxed processes in which benchmarking in specific areas, such as employee compensation, are compared against specific labs. Draper is utilizing the standard processes (ISO 9000 and ISO 2000) to ensure that it meets important standards of performance. GE and DuPont are developing Six Sigma programs, which some DOE labs are adopting as well.

Bob Gasser of Intel insisted that all performance can be measured in terms of results. Intel's budget process is tied to performance in terms of the business unit profits and the results-oriented results that are the product of the company's human capital. Benchmarking is a part of Intel's every day business agenda. If a better way of doing business is noted, Intel will study what it is and attempt to assimilate it, provided Intel's core values remain intact. All metrics at Intel are associated with a quantitative metric and time frame. The foci for metrics at Intel are output; improved, measurable product performance; and quality of "cool new ideas."

As mentioned above, Honeywell has been quite successful in transferring Six Sigma from their corporate environment to their Kansas City Plant. It is also in use at some industrial R&D labs, namely GE and DuPont. The use of Six Sigma may be better suited for applied labs than labs with a basic science orientation, although, as noted in Box 6, the approach can be applied in administrative areas and to improve internal processes.

The Working Group's survey of non-DOE labs also found that many of them used a predetermined benchmarking group of laboratories and/or used Industrial Research Institute (IRI) data for benchmarking purposes (see Box 1). Finally, the Working Group found that a great number of the non-DOE labs (Draper, Lincoln, Intel, Dupont, IBM, and GE) tie performance to missions and goals, as well as use performance-based metrics within a real business model (Box13).

5 Conclusions/Recommendations

The Working Group concludes that the use of industrial best practices within the DOE laboratory system is spotty at best. A sizable challenge for the lab complex as a whole is the propensity for the single lab to be stove piped, silo-oriented, and inward looking when it comes to mission uniqueness and process definition. This, coupled with an undefined

vision of best practices at DOE headquarters, adds to a situation where best practices are not readily discussed, congealed, agreed upon, and migrated. Thus benchmarking, the use of metrics, quantifying best practices, and migrating practices from the corporate parent and among the labs is not done on a consistent and regular basis.

> **Recommendation 1: DOE top management should define a requirement to include best practices and set expectations within its laboratory oversight function. The Office of the Secretary should provide direction and persistence. Furthermore, this should be institutionalized by the inclusion of performance-based evaluation factors in the M&O contract.**

While it is fundamental that DOE top management provide leadership in this area, it is equally important for that leadership to define the "what," namely the necessary steps in the development of consistently applied best practices among the labs. In this regard, the Working Group has two areas for consideration.

First, a consistent theme heard by the Working Group throughout the lab complexes is the difficulty the labs have in finding appropriate metrics to use. It is difficult to evaluate the quality of scientific research output accomplished at any given time. However, over time, it is possible and relatively straightforward to use conventional criteria to evaluate the quality of the research staff itself, and hence, indirectly, the quality of their output. Scientists themselves usually know who is good among their peers, and if asked to "pick a team" from a group of their coworkers he or she will unflinchingly pick the best performers. For others, the long-term judgment of the external community is the best overall guide to the quality of the research output of a laboratory. Thus, traditional measures such as per capita publications in refereed journals and conferences, patents, the number of fellows in professional societies, elections to academies, and professional awards would be meaningful. It is incumbent on the DOE, working with the labs, to determine the appropriate metrics. It must be remembered, however, that the "softer" the metric, the more difficult the benchmarking analysis.

The labs want to be evaluated on their programmatic results. DOE must find a means of evaluating the scientific output of the labs that is independent of the labs' and M&O contractors' own assessments. This can be done at the programmatic level with external advisory committees. The labs themselves can do their own evaluations at a more detailed level.

