

FY 2009

Performance Evaluation Report

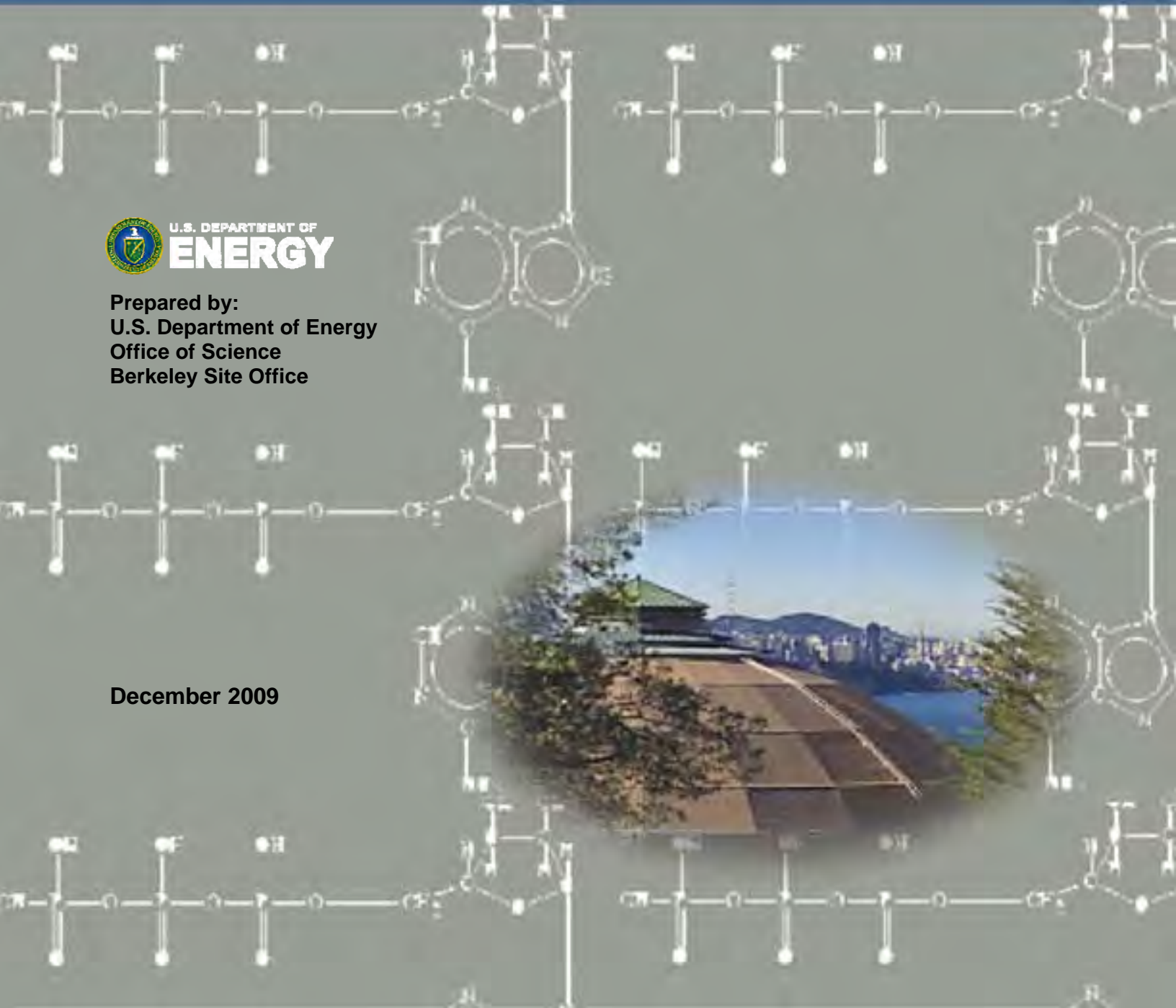


*Lawrence Berkeley National Laboratory*



Prepared by:  
U.S. Department of Energy  
Office of Science  
Berkeley Site Office

December 2009





## **DOE Office of Science**

**FY 2009**

**Performance Evaluation of  
The Regents of the University of California  
for the  
Management and Operations of the  
Ernest Orlando Lawrence Berkeley National  
Laboratory**

**December 2009**





## CONTRACTING OFFICER'S EVALUATION

The Department of Energy, Office of Science and Berkeley Site Office Senior Management reviewed and discussed the recommendations of functional managers and staff concerning the appropriate numeric scores and grades with which to rate the University of California's performance in the management and operation of the Lawrence Berkeley National Laboratory. Based upon this process, an overall score of 3.6 with a grade of "A-" is recommended for the science and technology component of the evaluation. An overall score of 3.3 with a grade of "B+" is recommended for the Management and Operation component of the evaluation. These recommendations have been forwarded to and considered by the Office of Science and approved. This report, entitled *FY 2009 Performance Evaluation of the Regents of the University of California for the Management and Operations of the Ernest Orlando Lawrence Berkeley National Laboratory* provides the basis for my determination, and is hereby endorsed and approved.

Recommendation:

Date: December 8, 2009

Charles W. Marshall, Contracting Officer  
Department of Energy  
Berkeley Site Office

Approval:

Date: December 10, 2009

Aundra M. Richards, Site Manager  
Department of Energy  
Berkeley Site Office





## Table of Contents

<b>I. OVERALL SUMMARY RATING/FEE</b> .....	<b>1</b>
<b>II. PERFORMANCE GOALS, OBJECTIVES, AND MEASURES/TARGETS</b> .....	<b>5</b>
<b>1.0 PROVIDE FOR EFFICIENT AND EFFECTIVE MISSION ACCOMPLISHMENT (QUALITY, PRODUCTIVITY, LEADERSHIP, &amp; TIMELINESS OF RESEARCH AND DEVELOPMENT)</b> .....	<b>5</b>
1.1 SCIENCE AND TECHNOLOGY RESULTS PROVIDE MEANINGFUL IMPACT ON THE FIELD .....	5
1.2 PROVIDE QUALITY LEADERSHIP IN SCIENCE AND TECHNOLOGY .....	5
1.3 PROVIDE AND SUSTAIN SCIENCE AND TECHNOLOGY OUTPUTS THAT ADVANCE PROGRAM OBJECTIVES AND GOALS .....	6
1.4 PROVIDE FOR EFFECTIVE DELIVERY OF SCIENCE AND TECHNOLOGY .....	6
<b>2.0 PROVIDE FOR EFFICIENT AND EFFECTIVE DESIGN, FABRICATION, CONSTRUCTION AND OPERATIONS OF FACILITIES</b> .....	<b>9</b>
2.1 PROVIDE EFFECTIVE FACILITY DESIGN(S) AS REQUIRED TO SUPPORT LABORATORY PROGRAMS.....	9
2.2 PROVIDE FOR THE EFFECTIVE AND EFFICIENT CONSTRUCTION OF FACILITIES AND/OR FABRICATION OF COMPONENTS .....	9
2.3 PROVIDE EFFICIENT AND EFFECTIVE OPERATION OF FACILITIES .....	9
2.4 UTILIZATION OF FACILITY TO GROW AND SUPPORT LAB’S RESEARCH BASE AND EXTERNAL USER COMMUNITY.....	9
<b>3.0 PROVIDE EFFECTIVE AND EFFICIENT SCIENCE AND TECHNOLOGY RESEARCH PROJECT/PROGRAM MANAGEMENT</b> .....	<b>12</b>
3.1 PROVIDE EFFECTIVE AND EFFICIENT STEWARDSHIP OF SCIENTIFIC CAPABILITIES AND PROGRAM VISION .....	12
3.2 PROVIDE EFFECTIVE AND EFFICIENT SCIENCE AND TECHNOLOGY PROJECT/PROGRAM PLANNING AND MANAGEMENT .....	12
3.3 PROVIDE EFFICIENT AND EFFECTIVE COMMUNICATIONS AND RESPONSIVENESS TO CUSTOMER NEEDS .....	12
<b>4.0 PROVIDE SOUND AND COMPETENT LEADERSHIP AND STEWARDSHIP OF THE LABORATORY</b> .....	<b>15</b>
4.1 PROVIDE A DISTINCTIVE VISION FOR THE LABORATORY AND AN EFFECTIVE PLAN FOR ACCOMPLISHMENT OF THE VISION TO INCLUDE STRONG PARTNERSHIPS REQUIRED TO CARRY OUT THOSE PLANS.....	15
4.2 PROVIDE FOR RESPONSIVE AND ACCOUNTABLE LEADERSHIP THROUGHOUT THE ORGANIZATION.....	17
4.3 PROVIDE EFFICIENT AND EFFECTIVE CORPORATE OFFICE SUPPORT AS APPROPRIATE.....	18
<b>5.0 SUSTAIN EXCELLENCE AND ENHANCE EFFECTIVENESS OF INTEGRATED SAFETY, HEALTH AND ENVIRONMENTAL PROTECTION</b> .....	<b>20</b>
5.1 PROVIDE A WORK ENVIRONMENT THAT PROTECTS WORKERS AND THE ENVIRONMENT .....	20
5.2 PROVIDE EFFICIENT AND EFFECTIVE IMPLEMENTATION OF INTEGRATED SAFETY, HEALTH AND ENVIRONMENT MANAGEMENT .....	22
5.3 PROVIDE EFFICIENT AND EFFECTIVE WASTE MANAGEMENT, MINIMIZATION, AND POLLUTION PREVENTION.....	23
<b>6.0 DELIVER EFFICIENT, EFFECTIVE, AND RESPONSIVE BUSINESS SYSTEMS AND RESOURCES THAT ENABLE THE SUCCESSFUL ACHIEVEMENT OF THE LABORATORY MISSION(S)</b> .....	<b>25</b>
6.1 PROVIDE AN EFFICIENT, EFFECTIVE, AND RESPONSIVE FINANCIAL MANAGEMENT SYSTEM(S) .....	25
6.2 PROVIDE AN EFFICIENT, EFFECTIVE, AND RESPONSIVE ACQUISITION MANAGEMENT SYSTEM .....	26
6.3 PROVIDE AN EFFICIENT, EFFECTIVE, AND RESPONSIVE PROPERTY MANAGEMENT SYSTEM .....	27
6.4 PROVIDE AN EFFICIENT, EFFECTIVE, AND RESPONSIVE HUMAN RESOURCES MANAGEMENT SYSTEM AND DIVERSITY PROGRAM.....	27

6.5	PROVIDE EFFICIENT, EFFECTIVE, AND RESPONSIVE MANAGEMENT SYSTEMS FOR INTERNAL AUDIT AND OVERSIGHT; QUALITY; INFORMATION MANAGEMENT; AND OTHER ADMINISTRATIVE SUPPORT SERVICES AS APPROPRIATE .....	28
6.6	DEMONSTRATE EFFECTIVE TRANSFER OF TECHNOLOGY AND COMMERCIALIZATION OF INTELLECTUAL ASSETS .....	29
<b>7.0</b>	<b>SUSTAIN EXCELLENCE IN OPERATING, MAINTAINING, AND RENEWING THE FACILITY AND INFRASTRUCTURE PORTFOLIO TO MEET LABORATORY NEEDS .....</b>	<b>31</b>
7.1	MANAGE FACILITIES AND INFRASTRUCTURE IN AN EFFICIENT AND EFFECTIVE MANNER THAT OPTIMIZES USAGE AND MINIMIZES LIFE CYCLE COSTS .....	31
7.2	PROVIDE PLANNING FOR AND ACQUIRE THE FACILITIES AND INFRASTRUCTURE REQUIRED TO SUPPORT FUTURE LABORATORY PROGRAMS.....	32
<b>8.0</b>	<b>SUSTAIN AND ENHANCE THE EFFECTIVENESS OF INTEGRATED SAFEGUARDS AND SECURITY MANAGEMENT (ISSM) AND EMERGENCY MANAGEMENT SYSTEMS.....</b>	<b>34</b>
8.1	PROVIDE AN EFFICIENT AND EFFECTIVE EMERGENCY MANAGEMENT SYSTEM .....	34
8.2	PROVIDE AN EFFICIENT AND EFFECTIVE SYSTEM FOR CYBER-SECURITY.....	35
8.3	PROVIDE AN EFFICIENT AND EFFECTIVE SYSTEM FOR THE PROTECTION OF SPECIAL NUCLEAR MATERIALS, CLASSIFIED MATTER, AND PROPERTY .....	35
8.4	PROVIDE AN EFFICIENT AND EFFECTIVE SYSTEM FOR THE PROTECTION OF CLASSIFIED AND SENSITIVE INFORMATION.....	35
<b>APPENDIX A - OFFICE OF SCIENCE FY 2009 SCIENCE AND TECHNOLOGY EVALUATION OF LAWRENCE BERKELEY NATIONAL LABORATORY .....</b>		<b>A-1</b>
<b>APPENDIX B – NON- OFFICE OF SCIENCE FY 2009 SCIENCE AND TECHNOLOGY EVALUATION OF LAWRENCE BERKELEY NATIONAL LABORATORY .....</b>		<b>B-1</b>



## I. OVERALL SUMMARY RATING/FEE

### Performance-Based Score and Adjectival Rating:

The basis for the evaluation of The Regents of the University of California (the Contractor) for the management and operations of the Ernest Orlando Lawrence Berkeley National Laboratory (the Laboratory) during FY2009 centered on the Objectives found within the following Performance Goals:

- 1.0 Provide for Efficient and Effective Mission Accomplishment (Quality, Productivity, Leadership, & Timeliness of Research and Development)
- 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operations of Facilities
- 3.0 Provide Effective and Efficient Science and Technology Research Project/Program Management
- 4.0 Provide Sound and Competent Leadership and Stewardship of the Laboratory
- 5.0 Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health, and Environmental Protection
- 6.0 Deliver Efficient, Effective, and Responsive Business Systems and Resources that Enable the Successful Achievement of the Laboratory Mission(s)
- 7.0 Sustain Excellence in Operating, Maintaining, and Renewing the Facility and Infrastructure Portfolio to Meet Laboratory Needs
- 8.0 Sustain and Enhance the Effectiveness of Integrated Safeguards and Security Management (ISSM) and Emergency Management Systems

Each Performance Goal was composed of two or more weighted Objectives and most Objectives had a set of performance measures, which assisted in determining the Contractor's overall performance in meeting that Objective. Each of the performance measures identified significant activities, requirements, and/or milestones important to the success of the corresponding Objective. The following describes the methodology utilized in determining the Contractor performance rating.