> **Recommendation 2: Laboratories engaged in scientific research should evaluate the relative quality of their research staff using traditional measures of scientific accomplishment recognized by the external professional community.**

Furthermore, the Working Group believes that the laboratory itself is in the best position to judge similarity. Each laboratory should conduct periodic comparisons of their own practices with those of other institutions that they themselves believe to have similar characteristics in whatever functional area is being assessed. For example, functional

areas such as financial systems, performance assessment, safety, project management, and HR systems should be compared with systems in place at whatever institution the laboratory deems itself to be similar to for that particular function. The designated "sister" institutions can be from government, commercial, or academic sectors. The purpose of this requirement is to motivate the discovery of best practices elsewhere. Sometimes elements of the practices discovered will be adopted, other times not, but the comparison needs to be documented and communicated. This documentation should also enable the accumulation of best practices to the benefit of all laboratories in the system.

> **Recommendation 3: Laboratories should be required annually to provide to the Office of the Secretary a periodic comparison of practices in selected functional areas against similar practices in self-selected sister institutions.**

Taking this idea a step further, the Working Group consistently found that the non-DOE labs were using various mechanisms to benchmark their performance and interact with other institutions [Industrial Research Institute (IRI), for example] to improve their practices. As such, they are continually testing and revitalizing their business practices against the best of the best. But the view from the labs should also include intramural efforts among the DOE labs. Various mechanisms exist which can be used for this purpose (i.e., NLIC, EFCOG, Lab Directors meetings).

> **Recommendation 4: DOE needs to formalize the communications and migration of best practices both within the DOE lab complex and with non-DOE labs. This can be done by expanding the use of existing vehicles.**

In our review of non-DOE labs, both FFRDC and industrial, the Working Group found that most of these labs use some mechanism for ranking the performance of their technical staff, regardless of seniority. Their annual performance reviews with staff highlight strengths and weaknesses and areas in which the person is counseled for improvement. If in fact improvement is not forthcoming, the bottom 5-10% of the ranked staff is encouraged to seek employment elsewhere. This allows the lab to constantly introduce new talent into its workforce and keep the technical staff motivated to excel. The level of detail is best left for the labs to define.

> **Recommendation 5: In the processes described above in Recommendation 3, the labs should look to migrate and integrate the ranking of staff into their human resource programs.**

Within this report, the Working Group has provided examples of best practices as they are being applied at DOE and non-DOE labs. One of the charges given to the Working Group was to identify those best practices which were worthy of migration among the labs. The recommendation that follows is our consensus view of this best practice set.

> **Recommendation 6: Of the best practices cited in this report, the DOE management and the lab directors should consider the migration of the**

following best practices into the DOE Lab complex: Boxes 1, 4, 5, 7, 8, 10, 11, 12, and 13.

Box Number	Title of Best Practice
1	Benchmarking
4	Project Management
5	Assessment of Scientific Output
7	Individual Performance Goals and Laddering
8	Employee Rewards
10	Human Capital Management
11	Openness as an Element in Lab Culture
12	Standards-Based Management System (SBMS)
13	Performance Metrics

The Working Group recognizes that implementation of these recommendations will take time, both from a cultural and an implementation perspective. But "world class" laboratories are only that if they constantly measure themselves against the best there is and incorporate the best of the best of practices. If asked, the LOB will work with the DOE to evaluate implementation and follow through.

Acronyms

Acronym	Meaning
Department of Energy Laboratories	
ANL	Argonne National Laboratory
BNL	Brookhaven National Laboratory
INEEL/ INEL	Idaho National Engineering and Environmental Laboratory
LANL	Los Alamos National Laboratory
LBNL	Lawrence Berkeley National Laboratory
LLNL	Lawrence Livermore National Laboratory
NETL	National Energy Technology Laboratory
NREL	National Renewable Energy Laboratory
ORNL	Oak Ridge National Laboratory
PNNL	Pacific Northwest National Laboratory
PPPL	Princeton Plasma Physics Laboratory
SNL	Sandia National Laboratories
Other DOE Commonly Used Acronyms	
CD	Critical Decision
CFO	Chief Financial Officer
CS	Computer Science
DFSS	Design for Six Sigma
DOD	Department of Defense
DOE	Department of Energy
EFCOG	Energy Facilities Contractors Group
FFRDC	Federally Funded Research and Development Center
FM&T	Federal Manufacturing and Technologies
GE	General Electric Company
GEM	Glovebox Excavator Method
HQ	Headquarters
HR	Human Resources
IR&D	Independent Research and Development
IRI	Industrial Research Institute
ISO	International Organization of Standardization
LOB	Laboratory Operations Board
M&O	Management & Operations
MIS	Management Information Systems
MIT	Massachusetts Institute of Technology
MSDP	Management Skills Development Program
MTS	Member, Technical Staff
NLIC	National Laboratory Improvement Council
NNSA	National Nuclear Security Agency
PEP	Project Execution Plan
PM	Project Manager
PMA	President's Management Agenda
PSO	Program Secretarial Office
R&D	Research & Development
SBSM	Standards-Based Management System
SEAB	Secretary of Energy Advisory Board
SNS	Spalation Neutron Source

APPENDIX A: Laboratory Operations Board Charge to the Best Practices Working Group

Scope and Objectives

The purpose of the Laboratory Operations Board (LOB) Best Practices Working Group (Working Group) is to conduct a broadly based management best practices review of the Department of Energy (DOE) national laboratories and their interaction with the Department. Management best practices are strategies and tactics identified and used by enterprises noted for their managerial excellence.

The study objective is to identify management best practices used in the DOE labs, other federal or university labs, and private industry labs that improve performance and promote innovation in the management of scientific research and development (R&D). Those management strategies that promise the greatest improvements in efficiency, quality, and productivity will be identified as candidates for migration throughout the DOE labs. The Working Group is asked to look at best practices that support the five initiatives identified in the President's Management Agenda:

- Strategic Management of Human Capital;
- Competitive Sourcing;
- Improved Financial Performance;
- Expanded Electronic Performance; and,
- Budget and Performance Integration.

This effort will identify and examine best practices within the context of the DOE laboratory organizational environment, recognizing that performance of best practices does not in and of itself guarantee a successful operation. The Working Group will examine the institutional context and recommend mechanisms for maintaining an institution's innovative edge. The best practices must be assessed in terms of their potential to enhance productivity that advances the Department's missions of national security, safety and security of the Nation's energy supply, provision of user facilities to enable the Nation to maintain its scientific and technological leadership, and employment and training of scientists and technical world leaders capable of conducting advanced scientific enquiry.

A major focus of the effort will be the migration of best practices between laboratories. The study should recommend processes for implementation of innovative best practices and metrics to examine the effects of adoption of new practices that flow from the President's Management Agenda down through the Department to the laboratories. Best practices are sought that motivate people to push DOE to a culture of excellence.

Background

A significant restructuring effort has taken place in the DOE program offices during 2001-2002. At the same time, the Lawrence Berkeley National Laboratory (LBNL), under the direction of Under Secretary Robert Card, and the Sandia National Laboratory (SNL), under the National Nuclear Security Agency, conducted separate studies and recommended changes that affect the laboratories' relationship to DOE. Both recommended best practices to be incorporated when their contracts were renegotiated. Contracts at SNL, Pacific Northwest National Laboratory, LBNL, and Brookhaven National Laboratory will be re-competed during 2002, and efforts have been undertaken to conduct the recompetition to reflect the changes in management structure proposed in the best practices efforts. There is an interest as well in migrating the proposed best practices to existing operations at other DOE laboratories. As the best practices and restructuring prove effective in those labs where they are being piloted, there is an interest in migrating them, and other best practices as they are identified, to all of the DOE laboratories. These efforts suggest that a broad-based management best practice review of the Department would be beneficial at this time. The changes in operating strategies and practices need to be benchmarked across the labs and against other agency and private laboratories to ensure that the changes in processes and relationships being undertaken are beneficial in reducing overhead while promoting better science at the laboratories. This effort can provide lessons learned for adapting the best practices to the unique environment at each laboratory.

Study Questions

- What management best practices have been identified in areas addressed in the President's Management Agenda?
- Where have labs leveraged the greatest returns in adopting new management practices?
- What best practices are viewed as the most transferable to another lab?
- What practices have managers introduced that motivate people to work towards an institutional culture that is innovative, hard-driving, productive, and focused on achieving DOE's long-term goals?
- What metrics can be put in place to provide the incentives to achieve the desired institutional culture described above?
- Have labs looked outside the lab/DOE structure, i.e., private industry, for best practices? If so, where?