Each Objective within a Goal was assigned a numerical score by the evaluating office. Each evaluation measured the degree of effectiveness and performance of the Contractor in meeting the Objective and was based on the Contractor's success in meeting the set of Performance Measures/Targets identified for each Objective as well as other performance information available to the evaluating office from other sources to include, but not limited to, the Contractor's self-evaluation report, operational awareness (daily oversight) activities; "For Cause" reviews (if any); other outside agency reviews (OIG, GAO, DCAA, etc.), and the annual 2-week review (if needed). If no performance measures/targets were utilized the description of the general expectations for the success of the objective was utilized as the baseline of the effectiveness and performance of the Contractor in meeting the corresponding Objective and in determining the score assigned. The Goal score was then computed by multiplying the numerical score by the weight of each Objective within a Goal. These values were then added together to develop an overall score for each Goal. This score was then compared to Table A to determine the overall grade for each Goal. A set of tables is provided at the end of each Performance Goal section of this document to assist in the calculation of Objective scores to the Goal score. The raw score (rounded to the nearest hundredth) from each calculation was carried through to the next stage of the calculation process. The raw score for Science and Technology and Management and Operations was rounded to the nearest tenth of a point for utilization in determining fee as discussed below. A standard rounding convention of x.44 and less rounds down to the nearest tenth (here, x.4), while x.45 and greater rounds up to the nearest tenth (here, x.50).



Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
<b>Total Score</b>	<b>4.3-4.1</b>	<b>4.0-3.8</b>	<b>3.7-3.5</b>	<b>3.4-3.1</b>	<b>3.0-2.8</b>	<b>2.7-2.5</b>	<b>2.4-2.1</b>	<b>2.0-1.8</b>	<b>1.7-1.1</b>	<b>1.0-0.8</b>	<b>0.7-0</b>

**Table A. FY2009 Contractor Letter Grade Scale**

Based on the evaluation of *The Regents of the University of California's* performance against the Goals and Objectives contained within the FY2009 Performance Evaluation and Measurement Plan (PEMP) the scores and corresponding grades awarded for each are provided within Table B below. Specific information regarding the Contractor's performance in meeting each of the Goals and their corresponding Objectives is provided within Section II of this report.

S&T Performance Goal	Numerical Score	Letter Grade	Weight	Weighted Score	Total Score
1.0 Mission Accomplishment	3.7	A-	35.9%	1.33	
2.0 Design, Fabrication, Construction and Operations of Facilities	3.6	A-	39.6%	1.43	
3.0 Science and Technology Research Project/Program Management	3.4	B+	24.5%	0.83	
<b>Total Score</b>					<b>3.6</b>
M&O Performance Goal	Numerical Score	Letter Grade	Weight	Weighted Score	Total Score
4.0 Leadership and Stewardship of the Laboratory	3.3	B+	25%	0.83	
5.0 Integrated Safety, Health, and Environmental Protection	3.0	B	27%	0.81	
6.0 Business Systems	3.6	A-	20%	0.72	
7.0 Operating, Maintaining, and Renewing Facility and Infrastructure Portfolio	3.1	B+	20%	0.62	
8.0 Integrated Safeguards and Security Management and Emergency Management Systems	3.6	A-	8%	0.29	
<b>Total Score</b>					<b>3.3</b>

**Table B. FY2009 Contractor Evaluation Score Calculation**

Performance-Based Fee Earned:

Utilizing Table B, above, the scores for each of the Science and Technology (S&T) Goals and Management and Operations (M&O) Goals were multiplied by the weight assigned and these were summed to provide an overall score for each. The percentage of the available performance-based fee that was earned by the Contractor was determined based on the overall weighted score for the S&T Goals (see Table B.) and then compared to Table C. below. The overall numerical score of the M&O Goals from Table B. was then utilized to determine the final fee multiplier (see Table C.), which was utilized to determine the overall amount of performance-based fee earned for FY2009 as calculated within Table D. Based on the overall performance within the S&T and M&O Goals the



Contractor is awarded \$4,230,000 in performance based fee for FY2009.

Overall Weighted Score from Table A.	Percent S&T Fee Earned	M&O Fee Multiplier
4.3	100%	100%
4.2		
4.1		
4.0	97%	100%
3.9		
3.8		
3.7	94%	100%
3.6		
3.5		
3.4	91%	100%
3.3		
3.2		
3.1		
3.0	88%	95%
2.9		
2.8		
2.7	85%	90%
2.6		
2.5		
2.4	75%	85%
2.3		
2.2		
2.1		
2.0	50%	75%
1.9		
1.8		
1.7	0%	60%
1.6		
1.5		
1.4		
1.3		
1.2		
1.1		
1.0 to 0.8	0%	0%
0.7 to 0.0	0%	0%

Table C. – Performance-Based Fee Earned Scale

Overall Fee Determination	
Percent S&T Fee Earned from Table C.	94%
M&O Fee Multiplier from Table C.	100%
Overall Earned Performance-Based Fee	94%

Table D. – Final Percentage of Performance-Based Fee Earned Determination



Performance Fee and Rating Adjustment Factor:

There was no performance fee and adjustment factor utilized for the FY2009 rating period.

<b>Performance Adjustment Determination</b>	
<b>Percent Fee Earned from Table D.</b>	<b>94%</b>
<b>Percentage of Performance Adjustment</b>	<b>0</b>
<b>Final Percentage of Fee Earned</b>	<b>94%</b>
<b>Final Performance Grade Awarded</b>	<b>A- / B+</b>

**Table E. Performance Adjustment Factor Calculation**

Based on the performance determination the Contractor is awarded \$4,230,000 in performance based fee for FY2009.

## II. PERFORMANCE GOALS, OBJECTIVES, AND MEASURES/TARGETS

For Science and Technology the format used by the program offices did not compute overall scores for all programs at the objective level, only at the goal level. Therefore no overall score and rating is identified at the objective level.

### 1.0 Provide for Efficient and Effective Mission Accomplishment (Quality, Productivity, Leadership, & Timeliness of Research and Development)

The Contractor produces high-quality, original, and creative results that advance science and technology; demonstrates sustained scientific progress and impact; receives appropriate external recognition of accomplishments; and contributes to overall research and development goals of the Department and its customers.

The weight of this Goal is 35.9%.

The performance evaluation narrative for goal 1.0 and its objectives is found at Appendix A and B of this report.

#### 1.1 Science and Technology Results Provide Meaningful Impact on the Field

Program	Page #
ASCR	A-2
BER	A-10
BES	A-17
FES	A-23
HEP	A-26
NP	A-30
WDTS	A-37
EERE	B-7
FE	B-26

#### 1.2 Provide Quality Leadership in Science and Technology

Program	Page #
ASCR	A-3
BER	A-11
BES	A-18
FES	A-23
HEP	A-26
NP	A-32
WDTS	A-37
EERE	B-7
FE	B-27



### 1.3 Provide and sustain Science and Technology Outputs that Advance Program Objectives and Goals

Program	Page #
ASCR	A-3
BER	A-12
BES	A-19
FES	A-24
HEP	A-27
NP	A-33
WDTS	A-38
EERE	B-8
FE	B-27

### 1.4 Provide for Effective Delivery of Science and Technology

Program	Page #
ASCR	A-4
BER	A-13
BES	A-19
FES	A-24
HEP	A-27
NP	A-33
WDTS	A-38
EERE	B-8
FE	B-28



Science Program Office	Letter Grade	Numerical Score	Objective Weight	Weighted Score	Overall Score
<b>Office of Advanced Scientific Computing Research</b>					
1.1 Impact	A-	3.6	40%	1.44	
1.2 Leadership	A-	3.5	30%	1.05	
1.3 Output	A-	3.5	15%	0.53	
1.4 Delivery	B+	3.4	15%	0.51	
<b>Total</b>					3.53
<b>Office of Basic Energy Sciences</b>					
1.1 Impact	A	3.9	50%	1.95	
1.2 Leadership	A+	4.1	20%	0.82	
1.3 Output	A	3.9	15%	0.59	
1.4 Delivery	A	3.8	15%	0.57	
<b>Total</b>					3.93
<b>Office of Biological and Environmental Research</b>					
1.1 Impact	A	3.8	30%	1.14	
1.2 Leadership	A	3.8	20%	0.76	
1.3 Output	A	3.8	20%	0.76	
1.4 Delivery	A-	3.6	30%	1.08	
<b>Total</b>					3.74
<b>Office of Fusion Energy Sciences</b>					
1.1 Impact	B+	3.1	30%	0.93	
1.2 Leadership	B+	3.4	20%	0.68	
1.3 Output	B+	3.4	25%	0.85	
1.4 Delivery	B+	3.1	25%	0.78	
<b>Total</b>					3.24
<b>Office of High Energy Physics</b>					
1.1 Impact	A	3.8	30%	1.14	
1.2 Leadership	A	3.8	30%	1.14	
1.3 Output	A-	3.6	30%	1.08	
1.4 Delivery	A	3.8	10%	0.38	
<b>Total</b>					3.74
<b>Office of Nuclear Physics</b>					
1.1 Impact	A	3.8	35%	1.33	
1.2 Leadership	A-	3.7	25%	0.93	
1.3 Output	A-	3.7	25%	0.93	
1.4 Delivery	A-	3.6	15%	0.54	
<b>Total</b>					3.72
<b>Office of Workforce Development</b>					
1.1 Impact	B+	3.1	25%	0.78	
1.2 Leadership	B+	3.1	30%	0.93	
1.3 Output	B+	3.1	30%	0.93	
1.4 Delivery	B+	3.1	15%	0.47	
<b>Total</b>					3.10

**Table 1.1 - 1.0 SC Program Office Performance Goal Score Development**

Science Program Office	Letter Grade	Numerical Score	BA Weight	Weighted Score	Overall Score
Office of Advanced Scientific Computing Research	A-	3.53	28.6%	1.01	
Office of Basic Energy Sciences	A	3.93	27.8%	1.09	
Office of Biological and Environmental Research	A-	3.74	19.5%	0.73	
Office of Fusion Energy Sciences	B+	3.24	1.9%	0.06	
Office of High Energy Physics	A-	3.74	15.0%	0.56	
Office of Nuclear Physics	A-	3.72	7.0%	0.26	
Office of Workforce Development	B+	3.10	0.3%	0.01	
<b>Performance Goal 1 Total</b>					<b>3.72</b>

Table 1.2 - SC Program Office Overall Performance Goal Score Development

HQ Program Office	Letter Grade	Numerical Score	Objective Weight	Weighted Score	Overall Score
<b>Energy Efficiency and Renewable Energy</b>					
1.1 Impact	A-	3.7	35%	1.31	
1.2 Leadership	A-	3.7	35%	1.31	
1.3 Output	A-	3.7	15%	0.56	
1.4 Delivery	A-	3.7	15%	0.56	
<b>Overall EERE Total</b>					<b>3.73</b>
<b>Fossil Energy</b>					
1.1 Impact	A+	4.09	25%	1.02	
1.2 Leadership	A+	4.09	25%	1.02	
1.3 Output	A+	4.09	25%	1.02	
1.4 Delivery	A+	4.09	25%	1.02	
<b>Overall FE Total</b>					<b>4.09</b>

Table 1.3 - Other Program Office Performance Goal Score Development

HQ Program Office	Letter Grade	Numerical Score	BA Weight	Weighted Score	Overall Score
Office of Science	A-	3.72	87.2%	3.24	
Energy Efficiency and Renewable Energy	A-	3.71	9.4%	0.35	
Fossil Energy	A+	4.10	3.4%	0.14	
<b>Performance Goal 1.0 Total</b>					<b>3.73</b>

Table 1.4 - Overall Performance Goal Score Development

Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

Table 1.5 – 1.0 Goal Final Letter Grade

## 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operations of Facilities

**The Contractor provides effective and efficient strategic planning; fabrication, construction and/or operations of Laboratory facilities; and is responsive to the user community.**

The weight of this Goal is 39.6%

The performance evaluation narrative for goal 2.0 and its objectives is found at Appendix A and B of this report.

### Objectives:

#### 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs

Program	Page #
ASCR	A-5
BER	A-13
BES	A-20
FES	A-24
HEP	A-27
NP	A-34
WDTS	A-38

#### 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components

Program	Page #
ASCR	A-5
BER	A-13
BES	A-20
FES	A-24
HEP	A-28
NP	A-34
WDTS	A-38

#### 2.3 Provide Efficient and Effective Operation of Facilities

Program	Page #
ASCR	A-6
BER	A-13
BES	A-20
FES	A-24
HEP	A-28
NP	A-34
WDTS	A-38

#### 2.4 Utilization of Facility to Grow and Support Lab's Research Base and External User Community

Program	Page #
ASCR	A-7
BER	A-14



BES            A-21  
FES            A-24  
HEP            A-28  
NP             A-35  
WDTS         A-39

Science Program Office	Letter Grade	Numerical Score	Objective Weight	Weighted Score	Overall Score
<b>Office of Advanced Scientific Computing Research</b>					
2.1 Effective Facility Designs	A-	3.7	10%	0.37	
2.2 Construction/Fabrication	B+	3.4	10%	0.34	
2.3 Operation of Facilities	A-	3.6	70%	2.52	
2.4 Support Research Base	B+	3.4	10%	0.34	
<b>Total</b>					3.57
<b>Office of Basic Energy Sciences</b>					
2.1 Effective Facility Designs	A	4.0	20%	0.80	
2.2 Construction/Fabrication	A	4.0	15%	0.60	
2.3 Operation of Facilities	A	4.0	50%	2.00	
2.4 Support Research Base	A	4.0	15%	0.60	
<b>Total</b>					4.00
<b>Office of Biological and Environmental Research</b>					
2.1 Effective Facility Designs			0%	0.00	
2.2 Construction/Fabrication			0%	0.00	
2.3 Operation of Facilities	A	3.9	90%	3.51	
2.4 Support Research Base	A-	3.6	10%	0.36	
<b>Total</b>					3.87
<b>Office of High Energy Physics</b>					
2.1 Effective Facility Designs	A-	3.6	50%	1.80	
2.2 Construction/Fabrication	B+	3.4	50%	1.70	
2.3 Operation of Facilities			0%	0.00	
2.4 Support Research Base			0%	0.00	
<b>Total</b>					3.50
<b>Office of Nuclear Physics</b>					
2.1 Effective Facility Designs			0%	0.00	
2.2 Construction/Fabrication			0%	0.00	
2.3 Operation of Facilities	A-	3.7	85%	3.15	
2.4 Support Research Base	A-	3.6	15%	0.54	
<b>Total</b>					3.69

**Table 2.1 - 2.0 SC Program Office Performance Goal Score Development**

Science Program Office	Letter Grade	Numerical Score	BA Weight	Weighted Score	Overall Score
Office of Advanced Scientific Computing Research	A-	3.57	21.9%	0.78	
Office of Basic Energy Sciences	A	4.00	35.5%	1.42	
Office of Biological and Environmental Research	A	3.87	29.9%	1.16	
Office of High Energy Physics	A-	3.50	8.7%	0.30	
Office of Nuclear Physics	A-	3.69	4.0%	0.15	
<b>Performance Goal 2 Total</b>					<b>3.81</b>

**Table 2.2 - SC Program Office Overall Performance Goal Score Development**

HQ Program Office	Letter Grade	Numerical Score	Objective Weight	Weighted Score	Overall Score
Energy Efficiency and Renewable Energy					
2.1 Effective Facility Designs			0%	0.00	
2.2 Construction/Fabrication			0%	0.00	
2.3 Operation of Facilities	A-	3.7	100%	3.71	
2.4 Support Research Base			0%	0.00	
<b>Total</b>					<b>3.71</b>

**Table 2.3 - HQ Program Office Performance Goal Score Development**

HQ Program Office	Letter Grade	Numerical Score	BA Weight	Weighted Score	Overall Score
Office of Science	A	3.81	98.6%	3.76	
Energy Efficiency and Renewable Energy	A-	3.71	1.4%	0.05	
<b>Performance Goal 2 Total</b>					<b>3.81</b>

**Table 2.4 - Overall Program Office Performance Goal Score Development**

Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

**Table 2.5 – 2.0 Goal Final Letter Grade**

### 3.0 Provide Effective and Efficient Science and Technology Research Project/Program Management

**The Contractor provides effective program vision and leadership; strategic planning and development of initiatives; recruits and retains a quality scientific workforce; and provides outstanding research processes, which improve research productivity.**

The weight of this Goal is 24.5%

The performance evaluation narrative for goal 3.0 and its objectives is found at Appendix A and B of this report.

#### Objectives:

#### 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Program	Page #
ASCR	A-7
BER	A-15
BES	A-21
FES	A-25
HEP	A-28
NP	A-35
WDTS	A-39
EERE	B-8
FE	B-29

#### 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management

Program	Page #
ASCR	A-8
BER	A-15
BES	A-22
FES	A-25
HEP	A-28
NP	A-35
WDTS	A-39
EERE	B-8
FE	B-29

#### 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs

Program	Page #
ASCR	A-8
BER	A-15
BES	A-22
FES	A-25
HEP	A-28
NP	A-36
WDTS	A-40
EERE	B-9
FE	B-29



Science Program Office	Letter Grade	Numerical Score	Objective Weight	Weighted Score	Overall Score
<b>Office of Advanced Scientific Computing Research</b>					
3.1 Effective/Efficient Stewardship	B+	3.3	30%	0.99	
3.2 Project/Program Planning & Management	B	2.8	40%	1.12	
3.3 Communications and Responsiveness	B	3.0	30%	0.90	
<b>Total</b>					3.01
<b>Office of Basic Energy Sciences</b>					
3.1 Effective/Efficient Stewardship	A-	3.7	40%	1.48	
3.2 Project/Program Planning & Management	A-	3.5	30%	1.05	
3.3 Communications and Responsiveness	B+	3.2	30%	0.96	
<b>Total</b>					3.49
<b>Office of Biological and Environmental Research</b>					
3.1 Effective/Efficient Stewardship	A	3.9	20%	0.78	
3.2 Project/Program Planning & Management	A	3.8	30%	1.14	
3.3 Communications and Responsiveness	B+	3.1	50%	1.55	
<b>Total</b>					3.47
<b>Office of Fusion Energy Sciences</b>					
3.1 Effective/Efficient Stewardship	B+	3.1	35%	1.09	
3.2 Project/Program Planning & Management	B+	3.1	30%	0.93	
3.3 Communications and Responsiveness	B+	3.1	35%	1.09	
<b>Total</b>					3.10
<b>Office of High Energy Physics</b>					
3.1 Effective/Efficient Stewardship	A-	3.6	40%	1.44	
3.2 Project/Program Planning & Management	B+	3.1	40%	1.24	
3.3 Communications and Responsiveness	B	3.0	20%	0.60	
<b>Total</b>					3.28
<b>Office of Nuclear Physics</b>					
3.1 Effective/Efficient Stewardship	A	3.9	40%	1.56	
3.2 Project/Program Planning & Management	A-	3.7	40%	1.48	
3.3 Communications and Responsiveness	B+	3.4	20%	0.68	
<b>Total</b>					3.72
<b>Office of Workforce Development</b>					
3.1 Effective/Efficient Stewardship	B+	3.2	20%	0.64	
3.2 Project/Program Planning & Management	B+	3.2	40%	1.28	
3.3 Communications and Responsiveness	B+	3.4	40%	1.36	
<b>Total</b>					3.28

**Table 3.1 – 3.0 SC Program Office Performance Goal Score Development**

Science Program Office	Letter Grade	Numerical Score	BA Weight	Weighted Score	Overall Score
Office of Advanced Scientific Computing Research	B	3.01	20.3%	0.61	
Office of Basic Energy Sciences	A-	3.49	26.3%	0.92	
Office of Biological and Environmental Research	A-	3.47	27.6%	0.96	
Office of Fusion Energy Sciences	B+	3.10	2.2%	0.07	
Office of High Energy Physics	B+	3.28	16.0%	0.52	
Office of Nuclear Physics	A-	3.72	7.4%	0.28	
Office of Workforce Development	B+	3.28	0.2%	0.01	
<b>Performance Goal 3 Total</b>					<b>3.36</b>

Table 3.2 – SC Program Office Overall Performance Goal Score Development

HQ Program Office	Letter Grade	Numerical Score	Objective Weight	Weighted Score	Overall Score
<b>Energy Efficiency and Renewable Energy</b>					
3.1 Effective/Efficient Stewardship	A-	3.7	50%	1.85	
3.2 Project/Program Planning & Management	A-	3.7	25%	0.93	
3.3 Communications and Responsiveness	A-	3.7	25%	0.93	
<b>Total</b>					<b>3.71</b>
<b>Fossil Energy</b>					
3.1 Effective/Efficient Stewardship	A	4.0	40%	1.60	
3.2 Project/Program Planning & Management	A	4.0	30%	1.20	
3.3 Communications and Responsiveness	A	4.0	30%	1.20	
<b>Total</b>					<b>4.00</b>

Table 3.3 – 3.0 HQ Program Office Performance Goal Score Development

HQ Program Office	Letter Grade	Numerical Score	BA Weight	Weighted Score	Overall Score
Office of Science	B+	3.36	90.9%	3.05	
Energy Efficiency and Renewable Energy	A	3.71	6.9%	0.26	
Fossil Energy	A	4.00	2.1%	0.09	
<b>Performance Goal 3.0 Total</b>					<b>3.40</b>

Table 3.4 - Overall Performance Goal Score Development

Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

Table 3.5 – 3.0 Goal Final Letter Grade

#### 4.0 Provide Sound and Competent Leadership and Stewardship of the Laboratory

**The Contractor's Leadership provides effective and efficient direction in strategic planning to meet the mission and vision of the overall Laboratory; is accountable and responsive to specific issues and needs when required; and corporate office leadership provides appropriate levels of resources and support for the overall success of the Laboratory.**

The weight of this Goal is 25%.

The Provide Sound and Competent Leadership and Stewardship of the Laboratory Goal measured the Contractor's Leadership capabilities in leading the direction of the overall Laboratory. It also measured the responsiveness of the Contractor to issues and opportunities for continuous improvement and corporate office involvement/commitment to the overall success of the Laboratory.

For Goal 4.0, Lawrence Berkeley National Laboratory (LBNL) achieved a numerical score of **3.3**, the equivalent of a grade of **B+**. Goal 4.0 has three objectives with 11 measures.

FY2009 was a year of transition for the laboratory's leadership. After former LBNL Director Steven Chu was confirmed as Secretary of Energy in January 2009, Deputy Director Paul Alivisatos was named Interim Director and Physical Biosciences Division Director was named Acting Deputy Director. The Department sees great potential for performance that could exceed expectations in the coming years.

#### 4.1 Provide a Distinctive Vision for the Laboratory and an Effective Plan for Accomplishment of the Vision to Include Strong Partnerships Required to Carry Out those Plans

The Laboratory's score for FY2009 under this performance objective is **3.3**, the equivalent of a grade of **B+**. Performance Objective 4.1 has five measures, each with associated target(s).

**The Annual Laboratory Plan provides all required data in a clear and concise manner and is completed within established guidelines and schedules. The Laboratory Mission included in the plan provides a clear understanding of the distinctive characteristics of the Laboratory.**

LBNL updated its Annual Laboratory Plan (ALP) in FY2009 according to SC's guidance. It integrates the Laboratory's core capabilities and science mission strategies with financial expectations and facilities and infrastructure (F&I) plans. An overview of the Plan was presented to SC leadership in HQ on April 28, 2009. LBNL's distinctive characteristics are delineated in fourteen core capabilities and seven science strategy areas with twenty initiatives applicable to a broad spectrum of DOE missions. The science strategy areas are: 1) Soft X-Ray Science for Energy Research, 2) Nanosystems for Solar Fuels and Energy Storage, 3) Dark Matter and Dark Energy R&D, 4) Computational Science at the Extreme, 5) Systems and Materials for Energy Efficiency, 6) Biological and Environmental Strategies for Energy Research, and 7) Accelerator Science and Engineering for Energy Research. As an indicator of both the quality and breadth of its research, LBNL won four R&D 100 Awards in 2009: cost-competitive solar cells, more computer memory at less cost, atomic scale matter in 3-D, and a more powerful analytical way to find geologic energy sources.

Strategic site investments totaling over \$1.2B over the next decade are included in the ALP to seismically upgrade or replace deficient buildings, demolish outdated buildings, construct new office and laboratory space, and modernize facilities and infrastructure to improve the condition of site assets and ensure mission readiness. A combination of DOE program, SC Science Laboratory Infrastructure (SLI), LBNL indirect, and UC contractor resources are included to support this ambitious plan. While the planning process is inherently dynamic, DOE is concerned that the Laboratory's F&I plans were in a state of considerable flux during the year, especially the multi-facility SLI Seismic Phase 2 & 3 projects.

**Strategic partnerships are developed that demonstrate the Laboratory's leadership, leverage DOE resources, and support collaborative programs with other DOE laboratories and academic, and industry groups.**



LBNL continued to expand a broad and diverse portfolio of research partnerships and collaborations with other DOE national laboratories, federal research agencies, universities, and the private-sector. Over a dozen new MOUs with international institutions for collaborative research were also developed during the year. Collectively, these demonstrate the Laboratory's leadership and leverage its capabilities to advance DOE missions. Highlights of notable accomplishments in FY2009 follow. LBNL continued to provide technical and management leadership of the NSF-sponsored Deep Underground Science and Engineering Laboratory (DUSEL) at the Homestake mine in Lead, S.D. The Project submitted a proposal to NSF for the design phase of the facility that will integrate experimental efforts into the design, including long baseline neutrino experiments.

LBNL led the four SC laboratories with synchrotron light sources (LBNL, SLAC, ANL, BNL) in developing a plan and report for "Science and Technology of Future Light Sources." A key part of this is the Laboratory's planned Next-Generation Light Source based on a superconducting RF accelerator, high-rep rate soft X-ray free electron laser facility for ultrafast science. LBNL also successfully led a five institution partnership (with ANL, BNL, ORNL and UIUC) to develop an install the Transmission Aberration-corrected Microscope (TEAM) at the National Center for Electron Microscopy (NCEM). TEAM 1.0 was completed on schedule and on budget in September 2009, and it is now the world's most powerful electron microscope. In its third year of operations, the Molecular Foundry user base continued to grow and now includes industrial partnerships on 22 active projects and an internship program with three European institutes. Building on its successful Energy Frontier Research Center (EFRC) award for the Nanoscale Control of Geologic CO<sub>2</sub>, LBNL has developed new partnerships in carbon sequestration research, including several with China.

LBNL's Center for Integrated Earth System Modeling (CIESM) established four new multi-laboratory collaborations with ANL, BNL, LANL, LLNL, ORNL, and PNNL on the projection and mitigation of climate change which will be shared with the international scientific community through the joint DOE-NSF Community Climate System Model. The Joint Bioenergy Institute (JBEI), an LBNL-led collaboration with SNLL, LLNL, UC Berkeley, UC Davis, and the Carnegie Institute for Science, had a productive second year of R&D into cellulosic biofuels, with expanding invention disclosures, patents filed, and industry interactions. LBNL continued to lead the Joint Genome Institute (JGI), a national user facility and genomic science collaboration that includes LLNL, LANL, ORNL, PNNL, and the Hudson Alpha Institute for Biotechnology. Following up on recommendations from a science and operations review in Dec. 2008, the JGI initiated the production transition to a new generation of higher-capacity DNA sequencers, prioritized support to the three Bioenergy Research Centers, and established contractual funding agreements and performance metrics with the partner institutions. Although the JGI has begun to strengthen its Informatics and genomic analytical capabilities, DOE remains concerned about continued leadership turnover in this increasingly important area of the facility.

**Effectiveness of the Work-for-Others (WFO), planning, management, and reporting that serves the needs of both LBNL and DOE, facilitates the project approval process.**

LBNL met expectations in its planning and management of the Work For Others (WFO) program, and supported the BSO's review of the activity in March 2009. DOE is pleased by LBNL's decision to invest in a new information technology system to support its sponsored projects and industrial partnerships program, and encourages the development of a plan to fully implement the new system by the end of FY2011.