Duties of Working Group

1. The Working Group should provide the Secretary of Energy through the Secretary of Energy Advisory Board (SEAB) with Department-wide policy recommendations on best practices on management structure, resource posture, personnel practices, and other areas that relate to the efficient and productive management of the DOE laboratory complex. The Working Group is asked to

identify best practices as they are observed in the labs, but in addition it should identify areas in which streamlining, restructuring, modern technology, and equipment upgrades or a change in policy or practice will improve mission productivity.

2. The Working Group should recommend processes and metrics for assessing if the best practices being adopted are enhancing organizational efficiency and accomplishment of the Departmental missions.

The LOB will provide findings and recommendations to the SEAB in its semi-annual progress reports.

Estimated Number and Frequency of Meetings

The Working Group will meet as required. In order to enhance members' knowledge and understanding of DOE management policies and practices and the relationships between DOE headquarters and its laboratories, DOE may organize site visits as needed. Headquarters personnel will be available to explain current policies. The Working Group may hold meetings outside of Washington, DC as required to fulfill its charge.

Membership

The Working Group shall have at least five members, including at least four individuals who are external members of the LOB. The remaining members shall be appropriate representatives of industry, business executives, and others with knowledge pertinent to the scope and objectives of this study, representing a balance of viewpoints. The External Chairman of the LOB, in consultation with the Chairman of the SEAB, shall appoint the Chair, as well as all other members.

Duration and Termination Date

The Working Group shall serve for approximately six months, subject to the extension or dissolution by the External Chairman of the LOB and the Chairman of the SEAB.

APPENDIX B: Survey of DOE Labs for Best Practices Study

LABORATORY OPERATIONS BOARD

Survey for Best Practices Study of DOE labs

The External Members of the Laboratory Operations Board have identified and reviewed many Best Practice Areas for Laboratory Management in both the public and private sector. To initiate this study, we have tentatively selected eight areas that we initially believe would be relevant to the wide spectrum of DOE labs and to the President's Management Agenda (PMA) in two initiatives—Budget and Performance Integration (BPI) and Strategic Management of Human Capital (SMHC). We seek your views on which of these areas or others might be of most help in our collective efforts to improve the effectiveness of laboratory management.

Best Practice Improvement Area	PMA Link	Please Rate (High, Medium, or Low)			
		Potential Lab Impact	Transferability	Doability	Interest
1. Effective and Efficient Project Management	BPI				
2. Building, Rebuilding, and Retaining Key Talents and Core Competencies	SMHC				
3. Clean and Simple Metrics and Performance Measurement	BPI				
4. Governance and Organizational Development	SMHC				
5. Innovation Culture, Entrepreneurship, and Morale	SMHC				
6. Partnering and Networking Across Labs and with Industry	SMHC				
7. Clean and Compelling Strategic Targets and Program Management	BPI				
8. Portfolio Balancing Risk, Reward, Fit and Attractiveness Over the Near- and Long-Term	BPI				

Do you, or does someone in your organization, maintain a best practices file? Yes_____ No_____ If "Yes"

1. Who?
2. What is their level of authority?

Do you make use of any best practices data base maintained outside of your organization? Please identify:

Return survey to: Dr. Laurie Keaton, Secretary of Energy Advisory Board (AB-1), 1000 Independence Ave., SW, Washington, DC 20585 by October 16, 2002. Laboratories should send responses by FAX to 202-586-6279.

1 Attachment 1

Survey Crib Sheet, or "What does it all mean?"

President's Management Agenda Items:

Strategic Management of Human Capital—workforce planning and flexible workforce management tools to recruit, retrain, and reward high-performing employees whose output is linked to an organizational mission, vision, core values, goals, and objectives.

Budget and Performance Integration—the allocation of federal resources to programs and managers that deliver results.

Best Practice Improvement Areas:

1. **Effective and Efficient Project Management**—practices to ensure major projects, such as construction of a new user facility, are completed on time and within budget, meeting milestones and project objectives.