**Effectiveness in developing and implementing communications and community relations strategies that enhance the reputation of LBNL, the Office of Science, and DOE.**

LBNL reorganized and redirected its public affairs activities toward six communications goals: 1) creating a consistent branding framework for the varied research activities at Berkeley Lab in order to unify the image of the Labs scientific research for more general audiences, 2) developing programs and opportunities for communicating that brand externally in order to raise LBNL's visibility, 3) redesigning and promoting *lbl.gov* as the primary source of timely information about Berkeley Lab, 4) building and nurturing a creative presence in social media, 5) improving and upgrading media relations to leverage good news coming from Berkeley Lab, and 6) securing improved relationships with primary stakeholders at DOE and UCOP. Following are

highlights from FY09 communication efforts. A lay-audience brochure was created titled “21 Berkeley Lab Breakthroughs that Improved the World - and Our Lives” to highlight LBNL’s historical science achievements and their benefits to society. LBNL redesigned its website ([www.lbl.gov](http://www.lbl.gov)) resulting in a 50% increase in usage. New additions include a video glossary to educate the general public on scientific terms and Laboratory research, a webpage for easy access to information on LBNL’s ARRA activities, and a news blog for easy access to articles that feature LBNL news. The “Science at the Theater” program was also redesigned using a panel format moderated by a local newscaster, which increased attendance and interest in the science programs and activities at LBNL.

LBNL initiated a Community Advisory Group to increase communication efforts with the Lab’s stakeholders. LBNL has worked proactively with the City of Berkeley regarding demolition of the Bevatron, particularly planning for truck shipments of shielding blocks and steel through the community. LBNL is a founding member in the *East Bay Green Corridor* partnership which is seeking to create a regional environmental hub and promote the East Bay as a nucleus of green research and manufacturing. In 2009, this partnership expanded from four to eight East Bay cities, and also added three local colleges. To assist the needed demolition and remediation of LBNL’s “Old Town” area, which is essential to create new building space on the site, LBNL secured letters of support from local elected officials to DOE-EM signed by Governor Schwarzenegger, Congresswoman Lee, Berkeley Mayor Bates, and Oakland Mayor Dellums. EM funding for this work is anticipated in FY2010.

**Analysis of the cost baseline developed during FY08 to evaluate strengths and weaknesses of baseline costs in meeting mission needs and recommend areas where cost savings could be realized and additional resources would enhance mission accomplishment.**

LBNL also met expectations in developing a study for understanding drivers and trends in its indirect costs, and presenting it to SC leadership. Expansion of categories in the eBuy supply chain initiative continue to provide cost savings relative to past practices.

#### **4.2 Provide for Responsive and Accountable Leadership throughout the Organization**

LBNL’s score for FY2009 under this performance objective is **3.3**, the equivalent of a grade of **B+**. Objective 4.2 has four measures, each with associated target(s).

**Leadership maintains an effective assurance function with cognizance of robust feedback and continuous improvement. Laboratory risks are managed commensurate with the level of significance and severity.**

During FY2009, LBNL conducted or updated Assurance Gap analyses of eight key Operations systems. Below is a brief summary of the findings and follow-up actions in each of the functional areas:

- ES&H – 4 risk areas with “limited” assurance. These are being addressed through the HSS Review Corrective Action Plan (CAP), and will be closed in FY10.
- Capital Projects - 2 risk areas were identified. They were addressed in FY09 by internally restructuring the management of Small and Capital Projects.
- Information Technology – no significant risks were identified.
- Financial Management – 7 gaps were identified. LBNL’s Internal Audit Services is helping to address findings.
- Procurement – no significant risks were identified.
- Property Management – 4 risk areas were identified. They are being addressed by implementation of a new Property Management Strategic Plan.
- Emergency Management – 7 risks were identified. Three gaps were closed in FY09, and the remaining four are scheduled for completion in FY10.
- Physical Security – 1 gap was identified. It was closed during FY09.

During FY09, LBNL received over \$220 million in American Reinvestment and Recovery Act (ARRA) funding from across all major SC programs, with more expected in FY10 from the DOE applied energy program offices. LBNL was proactive in planning for ARRA activities and establishing the need internal





controls and reporting protocols. It established an ARRA Project Management Plan, and a governing Stimulus Steering Committee to provide decision-making and oversight. ARRA training for management, business, financial, and other affected staff was internally developed and implemented. LBNL also provided good communications and access to LBNL ARRA-related information through its webpage at [www.recovery.lbl.gov](http://www.recovery.lbl.gov).

**Leadership is committed to a pervasive safety culture, and strives for continuous safety performance improvement.**

A site-wide Integrated Safety Management (ISM) review was conducted by the DOE Office of Health, Safety and Security (HSS) in early FY2009. LBNL prepared extensively for the review, and overall HSS found a strong leadership commitment to ISM and a generally good safety culture at LBNL. Still, the review had nearly 100 findings indicating that while the LBNL has pockets of ISM excellence, it is not uniform across the entire laboratory. LBNL did a credible job of causal analysis on the findings, and submitted a Corrective Action Plan (CAP) that was approved by DOE in June 2009. Although LBNL again did not achieve the TRC and DART goals for injury rates in FY09 (1.62/0.56 vs. targets 0.65/0.25, respectively), overall safety performance has improved since last year. The majority of work-related injuries were ergonomic, and LBNL is implementing an aggressive ergonomic evaluation program for ~4000 employees and guests that identified ~80 “high risk” positions for preventative mitigations. Despite a significant increase in construction work on-site over the past several years, FY09 marks the fourth consecutive year without a single construction lost-time injury, significantly better than industry standards.

**The Contractor will demonstrate that its Senior Managers are kept informed about evolving cyber security risks and threats.**

LBNL met expectations in providing risk-focused cyber-security communications to LBNL senior management. The CIO provided the leadership team timely threat updates, and briefed them on cyber-security policy developments, particularly as they related to the Secretary’s review of DOE’s Cyber-Security program.

**Leadership will improve internal communications on scientific, operational, and administrative issues.**

LBNL also met expectations in enhancing internal communications with staff. New efforts in FY09 included: video messages from the Interim Director, usually through a “Today at Berkeley Lab” (TABL) weblink, the addition of “Our Safety” webpage linked to the homepage, frequent safety notices in TABL and via all-hands emails, and the open brown-bag lunches with senior leadership around specific topics (UC salaries & pensions, union contracts, shuttle bus services, workplace survey results).

### **4.3 Provide Efficient and Effective Corporate Office Support as Appropriate**

LBNL’s score for FY2009 under this performance objective is **3.3**, the equivalent of a grade of **B+**. Objective 4.3 has two measures, each with associated target(s).

**University support of programs, business and other operations, including administration, finance, human resources, and facilities, and process and procedure improvements.**

The University of California (UC) completed the Berkeley Guest House at LBNL in FY09. This \$10M, 57 room facility is providing onsite lodging for User facility users and visitors to LBNL. This completes a commitment made in UC’s 2005 proposal to DOE to continue managing and operating LBNL. UC reinvested \$3.144M (~75%) of its FY08 earned fee back into Contractor Supported Research at LBNL. UC senior managers have increased their interactions with senior DOE and SC officials regarding LBNL including participating in visits to LBNL by senior DOE and other officials. The UC Office of the President (UCOP) participated throughout the LBNL ISM review by DOE-HSS in FY09, and also provided support in the corrective action process. UCOP continued to provide a variety of human resources-related support to LBNL including: leadership continuity/new Director search, recruitment and retention, labor relations agreements/new union contracts, pension and retirement resources, business continuity planning, training, diversity planning, et al. UC also worked closely with DOE during the California fiscal crisis to ensure that University cost savings measures were executed in a manner that did not adversely impact the LBNL contract.

**The demonstrated accomplishment of the Contractor to conduct appropriate corporate oversight and assurance.**

The executive-level LBNL Advisory Board (LAB) met in March 2009 and June 2009 and reviewed a range of LBNL science and operations topics including the leadership transition, science programs and initiatives, stimulus/ARRA funding, space and site planning including Old Town, the HSS ISM review, recruitment and retention, Operations climate and Post-Doc surveys, et al. The Board’s reports advise the UC President, UCOP and LBNL leadership, and copies are made available to DOE. The UC Contract Assurance Council (CAC) meets monthly with LBNL Operations leadership, and the BSO Site Manager periodically attends. The CAC works to ensure that the terms of the LBNL contract and UC bylaws are met, and it advises the UCOP Executive VP for Laboratory Management on issues needing management attention. Key CAC focus areas in FY09 included: the HSS ISM review and associated CAP, conflict of interest, ARRA funding management and related systems, LBNL’s assurance program and the gap analyses performed for Operations systems, and Internal Audit Services. During FY09, UCOP, LBNL, and BSO updated a set of *Operating Principles* to promote mutual partnership objectives.

ELEMENT	Letter Grade	Numerical Score	Objective Weight	Total Points	Total Points
<b>4.0 Effectiveness and Efficiency of Contractor Leadership and Stewardship</b>					
4.1 Provide a Distinctive Vision for the Laboratory and an Effective Plan for Accomplishment of the Vision to Include Strong Partnerships Required to Carry Out those Plans	B+	3.3	40%	1.32	
4.2 Provide for Responsive and Accountable Leadership throughout the Organization	B+	3.3	40%	1.32	
4.3 Provide Efficient and Effective Corporate Office Support as Appropriate	B+	3.3	20%	0.66	
<b>Performance Goal 4.0 Total</b>					<b>3.3</b>

**Table 4.1 – 4.0 Goal Performance Rating Development**

<b>Total Score</b>	<b>4.3-4.1</b>	<b>4.0-3.8</b>	<b>3.7-3.5</b>	<b>3.4-3.1</b>	<b>3.0-2.8</b>	<b>2.7-2.5</b>	<b>2.4-2.1</b>	<b>2.0-1.8</b>	<b>1.7-1.1</b>	<b>1.0-0.8</b>	<b>0.7-0</b>
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

**Table 4.2 – 4.0 Goal Final Letter Grade**



## 5.0 Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health and Environmental Protection

The weight of this goal is 27 percent.

The Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health, and Environmental Protection Goal measured the Contractor's overall success in preventing worker injury and illness; implementation of ISM down through and across the organization; and providing effective and efficient waste management, minimization, and pollution prevention.

For FY 2009, Goal 5.0, LBNL earned a numerical score of **3.0**, the equivalent of a grade of **B** based on the targets and measures of the PEMP. Goal 5.0 has three objectives with a total of 14 measures. However, as stated in the PEMP the measures and targets are to be the primary though not exclusive source for performance information.

During this rating period LBNL continued to improve their institutional ISM Program. LBNL management demonstrated a commitment to safety through increased ES&H resources, development of new safety programs and continued improvement in incident reporting. It is very apparent that a major improvement in the safety culture at LBNL has taken hold, with increasing awareness of safety related issues and increased depth of commitment to safety throughout the lab. LBNL's concentrated effort to prepare for, respond to and develop corrective actions for the DOE HSS Office of Independent Oversight evaluation of ISM implementation at LBNL was exemplary. However, notable weaknesses continued to be evident as documented in the HSS inspection report dated, April 16, 2009. DOE-SC's final assessment of LBNL performance took into account systemic safety deficiencies and incidents that have occurred over the past three rating periods. During this rating period LBNL demonstrated a strong desire for safety excellence and prepared an excellent roadmap to achieve "Best in Class" status. LBNL must now demonstrate sustainability through solid implementation of their HSS corrective action plan.

### 5.1 Provide a Work Environment that Protects Workers and the Environment

LBNL's score for FY2009 under this performance objective is **3.1**, the equivalent of a grade of **B+**. Objective 5.1 has six measures, each with associated targets.

#### **Demonstrate effective implementation of the 10 CFR 851 program**

BSO and LBNL continued to meet weekly to discuss new issues entered into the lab's internal tracking system and review issues that have potential for noncompliance with 10 CFR 851. LBNL appropriately analyzed external and internal information to make thoughtful determinations on compliance reporting. The annual update of the LBNL Worker Safety and Health (WSH) Program Description was submitted and approved as expected. While some specific programs under the WSH Program Description are under construction as a result of deficiencies noted in the HSS review, LBNL has met their target for this measure.

#### **Demonstrate effective management of the 10 CFR 830 and 10 CFR 835 program for nuclear safety and quality assurance.**

##### *Nuclear Safety*

LBNL did continue to make good progress on completing scheduled corrective actions for the facility hazard categorization review as demonstrated in BSO verification of completed corrective actions in May 2009. LBNL's management of the CAP under the ISM CAP Project provides a useful mechanism for tracking and documenting progress, and demonstrates LBNL's management commitment to resolving these issues. However, several corrective actions were completed after the target date and many corrective actions had to be rescheduled due to lack of resources, or redefined because they were poorly understood.

LBNL points to no 10 CFR 830 non-compliances being identified as an indicator of good performance. This is misleading: no non-compliance identification could be due to a failure to report non-compliances or not



knowing when non-compliance has occurred. No non-compliance reporting does not equal demonstration of improved nuclear safety compliance.

#### *Radiation Protection*

LBNL's self-assessment bases their performance rating in part due to only a single 10 CFR 835 PAAA violation being reported to NTS for FY09 for "Programmatic Deficiencies in the Sealed Source Program" (NTS—BSO-LBN-EHS-2008-0010). This fails to recognize that NTS—BSO-LBN-EHS-2009-0003, "HSS Assessment – Hazard ID & Assessment Need Improvement" identifies four non-compliances with 10 CFR 835. NTS Report 2009-0003 addresses the ten findings from the HSS ES&H Assessment Report (April 2009), one of which pertained specifically to 10 CFR 835:

"LBNL has not established and implemented sufficient radiation protection requirements in the areas of radiological work authorizations, contamination control, radiological postings and boundary control, technical basis documentation, and training, as needed to ensure adequate radiological safety consistent with all applicable requirements of 10 CFR835, *Occupational Radiation Protection*."

The fact that LBNL's Radiation Protection Program was found in the HSS ES&H Assessment to be deficient should reasonably lead to the conclusion that LBNL's performance requires significant improvement.

#### **Demonstrate progress toward full compliance with DOE facility safety requirements.**

##### *Facility Hazard Categorization CAP:*

As noted in the above measure, LBNL continues to make good progress on the completion of the Facility Hazard Categorization CAP, and LBNL senior management has demonstrated its commitment to development and implementation of a nuclear safety program. BSO is encouraged that additional resources have been allocated to the Radiation Protection Group and several new hires have been made this fiscal year. However, key aspects of the CAP have been delayed due to competing priorities and a less than complete understanding of how to achieve identified corrective actions. For example completion of the site wide confirmatory inventory, issuing the institutional policy for 10 CFR 830, acquisition of allocated resources, and issuing a new institutional procedure for safety basis requirements all had their target dates extended because of competing priorities or simply requiring additional time to complete. Six corrective actions of the thirteen scheduled for completion in FY09 in the NTS report were completed after the target date (3) or are still shown as open (3). While there are demonstrated improvements in inventory control for radiological materials and increased assurance that facilities are maintained below Hazard Category 3 inventories, the development of a methodology for performing hazards analysis for radiological facilities and its implementation continues to lag.

##### *Accelerator Safety Documentation:*

LBNL successfully submitted Safety Assessment Documents (SAD) and their associated Accelerator Safety Envelopes (ASE) for both the 88 Inch Cyclotron and Advanced Light Source (ALS) in FY2009 although BSO revised the deadlines for submittal at LBNL's request. LBNL senior management demonstrated their support of achieving compliance with the Accelerator Safety Order, DOE O 420.2B, through securing resources from LLNL to assist in performing the hazard analyses for these accelerator facilities. RPG has been given the approval to hire a full-time safety analyst to support the development and maintenance of SADs and ASEs, and interviews are ongoing. RPG and accelerator facility personnel worked closely with BSO in support of the review and approval process.

In the course of the SAD/ASE review and approval process, BSO identified systemic issues within LBNL's institutional accelerator safety program. On September 2, 2009, LBNL issued a revised procedure for compliance with DOE O 420.2B (EHS 703) in an effort to address the BSO identified issues. An oversight assessment will be scheduled in FY2010 to evaluate the new institutional accelerator safety program.

**The Contractor's progress in achieving and maintaining "best-in-class" ES&H program performance, as measured by the days away, restricted or transferred (DART) case rate and total recordable (TRC) case rate.**

LBNL continued to aggressively pursue the largest contributor of recordable injury. Significant ES&H resources were provided to assist employees and prevent injury. Nevertheless, LBNL failed to meet the SC goals for recordable injuries.

**Demonstrate progress in inspecting existing electrical equipment not Nationally Recognized Testing Laboratory listed.**

The approach taken to this project was well thought out and executed. A comprehensive training program was developed and implemented to help employees complete the surveys, and additional assistance and resources were provided by the lab when needed to help the divisions be successful.

Starting in March, 2009 there was steady progress made in the number of surveys completed. Database reports were analyzed to determine that most divisions participated and completed an appropriate number of surveys. A few divisions seem to either have not fully completed the surveys or have a significantly small inventory of electrical equipment. An example is PBD, which performed 122 surveys while LSD performed 1531 surveys.

As of September 16, 2009, almost 17,000 pieces of equipment have been surveyed, above the 15,000 estimate that was predicted at the beginning of the program. Overall, the lab was successful in exceeding the target for this measure.

**5.2 Provide Efficient and Effective Implementation of Integrated Safety, Health and Environment Management**

LBNL's score for FY2009 under this performance objective is **2.8**, the equivalent of a grade of **B**. Objective 5.2 has six measures, each with associated targets. While performance against the measures would have suggested a higher grade should be given, the BSO had to consider the impact of several safety incidents and information that evolved from these events regarding LBNL's ability to safely plan and control work. While there is notable improvement in work control across all laboratory divisions, and the ESH Division has made tremendous progress developing good safety programs, there still appears to be ambiguous direction within the Facilities Division regarding implementation of safety regulations. This concern is particularly critical given the large increase in facilities work from ARRA funded projects. These concerns were conveyed in multiple letters to UCOP throughout the performance year.

**Validation of effective ISM implementation within each Laboratory Division**

Each of LBNL's 17 divisions assessed their activities and operations. EH&S Division subject matter experts performed technical reviews of over 20 ES&H programs. LBNL also performed independent assessments of laser safety and fall protection. Using methodology similar to the HSS reviewers, LBNL independently assessment the remaining 6 scientific division that had not been reviewed during the audit.

**Institutional processes effectively report events/incidents and conditions promoting continuous improvement and lessons learned.**

In February of 2009, the HSS Independent Oversight Team identified deficiencies in LBNL's processes and in the accuracy of LBNL's documentation of discovery dates and times that resulted in categorization and notification that did not meet the requirements of DOE Manual 231.1-2. A review of ORPS reports after March of 2009 revealed that, although many of the ORPS reports do not meet the requirements of DOE Manual 231.1-2, the process of categorizing and notifying DOE was improving. For example, a review of the BSO Duty Officer log-book revealed that although there have been 16 reportable events leading to ORPS reports, there were well over 25 calls to the Duty Officer about incidents that were potentially reportable in FY09. This demonstrates a commitment to identifying and reporting incidents and potential ORPS reports to BSO in an expeditious manner. All indications are that LBNL is following their internal procedures for the analysis for recurring cases and the identification of corrective actions and lessons learned in order to initiate process/program improvements.



**Implementation of the JHA processes will be verified and validated as part of the work authorization process.**

A document review was performed using the LBNL internal criteria for active and accurate JHAs. This review concluded that LBNL had met their target for active and accurate JHAs, containing a description of work, identifying tasks and hazards, and implementing controls such as training completion. In addition, BSO performed a field review of representative JHAs to determine if the documents reflected the actual work being performed. This review also concluded that the JHA program is improving and that adequate progress has been made this year toward a fully implemented system.

Opportunities for improvement: Continued enhancement of the “description of work” fields and the specificity of tasks and controls are suggested areas for improvement, and LBNL is addressing these concerns through corrective actions developed for the HSS CAP. Another suggested improvement for document control is having a watermark appear on hard copy JHAs stating that the official copy is found online and that this document is uncontrolled when printed. Several people produced hard copy JHAs during the review that were not active, however the official online version was active.

**Implementation of the Technical Assurance Program (TAP) will be completed per the 3-year schedule. Systemic safety program issues will be identified and their causes analyzed per appropriate causal analysis methodology.**

While still not fully mature, the TAP did continue to evolve. The HSS review noted that: “The LBNL technical assurance program (TAP) has the potential to be a highly effective tool for subject matter experts to assess the adequacy of safety programs and implementation. Although in its early stages of implementation, the TAP concept – including the comprehensive approach to evaluating compliance, performance, and program adequacy defined in the program manual; the formal assessment plans; and the reporting and trending requirements – constitute an effective self-assessment program element.”

One area of the TAP that demonstrated sustained improvement over the past three years and was validated effective in FY2009 was the Laser Safety Program. After significant weaknesses in the Laser Safety Program were identified in reviews in 2005 and 2006, LBNL hired a well qualified laser safety officer and developed a robust laser safety program. LBNL’s TAP conducted a programmatic assessment and BSO verified the effectiveness of the program and TAP assessment.

**Complete required safety-related training identified through the Job Hazard Analysis program.**

This measure was added at midyear, with data collected for the months of June through September, 2009. For three of the four months, all divisions met the target of 90%. At the end of June, two divisions fell under 90% for all required training (physics at 89% and public affairs at 88%), which includes other training such as hosting foreign nationals and cyber-security. In addition, the public affairs number was determined to be low due to a large number of recent hires that hadn’t had the opportunity to attend training yet. 90% of the safety related training was completed, therefore the lab met their performance target for this measure.

**Install safety training-dependent access control system to key LBNL locations requiring restricted access.**

LBNL implemented a new policy to link General Employee Radiological Training (GERT) and card-access entrance to the Lab. Employees without valid GERT will have all their badge access authorizations revoked. LBNL completed an analysis of expanding physical access controls and cost of implementation.

**5.3 Provide Efficient and Effective Waste Management, Minimization, and Pollution Prevention**

LBNL’s score for FY2009 under this performance objective is 3.5, the equivalent of a grade of A-. Objective 5.3 has two measures, each with associated targets.

**The Contractor shall develop, implement, and maintain an Environmental Management System (EMS) that reflects the EMS elements and framework found in the International Organization for Standardization’s (ISO) 14001-2004 (E) International Standard or equivalent.**

LBNL commissioned an independent assessment of their revised Environmental Program (EMS). The review found no nonconformances and three strong points. As a result of the assessment BSO was able to declare their Environmental Management System fully implemented by the deadline established by DOE Order 450.1A.

**The Contractor shall complete the EMS Projects designed to minimize waste, reduce emissions and/or conserve resources.**

LBNL completed 18 projects for implementation of in-house energy conservation measures; updating the subcontract terms to specify sustainable acquisition measures in applicable subcontracts; reducing petroleum fuel use by 2%; renewal of the R&D test site authorization with CARB for E85 fuel dispensing; installing diesel abatement devices on two stationary generators; performing detailed energy study by energy service contractor (NORESKO); and completing phases I and II of the nanoparticle study.

ELEMENT	Letter Grade	Numerical Score	Objective Weight	Weighted Score	Total Points
<b>5.0 Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health and Environmental Protection</b>					
5.1 Provide a Work Environment that Protects Workers and the Environment.	B+	3.1	30%	0.93	
5.2 Provide Efficient and Effective Implementation of Integrated Safety, Health and Environment Management	B	2.8	50%	1.40	
5.3 Provide Efficient and Effective Waste Management, Minimization, and Pollution Prevention.	A-	3.5	20%	0.70	
<b>Performance Goal 5.0 Total</b>					<b>3.0</b>

**Table 5.1 – Goal 5.0 Performance Rating Development**

Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0

**Table 5.2 – Goal 5.0 Final Letter Grade**



## **6.0 Deliver Efficient, Effective, and Responsive Business Systems and Resources that Enable the Successful Achievement of the Laboratory Mission(s)**

The Contractor sustains and enhances core business systems that provide efficient and effective support to Laboratory programs and its mission(s).

The weight of this Goal is 20 percent.

The Deliver Efficient, Effective, and Responsive Business Systems and Resources that Enable the Successful Achievement of the Laboratory Mission(s) Goal measured the Contractor's overall success in deploying, implementing, and improving integrated business system that efficiently and effectively support the mission(s) of LBNL.

For FY2009, LBNL achieved the target for Goal 6.0 by successfully demonstrating there are efficient and effective business systems in place to ensure meeting the mission of the Laboratory. For the six systems evaluated: financial management; acquisition management; property management; human resource management; internal audit and information management; and, technology transfer and commercialization of intellectual assets, each objective score was given a weighting.

For FY2009 the combined numeric score is **3.6** which translates to a grade of **A-** and is based on the following accomplishments for each management system.

### **6.1 Provide an Efficient, Effective, and Responsive Financial Management System(s)**

LBNL's score for FY2009 under this performance objective is **3.8**, the equivalent of a grade of **A**.

Objective 6.1 is a measure of the effectiveness of the financial management systems of the Laboratory. A balanced scorecard model is used to measure performance in four activities: the ethics/governance/compliance activities; financial activities; people activities; and internal business activities.

Financial Management was evaluated under one measure focused on achievement of seven Balanced Scorecard Plan activities reflective of an effective Financial Management System. In evaluating the overall objective of the measure, BSO considered LBNL performance against the Balanced Scorecard, along with all other factors that ensure that LBNL has an efficient, effective and robust Financial Management System.

LBNL achieved the "expected performance criteria" by meeting all of the Balanced Scorecard measures and obtaining 100 of 100 possible points. LBNL continues to demonstrate effective accounting practices by providing required submissions timely and accurate, as well as reconciling all of their balance sheet accounts. LBNL's resolution of audit findings and recommendations showed that corrective actions were completed on or ahead of schedule.

The Office of the Chief Financial Officer (OCFO) continued its efforts to review existing financial policies and procedures for the lab. The OFCO reviewed 27 policies to ensure each policy is compliant with Contract 31, applicable laws and regulations and Laboratory business practices. The Self-Assessment program was developed to assess practices, mitigate risk, provide assurance and identify opportunities for improvement. This year, the Conference Travel Expense and the Divisional Financial Management Practices were selected and assessed. The self assessments produced final summary reports, identifying suggested improvements and any resulting corrective actions.

The OCFO continues to support the DOE system priorities and initiatives, by being diligent in supporting Standard Accounting and Reporting System (STARS), continuing to work through reconciliation issues, and maintaining financial integrity.

Notable achievements: The Laboratory attained significant notable accomplishments with their American Recovery & Reinvestment Act (ARRA) planning, preparation and performance.



- From the inception of ARRA, LBNL was at the forefront developing a strategy and approach for effective funds management.
- Established a Stimulus Steering Committee to provide high level oversight, strategic direction and operational support.
- Developed and provided ARRA training for all those that are impacted by ARRA funds.
- Have been able to adjust to the many ARRA requirement changes requested by DOE and OMB.
- Worked closely with the BSO to become a leader in planning and managing ARRA funds and expenditures across the DOE complex.

## 6.2 Provide an Efficient, Effective, and Responsive Acquisition Management System

The FY 2009 Procurement Balanced Scorecard (BSC) indicates that the Procurement Department successfully supported the Laboratory mission, complied with statutes and regulations, and met or exceeded a majority of the targets. Performance indicates LBNL has earned a score of **3.7** which equates to an **A-**. The Procurement organization was evaluated against measures detailed in the Procurement System Evaluation Plan and the four perspectives of the Balanced Score Card (BSC). These four perspectives are (1) Customer Satisfaction, (2) Internal Business Processes, (3) Learning and Growth, (4) Financial Aspects. The Target for this year was for LBNL to meet at least 10 of 10 targets in the BSC or meet at least a combination of BSC measures and stretch goals to total 10. The purpose of the stretch goals is for LBNL to strive for a higher level of performance while managing key measures. For this rating period LBNL met all 10 targets and five stretch goals for a total of 15. From the 3 key elements identified, LBNL achieved 1 stretch goal. During the past rating periods to Laboratory was only striving to meet the 10 targets.

Notable achievements: LBNL has a comprehensive strategic sourcing program. It now has eight commodities through an eCommerce process called eBuy. This process enables Laboratory employees to procure items without the use of the traditional credit card or purchase order process. The number of transactions placed through the system is up from 24,821 in FY 2008 to 31,089 in FY 2009. This process is producing cost savings for LBNL in the areas of pricing and overhead. End users are able to place orders directly, and thus avoiding the full procurement burden for a lower cost to programs.

In the small business area, the obligations through September indicate LBNL has exceeded FY 2008 obligations in the following four categories: Small Business, Women Owned Small Business, Service Disabled Veteran Owned Small Business, and Veteran Owned.