2. **Building, Rebuilding, and Retaining Key Talents and Core Competencies**—tools for recruiting and training employees to match organizational requirements and job enhancements to encourage employees to develop desired skills and remain at the laboratory.

3. **Clean and Simple Metrics and Performance Measurement**—practices related to the definition of performance measures that are clear and carefully designed to examine the efficiency with which desired outcomes are achieved.

4. **Governance and Organizational Development**—the number of management levels is minimized and new management models are used that lead to increased idea creation and employee partnering both within and external to the lab.

5. **Innovation Culture, Entrepreneurship, and Morale**—creating new value through focusing organizational goals on research that will lead to new products with potential commercial value and rewarding these efforts through career enhancement.

6. **Partnering and Networking Across Labs and Industry**—steps taken to enhance employee and laboratory opportunities through increased teaming outside the laboratory campus to achieve the lab's organizational objectives, strengthen opportunity potential, and maximize resources.

7. **Clean and Compelling Strategic Targets and Program Management**—developing clearly stated, focused organizational goals of critical importance in driving the advancement of the lab's and DOE's science and technology missions.

8. **Portfolio Balancing Risk, Reward, Fit, and Attractiveness Over the Near- and Long-Term**—planning processes and metrics for organizational capacity and competency building for immediate (three to four years) and future (greater than seven years) projects.

APPENDIX C: Survey of Industries with R&D Laboratories

Laboratory Operations Board
Best Practices Working Group

Background

The Department of Energy (DOE) has been challenged to improve both the efficiency of output and the excellence of performance at its national research and development (R&D) laboratories in support of the President's Management Agenda (PMA). The Laboratory Operations Board (LOB), a subcommittee of the DOE's Secretary of Energy Advisory Board, has been asked to recommend management best practices that, if adopted by the DOE and its laboratory complex, could improve the management interface between the labs and headquarters and lead to an improved standard of excellence and increased productivity to benefit the nation. Management Best Practices are the management strategies and tactics identified and used by enterprises noted for their managerial excellence.

In discussing the study with the LOB Best Practices Working Group (Working Group), the DOE Chief of Staff and DOE Principle Secretarial Officers identified two critical areas of the PMA for the LOB to address:

- **Budget and Performance Integration**—the allocation of federal resources to programs and managers that deliver results; and,
- **Strategic Management of Human Capital**—workforce planning and flexible workforce management tools to recruit, retain, and reward high-performing employees whose output is linked to an organizational mission, vision, core values, goals, and objectives.

Practices in these areas have great potential for transfer from industrial labs to the Department's laboratory complex.

As part of this effort, the LOB seeks the assistance of industry leaders who are recognized for their management excellence in the conduct of R&D at their industrial laboratories. The LOB has developed a set of questions that the members hope will stimulate discussion about management best practices related to the management of your R&D laboratories.

LABORATORY OPERATIONS BOARD
Survey of Industries with R&D Laboratories

Interview Questions

1. How would you describe the management culture of your company?

2. What management best practices do you employ in your R&D laboratories that you believe have made a positive impact on the quality and efficiency of your operations?

3. What best practices have you adopted that relate to budget and performance integration or strategic management of human capital?

4. How do you identify a management best practice for implementation? What strategies have you used that were effective in implementing a management best practice in your operation?

5. What problems have you experienced, if any, in implementing best practices in your laboratories?

6. Do you use benchmarking to determine if a best practice is effective? If you do benchmark, do you have a process that you think is efficient in demonstrating improvements? What kind of metrics do you use?

7. Do you have established processes for migrating best practices among business units within your company?

8. What processes do you have in place for selecting and funding R&D projects? What is your review procedure for continuing or discontinuing support of projects?

9. Do you have processes in place for setting milestones/targets for your R&D labs? Have you established some clean and simple metrics for use in evaluating multiyear projects?

10. What metrics do you use in general for your R&D laboratories? Do you have some corporate metrics?

11. How are R&D units evaluated?

    -Is the focus on output? If so, what kind?
    -Who evaluates—corporate, business units?
    -What evaluation process is in place?

12. If budgets are going to be impacted (i.e., reduced), what mechanisms do you have to do this (including talking with your various constituents about the cuts to be made)?