	Goal	Achievement	Projected Dollars without Recovery Dollars	Actual Dollars
Small Business	46.4%	55.9%	\$95,120,000	\$164,956,310 *
Small Disadvantaged Business	6.0%	5.4%	\$12,300,000	\$ 15,946,825
Women-owned Small Business	5.0%	4.7%	\$10,250,000	\$ 13,810,748
HubZone Small Business	3.0%	1.2%	\$ 6,150,000	\$ 3,607,598
Veteran Owned	1.0%	11.4%	\$ 2,050,000	\$ 33,571,655 *
Service Disabled Veteran Owned Small Business	3.0%	8.9%	\$ 6,150,000	\$ 26,372,336 *

\*The exceptional performance in three categories is attributed to the dollars obligated through the American Recovery and Reinvestment Act (Recovery Act). This level of performance is not anticipated in the future.

One of the key aspects of the Recovery Act is to award to Small Business. Clearly LBNL has achieved this goal. In the upcoming year, the focus will be on the actual reporting and validation of payments.

The Procurement Department continued to maintain a high level of customer satisfaction, cost efficiency and effectiveness, and adhered to accepted best business practices. The self-assessments performed during this



rating period, complied with the Procurement System Evaluation Plan, and showed no evidence of system deficiencies.

### **6.3 Provide an Efficient, Effective, and Responsive Property Management System**

The FY 2009 Property Balanced Scorecard (BSC) indicates that the Property System is adequately operating to meet the mission of the Laboratory. Overall assessment for LBNL in this area is 92 points. The PEMP score is **3.4** which equates to a **B+**. The Property System was evaluated this year by the Organizational Property Management Officer (OPMO). The assessment uncovered 2 findings and several recommendations. The findings were corrected and an effectiveness review will be conducted next year.

Additionally, the Balanced Score Card (BSC) for property continued to monitor the health of the system. The four perspectives of the BSC include: (1) Customer Satisfaction; (2) Internal Business Processes; (3) Learning and Growth; and (4) Financial Aspects. Measures under each perspective were assigned points based upon the weight given each measure in terms of importance. LBNL achieved 92 points out of a possible 100.

LBNL has implemented a highly successful inventory program, which is uncovering not necessarily inventory issues but institutional issues.

#### Opportunities for improvement:

- 1) There is a difference in how equipment is viewed within LBNL vs. on the University of California Campus. During the precious metal validation, the BSO reviewer identified weaknesses in the protection of the asset and providing evidence of record keeping.
- 2) The equipment held for future use, measure 20 in the BSC, is not managed. LBNL conducted a review but did not adequately ensure that the equipment is retained in accordance with Department of Energy requirements, and needs to execute its plan to correct the issue. The points will be reduced from 4 to 2.
- 3) LBNL has disclosed weaknesses in the control of laptop losses, and is planning to institute a plan to mitigate the issue.

### **6.4 Provide an Efficient, Effective, and Responsive Human Resources Management System and Diversity Program**

LBNL's score for FY2009 under this performance objective is **3.4**, the equivalent of a grade of **B+**. Objective 6.4 has two measures, each with associated targets.

**Operate an efficient, effective, and responsive Human Resources System and maintain National Academy of Public Administrators (NAPA) certification in three standards: HR Operations and Program Assurance, Total Compensation and Benefits, and Work Environment and Employee/Labor Relations.**

Overarching objective 6.4.1: BSO is concerned by the fact that nowhere in their self-assessment did the Lab address whether they are maintaining NAPA certification in the three standards. They have scrapped the entire NAPA re-certification effort due to money but they invested a great deal in this to begin with. They have indicated verbally now that they will do a peer review instead. If this was going to be the case, they should have formally gotten CO approval to change the wording of this measure beforehand.

The targets of the measure have satisfactorily been completed and warrant an overall grade of **B+**. Three HR policies have been reviewed and revised, a total rewards brochure has been developed and published, salary planning process continues to be tweaked, benefits statistics and employee satisfaction has been recorded, a supervisory course was deployed and internal and external complaints were tracked.

LBNL asserts that above and beyond the 6 targets completed, the Lab has undertaken accomplishments in three areas warranting an A grade; work place environment, leadership development and operational efficiency. We applaud the Lab in undertaking efforts to improve select employees' work environments and develop their senior management leadership skills. These objectives are not technically overarching creating significant impact lab-wide. Two employee populations were chosen for the work place environment survey and feedback

and those were the operations sector and Postdocs. Leadership development was conducted for the highest management of the Lab but not the lower tier managers. However, the surveys were comprehensive and management has taken initiative to act upon the areas that need improvement to make for a better work environment. In addition, the Lab can only benefit from developing more enhanced leadership qualities in the highest management. DOE was impressed to see that managers took their staffs' input and discussed with them the results in an honest and open fashion. The operational efficiencies while good are not that large of an effort. The e-verify program is a federally mandated program so this is not an initiative the Lab did on it's own without a requirement to do so. And the I-9 process goes hand-in-hand with the e-verify program. And while it is good to make the personnel program electronic, it is not a highly overarching significant impact on the Lab.

These extra initiatives conducted by LBNL are impressive and beneficial to the Lab. However, the Human Resources division has had more than a few major problems this fiscal year that need to be addressed.

Opportunities for Improvement: First, proposed salary increases for the Laboratory Director for the past two years were not submitted until the Director was out of the position for some time. These were untimely and the Lab was denied a higher reimbursement level from DOE. Second, the benefit-value study is a requirement every two years. The last study was conducted in FY05 with the requirement to submit a new study in FY08. The Lab commissioned the study and it was finished in FY08 although the study was never submitted to DOE. The study was sent to DOE towards the end of FY09 at the prompting of DOE. This was extremely untimely. Third, in the Lab's submission of the introduction of a minimal amount of stipend for scientific managers, it was brought to DOE's attention that the Lab has been giving base increases to managers and not removing them when managers step out of their role. This practice is not in line with Appendix A authorizations. Finally, the Lab, for the second year in a row had to ask for an increased Compensation Increase Plan amount at the end of the fiscal year due to depleted funds. This suggests either continued poor planning of resources, or execution of the plan throughout the fiscal year.

**Recruit and retain the most qualified and most diverse personnel available.**

LBNL met the performance expectations in terms of diversity by completing all three initiatives in the Performance Evaluation and Measurement Plan. LBNL completed a single comprehensive web-based Recruitment Resource Guide of applicant sources for specific positions (within high priority job groups). LBNL prepared an Affirmative Action Plan which was approved by UCOP and posted on the LBNL web site. LBNL also posted an online compendium of each division's diversity practices and programs.

**6.5 Provide Efficient, Effective, and Responsive Management Systems for Internal Audit and Oversight; Quality; Information Management; and Other Administrative Support Services as Appropriate**

LBNL's score for FY2009 under this performance objective is **3.5**, the equivalent of a grade of **A-**. Objective 6.5 has two measures, each with associated targets.

**The Laboratory will present data and analysis demonstrating the Laboratory's success in meeting Internal Audit goals and expectations using the Laboratory's Balanced Scorecard Model Index.**

The Internal Audit Services has met expectation with an overall score of 96.5 of 100 possible points, which were established in the IAS Scorecard. There were no deficiencies identified.

Notable achievements:

- IAS was incorporated into the American Recovery and Reinvestment Act (ARRA) Steering Committee, as requested by the CFO, Contract Assurance Council and by Berkeley Site Office. In addition, IAS performed an "ARRA Controls" advisory service that continues to provide critical input to stakeholders on the ability of the Lab to ensure transparency and oversight over ARRA funds, as well as its ability to utilize these funds in compliance. We have also included a "Transparency and Oversight over Recovery Acts Fund" audit on next year's audit plan, this way ensuring continued diligence in maintaining controls over ARRA expenditure.

- In conjunction with an OCFO PEMP measure, IAS conducted comprehensive business process reviews of two selected Science Divisions (Physical Biosciences and Materials Sciences). This is the first time in at least 10 years that IAS has performed audits or advisories from within the Science business offices, and by doing this, the intent is to set a new standard of reviewing other program divisions in the future, beginning with FY10. This new approach was very effective at identifying opportunities that could not have occurred without the committed interest and joint efforts of OCFO, COO, Office of Contract Assurance, and management of divisions involved.

**Information Management: The Laboratory will achieve a score of 85 points or above on the IT Scorecard which includes measures of customer service, system availability, network availability, and efficiency.**

LBNL met the goal of 85 points or above by obtaining 93 points. Although this goal was met, they failed to meet the targets of two of components (Efficiency and Availability for Business) which are comprised in the total score.

- Efficiency: LBNL's telephony time spent per service call was 1.06 hrs, which was equivalent to FY08. This was below the target of being more than 1% below FY08.
- Availability for Science: LBNL's network availability was 99.993%, which exceeded 99.99%.
- Availability for Business: LBNL's availability was 99.82%. This was below the expected rate, which was to exceed 99.9%.
- Customer Service: LBNL's performance for the year was over 9.7, which exceeded the expectation of 9.5.
- Efficiency: LBNL's telephony time spent per service call was 1.06 hrs, which was equivalent to FY08. This was below the target of being more than 1% below FY08.
- Availability for Science: LBNL's network availability was 99.993%, which exceeded 99.99%.
- Availability for Business: LBNL's availability was 99.82%. This was below the expected rate, which was to exceed 99.9%.
- Customer Service: LBNL's performance for the year was over 9.7, which exceeded the expectation of 9.5.

## 6.6 Demonstrate Effective Transfer of Technology and Commercialization of Intellectual Assets

LBNL's score for FY2009 under this performance objective is 3.6, the equivalent of a grade of A-. Objective 6.6 has two measures, each with associated targets.

**The Contractor will write non-confidential descriptions of Laboratory inventions and post them on the Contractor's Technology Transfer website.**

LBNL has far exceeded the goal of 30 – 34 technology announcements by posting 81 announcements during the rating period. The primary reason for this was that LBNL leveraged its capabilities by using writers in the Creative Services Organization on a cost-recharge basis.

**The Contractor will require companies that execute exclusive license agreements for Berkeley Lab technologies to contractually agree to multiple technology development milestones as part of the license agreement to ensure diligent progress toward commercialization.**

During the rating period LBNL executed eight exclusive licenses and all of them had multiple development milestones thus exceeding the 80% goal of the measure.



ELEMENT	Letter Grade	Numerical Score	Objective Weight	Total Points	Total Points
<b>6.0 Deliver Efficient, Effective, and Responsive Business Systems and Resources that Enable the Successful Achievement of the Laboratory Mission(s)</b>					
6.1 Provide an Efficient, Effective, and Responsive Financial Management System(s)	A	3.8	30%	1.14	
6.2 Provide an Efficient, Effective, and Responsive Acquisition Management System	A-	3.7	20%	0.74	
6.3 Provide an Efficient, Effective, and Responsive Property Management System	B+	3.4	15%	0.51	
6.4 Provide an Efficient, Effective, and Responsive Human Resources Management System and Diversity Program	B+	3.4	15%	0.51	
6.5 Provide Efficient, Effective, and Responsive Management Systems for Internal Audit and Oversight; Quality; Information Management; and Other Administrative Support Services as Appropriate	A-	3.5	10%	0.35	
6.6 Demonstrate Effective Transfer of Technology and Commercialization of Intellectual Assets	A-	3.6	10%	0.36	
<b>Performance Goal 6.0 Total</b>					<b>3.61</b>

**Table 6.1 – 6.0 Goal Performance Rating Development**

<b>Total Score</b>	<b>4.3-4.1</b>	<b>4.0-3.8</b>	<b>3.7-3.5</b>	<b>3.4-3.1</b>	<b>3.0-2.8</b>	<b>2.7-2.5</b>	<b>2.4-2.1</b>	<b>2.0-1.8</b>	<b>1.7-1.1</b>	<b>1.0-0.8</b>	<b>0.7-0</b>
<b>Final Grade</b>	A+	A	A-	B+	B	B-	C+	C	C-	D	F

**Table 6.2 – 6.0 Goal Final Letter Grade**

## **7.0 Sustain Excellence in Operating, Maintaining, and Renewing the Facility and Infrastructure Portfolio to Meet Laboratory Needs**

**The Contractor provides appropriate planning for, construction and management of Laboratory facilities and infrastructures required to efficiently and effectively carry out current and future S&T programs.**

The weight of this Goal is 20%.

The Sustain Excellence in Operating, Maintaining, and Renewing the Facility and Infrastructure Portfolio to Meet Laboratory Needs Goal measured the overall effectiveness and performance of the Contractor in planning for, delivering, and operations of Laboratory facilities and equipment needed to ensure required capabilities are present to meet today's and tomorrow's complex challenges.

The rating for Goal 7.0 is **3.1(B+)**. Objective 7.1 is rated 3.2 (B+) and Objective 7.2 is rated 3.0 (B).

## **7.1 Manage Facilities and Infrastructure in an Efficient and Effective Manner that Optimizes Usage and Minimizes Life Cycle Costs**

The rating for Objective 7.1 is **3.2**, which is based on the performance against three measures:

**Maintenance Management- Effectiveness and efficiency of maintenance activities to maximize the operational life of facility systems, structure and Components.**

Notable achievements: The Maintenance Management Program submitted in July 2009 addressed all issues raised by the December 2008 ORNL assessment of Facility Operations. The Lab self-identified areas for improvement in the March 2009 Extent of Condition review. Operational Department staff has increased by forty percent.

Opportunities for Improvement: Reduce potential unsafe conditions and incidents. Address legacy maintenance issues, e.g., power failure in B46, 46A, 47, 53, 58, 58A and water leaks in B70 & B90. Finalize, approve and fully implement the Maintenance Management Program. Integrate Mission Readiness into institutional processes. Provide resources for management, quality assurance and oversight of the increasing amount and complexity of maintenance, operations and repair/restoration work. Implement a robust contractor assurance system.

Although maintenance procedures are more fully documented in the Maintenance Management Program than before, there are still areas to be clarified and fleshed out. The relationships and interactions between the Operations and Construction Projects departments are not yet well defined and the fire protection processes are not yet fully covered.

**LBNL Site Executable Plan for Environmental Energy and Transportation Management-LBNL demonstrates the application of proactive sustainable/renewable energy, transportation, and environmental management practices and requirements as defined in DOE O 430.2B, Attachment 1, Contractor Requirements Document (CRD).**

Notable achievements: The Lab's response to the non-productive (cancelled) ESCP included renewed commitment to meet the 2015 targets. The Lab implemented almost all of the FY09 and some of the FY10 measures and made advanced equipment purchases for future-year implementation.

**Real Property Management Space/Facility Utilization - Effectively managed consistent with mission, requirements, and DOE direction.**

FIMS data entered, validated, used and reported.

Opportunities for Improvement: FIMS source documents require improvements, i.e., the Key Plans need to be updated.

## **7.2 Provide Planning for and Acquire the Facilities and Infrastructure Required to support Future Laboratory Programs**

The rating for Objective 7.2 is **3.0** based on the performance against two measures.

**Integrated Site Planning - The Laboratory develops, documents, and maintains an integrated site planning process that is aligned with DOE mission needs and the Laboratory strategic/business plan. Intent is to measure the effectiveness of integrated site planning activities using any related site development planning documents.**

Notable achievements: The Lab's Mission Readiness Implementation Plan was the centerpiece of a successful peer review which included SC-wide participation. The peer review and LBNL "UniCall" prioritization process demonstrated strong participation of the scientists and Lab leadership in the Mission Readiness process. The Annual Laboratory Plan addresses LBNL strategic goals and SC's guidance. The Lab took the initiative to develop a site-wide Massing Study to collocate related sciences and activities. Over 1200 NEPA actions were completed, double last year's workload.

Opportunities for Improvement: Incorporate an integrated set of projects and actions into the Annual Plan to address identified mission needs over the next 3 – 5 years. Develop and execute robust, comprehensive, fully-vetted and integrated plans for 413.3A and small projects.

Revising the UniCall process, a seven-month undertaking, to incorporate the steps described in the Mission Readiness Implementation Plan, a year-round endeavor, is critical for Lab-wide participation in and adherence to the Mission Readiness precepts.

**Construction/Project Management - Activities and requirements related to Line Item projects are complete within preliminary performance baselines for scope, schedule and cost (established at CD-1) or performance baselines (established at CD-2).**

Notable achievements: The Bevatron Demolition is well managed; project issues are resolved thoroughly and quickly. The ALS USB responded well to CR-delayed then ARRA-accelerated funding. CD-0 was approved for LBNL Seismic Upgrades, Modernization & Replacement of General Purpose Buildings, Phase 3 Line Item projects with a TPC of approximately \$93 M.

Opportunities for Improvement: Address and mitigate recurring safety issues. Proactively complete, document and properly close corrective actions in CATS and implement compensatory measures for those not yet completed. Provide resources for management, quality assurance and oversight of the increasing amount and complexity of facilities work. Implement a robust contractor assurance system.

Seismic Phase I is on schedule and at cost; however, there were two safety incidents in FY 09. At Building 50, a drill rig operator ran over his foot requiring three stitches. Although there was minimal impact to the project cost/schedule, this was a safety issue of concern. Additionally, the line penetration at B-74 caused a significant delay in activities and additional expense. Review of the causal factors identified in LBNL's root causal analysis implied that with additional planning, the line penetration could have been avoided. Several cost and schedule delays occurred on the project as a result of not knowing the exact location of subsurface utilities. Improvement in identifying the location of utilities during the project planning phase appears to be an opportunity for improvement in safety as well as cost and schedule planning.

Seismic Phase 2: General Purpose Laboratory location is being revisited post CD1. Executable plans for DOE projects should be developed which include appropriate risk analysis and mitigation for NEPA/CEQA constraints.

ARRA GPP Projects Building 62 and Building 66: After ARRA WAS/Contract modification was issued, work to be accomplished was modified from what had been proposed and accepted. A portion of the design work prior to the change was not used.

GPP Project, B67 Clean Room, did not receive BSO approval prior to the start of work and the budget was approximately \$300-400K short (~50%) of anticipated cost. The funding request for ARRA GPP Project, Upgrade Building 66, was approximately \$3 million (~75%) short of requirements.

A new document, the Small Projects Manual, was issued with nine of the 13 chapters still in development. The Small Projects Manual should be fully developed and implemented.

ELEMENT	Letter Grade	Numerical Score	Objective Weight	Total Points	Total Points
<b>7.0 Sustain Excellence in Operating, Maintaining, and Renewing the Facility and Infrastructure Portfolio to Meet Laboratory Needs</b>					
7.1 Manage Facilities and Infrastructure in an Efficient and Effective Manner that Optimizes Usage and Minimizes Life Cycle Costs	B+	3.2	50%	1.60	
7.2 Provide Planning for and Acquire the Facilities and Infrastructure Required to support Future Laboratory Programs	B	3.0	50%	1.50	
<b>Performance Goal 7.0 Total</b>					3.1

**Table 7.1 – 7.0 Goal Performance Rating Development**

<b>Total Score</b>	<b>4.3-4.1</b>	<b>4.0-3.8</b>	<b>3.7-3.5</b>	<b>3.4-3.1</b>	<b>3.0-2.8</b>	<b>2.7-2.5</b>	<b>2.4-2.1</b>	<b>2.0-1.8</b>	<b>1.7-1.1</b>	<b>1.0-0.8</b>	<b>0.7-0</b>
<b>Final Grade</b>	A+	A	A-	B+	B	B-	C+	C	C-	D	F

**Table 7.2 – 7.0 Goal Final Letter Grade**



## **8.0 Sustain and Enhance the Effectiveness of Integrated Safeguards and Security Management (ISSM) and Emergency Management Systems**

The Contractor sustains and enhances the effectiveness of integrated safeguards and security and emergency management through a strong and well deployed system.

The weight of this Goal is 8 percent.

The Sustain and Enhance the Effectiveness of Integrated Safeguards and Security Management (ISSM) and Emergency Management Systems Goal measured the Contractor's overall success in safeguarding and securing Laboratory assets that supports the mission(s) of the Laboratory in an efficient and effective manner and provides an effective emergency management program.

For Goal 8.0, Lawrence Berkeley National Laboratory (LBNL) achieved a numerical score of **3.6**, the equivalent of a letter grade of **A-**. Goal 8.0 has four objectives.

### **8.1 Provide an Efficient and Effective Emergency Management System**

For FY2009, performance objective 8.1, LBNL achieved a numerical score of **2.4**, the equivalent of a grade of **C+** and is based on two measures.

**The Contractor will demonstrate Emergency Management commitment through developing a long term Emergency Operations Center (EOC) improvement plan for the improvement of emergency operations.**

LBNL has made significant progress in its development of a long term Emergency Operations Center (EOC) improvement plan. In FY09, LBNL has procured, received, and implemented all of their stipulated 14 EOC improvement items.

Opportunities for Improvement: Performance of the MC&A peer review was successfully completed on time and no corrective actions have been identified. BSO has noted that the annual peer review has been performed by the same individual for several years now and recommends that LBNL consider how to demonstrate that such a review continues to be "independent".

Another opportunity for improvement exists in the timely submittal of requests for termination of safeguards for material that has been declared as waste. Two requests were received by BSO in FY2009, and in both cases, LBNL provided only a few days for BSO to complete the approval process which requires coordination with the Oak Ridge Integrated Service Center. LBNL could improve performance in this area simply by preparing these requests well in advance of their needed approval date since shipments of LLW are scheduled well in advance.

**The Contractor will demonstrate Emergency Management commitment through its development, execution, and maintenance of emergency management activities to achieve full implementation of DOE O 151.1C.**

LBNL also has made significant progress towards achieving and maintaining compliance with DOE Order 151.1C, *Comprehensive Emergency Management System*. LBNL has achieved a 47% completion rate by completing 8 of 17 of the Implementation Plan action elements. Despite these creditable achievements, complete or full compliance with DOE Order 151.1C was not obtained this year. It must be noted that LBNL is allocating additional resources (e.g., hiring another FTE) in FY2010 to address some of the gaps.

Opportunities for Improvement:

#1: Development of a robust emergency management training program.

- Applying resources to the formation of a training program aimed at increasing the knowledge base of EOC and ERO staff.



- Identify ERO staff positions, develop positions descriptions, and identify required training for each ERO staff position.
- Increased number of drills and exercises to allow ERO staff practical application of knowledge obtained in training classes.

#2: Formation of a strong readiness assurance program aimed at continual improvement of the LBNL emergency management program.

- Increased usage of the CATS system to document the identification and progress made on issues identified during internal/external assessments and other drills and exercises.
- Develop and implement an Emergency Management Assurance Plan (EMAP) that addresses the feedback and improvement processes.
- Validate the effectiveness of the EMAP through a formal assessment.

#3: Completion of corrective actions associated with the ORO/BSO Review of the LBNL Emergency Management Program in July of 2009, per the approved Lawrence Berkeley National Laboratory Emergency Services Program Assessment Corrective Action Plan.

## **8.2 Provide an Efficient and Effective System for Cyber-Security**

LBNL's score for FY2009 under this performance objective is **4.0**, the equivalent of a letter grade of **A**.

LBNL continues to perform exceptionally well as a leader in Cyber Security and IT Management in the SC Complex. During this fiscal year, LBNL not only met their Cyber Security Scorecard goal of 85 points but well exceeded it by scoring a perfect score of 100. This was achieved a number of ways. During the year, LBNL have had several reviews, risk assessments, and self assessments (including ORO 2009 Security Survey) that were all satisfactory and had very minimal findings if none. These reviews included an ongoing review by OIG, a peer review (which involved DOE, Higher Education, Defense, and ESNET), Security Survey (ORO), and LBNL's self assessment. LBNL successfully completed its annual risk assessment for all enclaves within the performance period. This assessment was turned in to BSO. Additionally, LBNL have incorporated new tools to reflect the ever changing threats and vulnerabilities. These tools include items such as the PII Search Tool that provide additional assurance for the protection of Personal Identifiable Information (PII). Other tools developed were monitoring tools to detect credential stealing, detection systems, email filters, and the Bro Cluster. As a notable, the Bro Cluster, which is an Intrusion Detection System, is a major project with implications for the entire Science community. In regards to training, Personal Identifiable Information (PII) training well exceeded the target expectation of 90% employees trained (95%). Lastly, LBNL completed this year without having to develop or track any serious corrective actions through Plans of Actions and Milestones (POA&Ms), thus there were no correction actions not completed on target. Earlier during the year, there were three ARRA POA&Ms, however, they were removed being ARRA Cyber funding was eliminated. Although stolen credentials and phishing attacks has been the biggest problems in the past, they have maintained them at an acceptable risk level by the training of employees and protective measures such as BRO monitoring and vulnerability scans. LBNL continues to exceed expectations in both Cyber Security and IT Management.

## **8.3 Provide an Efficient and Effective System for the Protection of Special Nuclear Materials, Classified Matter, and Property**

LBNL's score for FY2009 under this performance objective is **4.0**, the equivalent of a letter grade of **A**.

LBNL has continued to be very effective and efficient in the protection SNM and property. This year, there were no incidents or handling incidents in accordance with MC&A procedure during FY09. Along with this, the MC&A peer review was completed in May 2009 with no findings noted.

## **8.4 Provide an Efficient and Effective System for the Protection of Classified and Sensitive Information**

LBNL's score for FY2009 under this performance objective is **2.9**, the equivalent of a letter grade of **B**.

In the protection of Classified and Sensitive Information, during the fiscal year, LBNL did not provide a final Site Security Plan (SSP) by the required date of 7-20-09. They did submit a draft revision by that date. Their overall performance was not indicative of the performance under the measure and target because they did complete all five Facility Security Plans (FSP) and the Physical Security Assurance Plan by 9-30-09 and so the grade provided considered this additional performance.

ELEMENT	Letter Grade	Numerical Score	Objective Weight	Total Points	Total Points
<b>8.0 Sustain and Enhance the Effectiveness of Integrated Safeguards and Security Management (ISSM)</b>					
8.1 Provide an Efficient and Effective Emergency Management System	B+	2.4	20%	0.48	
8.2 Provide an Efficient and Effective System for Cyber-Security	A	4.0	65%	2.60	
8.3 Provide an Efficient and Effective System for the Protection of Special Nuclear Materials, Classified Matter, and Property	A	4.0	10%	0.40	
8.4 Provide an Efficient and Effective System for the Protection of Classified and Sensitive Information	B	2.9	5%	0.15	
<b>Performance Goal 8.0 Total</b>					3.6

**Table 8.1 – 8.0 Goal Performance Rating Development**

<b>Total Score</b>	<b>4.3-4.1</b>	<b>4.0-3.8</b>	<b>3.7-3.5</b>	<b>3.4-3.1</b>	<b>3.0-2.8</b>	<b>2.7-2.5</b>	<b>2.4-2.1</b>	<b>2.0-1.8</b>	<b>1.7-1.1</b>	<b>1.0-0.8</b>	<b>0.7-0</b>
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

**Table 8.2 – 8.0 Goal Final Letter Grade**



**APPENDIX A**  
**OFFICE OF SCIENCE**  
**FY 2009**  
**SCIENCE AND TECHNOLOGY EVALUATION**  
**OF**  
**LAWRENCE BERKELEY NATIONAL LABORATORY**

<b>Program Area</b>	<b>Page</b>
<b>Advanced Scientific Computing Research (ASCR)</b>	<b>A-2</b>
<b>Biological and Environmental Research (BER)</b>	<b>A-10</b>
<b>Basic Energy Sciences (BES)</b>	<b>A-18</b>
<b>Fusion Energy Sciences (FES)</b>	<b>A-24</b>
<b>High Energy Physics (HEP)</b>	<b>A-27</b>
<b>Nuclear Physics (NP)</b>	<b>A-32</b>
<b>Workforce Development for Teachers and Scientists (WDTS)</b>	<b>A-37</b>



## Laboratory Year-End Performance Assessment Report

Date:10/14/20 09

Headquarters Program Office Fiscal Year 2009 Evaluation of The Regents of the University of California for Management and Operation of the Lawrence Berkeley National Laboratory

Agency:

U.S. Department of Energy

Program Office:

Office of Science - Advanced Scientific Computing Research

FY Funding Level: (Budget Authority)

### Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 3.44

Goal Grade: B+

#### Goal 1.0 Performance Summary Statement:

LBNL research continues to have a broad impact, producing numerous publications, posters, invited talks, and open source software packages. Many years of excellent work have raised ASCR expectation for LBNL research to a very high standard. LBNL had several standout results in FY09 - notably the role of LBNL in ASCR Recovery Act projects, 2009 awards to LBNL projects and researchers (including a Gordon Bell prize and PECASE award), and LBNL contributions to ASCR workshops and working groups.

#### Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field Score: 3.5

Grade: A- Weighting: 40

#### Objective 1,1 Performance Summary Statement:

LBNL leads two Recovery Act projects for ASCR and participates in two others. These projects have the potential to have a dramatic impact on the conduct of science.

- LBNL is leading the Advanced Networking Initiative with a goal to realize a 10 fold improvement in throughput over the 10Gbps currently available in the commercial market place. LBNL technical expertise and leadership will be critical to the success of this effort.

- LBNL is co-lead in the Magellan project, in partnership with ANL, with a goal to demonstrate a cost effective and efficient solution to the mid-range computing needs of scientific research institutions. LBNL technical expertise and leadership will be critical to the success of this effort.

In FY09 LBNL continues to have a broad and significant impact in Applied Math, Computer Science and Computational Science. A few highlights:

- A team of LBNL researchers developed the Linear Scaling Three Dimensional Fragment (LS3DF). LS3DF offers a more efficient method for calculating energy potential because it is based on the observation



that the total energy of a large (10,000 or more) nanostructure system can be broken down into two component parts: electrostatic energy and quantum mechanic energy. The developers of LS3DF won the Association for Computing Machinery's (ACM) Gordon Bell Prize at SC08.

- perfSONAR, an LBNL network performance monitoring and diagnostic system, was open sourced to assist network engineers with identifying bottlenecks, which allow them to make relatively small adjustments to gain significant increases in network throughput.

### **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 3.4

Grade: B+ Weighting: 30

#### **Objective 1.2 Performance Summary Statement:**

LBNL has, in FY2009, maintained its status as an international powerhouse in computer science and applied mathematics and advanced networking. LBNL visionary leadership in areas of this research directly related to high performance computing was internationally and nationally recognized in FY09.

A SciDAC team of computational scientists from Lawrence Berkeley National Laboratory (Berkeley Lab) won a prestigious Gordon Bell Prize, sponsored by the Association for Computing Machinery (ACM), for special achievement in high performance computing for their research into the energy harnessing potential of nanostructures. Their method, which was used to predict the efficiency of a new solar cell material, achieved impressive performance and scalability.

Juan Meza has received several important awards this year for his leadership at LBNL including the 2008 Blackwell-Tapia Prize and Hispanic Business magazine's annual list of 100 influential Hispanics.

Five LBNL mathematicians—John Bell, Alexandre Chorin, Phillip Colella, James Demmel and James Sethian—were among the first group of Fellows announced May 1 by the Society for Industrial and Applied Mathematics (SIAM). Berkeley Lab's group of SIAM fellows was the largest of the DOE labs.

Cecilia Aragon, staff scientist in the Computational Research Division, was honored in July 2009 with the Presidential Early Career Award for Scientists and Engineers (PECASE), the U. S. government's most prestigious award for early-career scientists.

At the 51st Cray User Group (CUG) annual meeting, held May 4-7 in Atlanta a framework developed by Berkeley Lab computer scientists for speeding up the performance of scientific computing applications on multicore processors was recognized as the best paper presented at the "Multiplication on Emerging Multicore Platforms," co-authored by five LBNL researchers.

Science Direct's Top 25 Hottest Articles (most downloaded) for the January to March issues of the journal *Parallel Computing* cited number one on the list "Optimization of sparse matrix-vector multiplication on emerging multicore platforms," co-authored by five LBNL researchers.

Berkeley Lab hosted the 2009 SciDAC Conference held June 14-18, 2009, in San Diego. In addition to Horst Simon serving as general conference chair, LBNL staff served on the organizing committee, and provided logistical and communications support. The conference was the largest in the five-year history of the series, with more than 400 computational science experts registering. Additionally, after several years of co-location, the 2009 meeting marked the first time the SciDAC meeting had formal interactions with the DoD HPC Users Group Meeting, consisting of a joint plenary session and a joint poster session.

LBNL staff also gave many invited talks and "best paper" awards.

### **Objective 1.3 Provide and Sustain Outputs that Advance Program Objectives and Goals**

Score: 3.4

Grade: B+

Weighting: 15

#### **Objective 1.3 Performance Summary Statement:**



LBNL work in all of the ASCR core research areas provide sustained efforts and world leading groups that are important to the continued success of our program.

The quality and quantity of projects and researchers and pace of progress in FY09 again exceeded ASCR's very high expectations for LBNL.

- There was a large number of highly cited and best papers awards in FY09.
- Publication rates in CRD at LBNL were higher than at our other top performing labs.
- CRD staff authored approximately 250 papers.

According to Web of Science, three senior Applied Mathematics Researchers published 15 articles in peer-reviewed journals such as Proceedings of the National Academies Of Science and Journal of Computing Physics.

Researchers from LBNL made significant contributions to the SC08 Conference Technical Program and to the SIAM Conference on Computational Science and Engineering.

#### **Objective 1.4 Provide for Effective Delivery of Products**

Score: 3.4

Grade: B+

Weighting: 15

##### **Objective 1.4 Performance Summary Statement:**

The quantity and quality of the LBNL program in ASCR core research is especially strong in key areas both in terms of publications and continued progress but this is in accord with our very high expectations for LBNL.

LBNL researcher peer reviews are generally very strong and participation in ASCR projects is very high - as would be expected of such an outstanding program. LBNL Software is made available via open source in a timely manner with documentation and support.

#### **Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities**

Goal Score : 3.50

Goal grade: A-

##### **Goal 2.0 Performance Summary Statement:**

Years of excellent work have raised ASCR expectations for LBNL facilities to a very high standard of planning, delivery and user support. However, especially good external reviews and awards and new activities have resulted in LBNL improving over FY08's excellent performance

The National Energy Research Scientific Computing (NERSC) Facility at LBNL is a critical facility for the Office of Science. As the keystone production supercomputer center for the Office of Science (SC), it offers exemplary, "gold standard" (according to the Lehman review team) computing and data storage resources to the SC community, while successfully upgrading its resources to meet ever-growing SC Programs' needs. NERSC supports 3100 users and 400 projects. NERSC advances ASCR's plans for the Leadership Computing Facilities (LCF) by nurturing computational and application scientists to scale their work that will take advantage of the LCF's capability computing. New activities in FY09 included implementation of the ASCR Leadership Computing Challenge and NERSC began to collect requirements from the Office of Science programs through workshops to better meet program needs.

LBNL's ESnet is widely regarded as the best facility of its type in the world and received two prestigious awards in FY09 to further bolster that reputation. ESnet also plays a critical role in supporting data transaction needs of the SC community and its research collaborators in the United States and around the world in this era of peta-scale data. To name just one example, ESnet is critical in support of the start up of the international Large Hadron Collider (LHC) collaboration. ESnet ensures that LHC's peta-bytes of data can be transacted to desired member facilities securely and in a timely manner for data analysis that might make unprecedented scientific discoveries.

**Objective 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs (i.e., activities leading up to CD-2)**

Score: 3.4

Grade: B+

Weighting: 10

**Objective 2.1 Performance Summary Statement:**

NERSC conducted a successful NERSC-6 CD2b/3 Mini Lehman Review in April 2009, with two objectives: review (1) NERSC's responses to the 2008 NERSC-6 CD1/2a Lehman Review recommendations and (2) documentations on their vendor selection and how their proposed contract would help the Office of Science's science communities to make scientific discoveries. The Review Committee recommendation to the Acquisition Executive was to approve CD-2B/3 and to proceed with the contract award.

The NERSC-6 RFP is designed to procure a system in 2009 that will boost NERSC high performance computing capability by five to seven times over the existing dual-core Franklin system currently in production at the NERSC facility.

The evaluation process of proposals was based on a NERSC's own Best Value Source Selection (BVSS) process that allows the evaluation committee to balance various proposed detailed system characteristics against the delivered SSP-6 performance, cost, schedule, and risk. This process is well recognized for its effectiveness, and has been adopted by the Argonne Leadership Computing Facility in their ALCF-2 procurement.

NERSC has demonstrated their excellent responsiveness to DOE's needs for accurate and timely management information (e.g., budget exercises, OMB 300) without fail.

NERSC has scored "Green" on the new OMB IT Dashboard monthly score card (29 out of 30 points).

**Objective 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components (execution phase, Post CD-2 to CD-4)**

Score: 3.1

Grade: B+ Weighting: 10

**Objective 2.2 Performance Summary Statement:**

NERSC conducted a very successful NERSC-5 (Franklin) quad-core chip upgrade operation as part of its steady-state operation. Since Franklin is the main production system, a very careful chip replacement plan was designed and executed flawlessly without affecting the availability of Franklin to the users.

The NERSC Team, when upgrading software to go with the hardware upgrade, also employed best practices in software upgrades. However, events unforeseeable occurred and the system became unstable. The team immediately came up with a Get-Well Plan, which led to a very successful conclusion and acceptance of the quad-core system software and hardware upgrade contract.

Franklin experienced an unforeseeable setback during software upgrades following a flawless chip upgrade. A 2009 NERSC operational assessment Peer Reviewer states: "NERSC quickly recognized that Franklin's uptime was a problem for users and quickly devised strategies to improve the stability of the platform. The situation has stabilized and improved." Scheduled Availability on Franklin was 95.53%, and other resources (Bassi, Jacquard, Da Vinci, HPSS, ad Global Filesystem) all scored over 99%.





### **Objective 2.3 Provide Efficient and Effective Operation of Facilities**

Score: 3.6

Grade: A-

Weighting: 70

#### **Objective 2.3 Performance Summary Statement:**

NERSC continued to receive excellent review on its operations in 2009 NERSC Operational Assessment (OA) Peer Review. NERSC Customer Satisfaction is measured by the "Users rate satisfaction on a 7-point scale where 1 means very dissatisfied and 7 means very satisfied. NERSC received 6.21.

NERSC has achieved many "innovations." Especially when addressing the Franklin instability problem, NERSC came up with a number of novel approaches to solve the problem. A 2009 OA Reviewer states: "stabilization of Franklin; improvements to Franklin I/O; quad-core upgrade to Franklin; implementing science gateways; adding 60PB of HPSS storage; providing leadership for the Lustre monitoring framework; increasing the bandwidth for the global filesystem; assisting Cray with the development and testing of the data virtualization service software; improving data transfer speeds between DOE facilities; porting and improving VisIt scaling on Franklin; analyzing and optimizing HDF5 I/O performance; collaborating with Lightwave Research Center on network-on-chip energy efficiency; researching and reporting on development of a logical prototype supercomputer that would cost less to building and require less electricity to operate."

ASCR has many examples of outstanding science results enabled by NERSC.

ESnet continues to receive excellent reviews on its operations in 2009 ESnet Operational Assessment (OA) peer review. ESnet customer satisfaction is rated through a thirteen-part customer survey. On a scale of 1 to 5, ESnet overall average rating came to 4.86, an improvement over the previous year. This year also marked an expansion in soliciting customer feedback through the introduction of a new seven-part satisfaction survey tailored to the laboratory CIOs. On a scale of 1 to 5, ESnet overall average rating came to 4.46 for the laboratory CIO responses.

Regarding availability, a quote from one of the reviewers is as follows, "ESnet is effectively maximizing the quantity and quality of delivered services in line with its mission. The metrics on site availability are particularly impressive. The accepted traffic has continued to rise consistent with the historical expectation of around 80% per year."

Further, "ESnet presented evident of significant improvements to operational performance .... In the Technology Transfer section, perfSONAR represents an important collaborative effort that will yield increasing returns in the rapid detection and understanding of intercontinental and US network problems. The OSCRS service places ESnet in a leadership role in the separation of major science flows from general-purpose traffic, providing clear gains for network-intensive science and for more general ESnet use."

ESnet Honored as One of Top 10 Government IT Innovators - Once a year, Information Week magazine honors the most innovative players in the field of information technology, including the top 10 government agency innovators. And on Sept. 14, the DOE's Energy Sciences Network (ESnet) was recognized as a member of this select group for its work helping thousands of researchers worldwide manage the massive amounts of scientific data stemming from the application of petascale supercomputers and high-precision instruments to cutting-edge disciplines such as climate science, high energy physics, astrophysics and genomics.

ESnet Wins Excellence.Gov Award - DOE's Energy Sciences Network (ESnet), a high-speed network linking tens of thousands of researchers around the nation, was honored April 14 with an Excellence.Gov award for its excellence in leveraging technology. The Excellence.Gov awards are sponsored by the Industry Advisory Council's (IAC) Collaboration and Transformation Shared Interest Group and recognize the federal government's best information technology (IT) projects. A panel of 25 judges-federal government and industry executives-reviewed the nominations and

selected ESnet as the winner in the area of "Excellence in Leveraging Technology," one of five award categories. The winners were recognized at a ceremony in Washington, D.C. ESnet was honored for ESnet4, a recently completed network infrastructure providing highly reliable, high-bandwidth connectivity to support and advance the United States' scientific competitiveness and capabilities by linking scientists at national laboratories and universities across the country.

**Objective 2.4 Utilization of Facilities to Grow and Support Lab's Research Base and External User Community**

Score: 3.3

Grade: B+

Weighting: 10

**Objective 2.4 Performance Summary Statement:**

NERSC excelled in user utilization by responding to their problems within three working days. In 2009, 91.4% of the trouble tickets were responded within three working days (baseline: 80%).

NERSC scientific consultants helped science users accomplish their scientific goals. The consultants' efforts are measured in terms of "Key HPC consulting metrics, such as timely initial response, quality of technical advice, follow up to initial consulting questions, and amount of time to resolve user's issue. The overall score was 6.56 out of 7.

NERSC collaborated with Lightwave Research Center on network-on-chip energy efficiency, which can benefit other facilities;

NERSC conducted research on development of a logical prototype supercomputer that would cost less to building and require less electricity to operate." The results will also benefit LBNL and other facilities.

NERSC encourages staff to excel. For example, the Best Overall Value system for vendor selection has

been well recognized as a best practice, and was adopted by ALCF-2 procurement.

NERSC hosted a Best Practices Workshop for the HPC Community. This year's topic: software lifecycle for HPC centers.

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 3.14

Goal Grade: B+

**Goal 3.0 Performance Summary Statement:**

LBNL has improved in this area over FY08 but ASCR continues to has a few concerns for Lab management to consider - primarily the future home of NERSC and senior management attention.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.1

Grade: B+

Weighting: 30

**Objective 3.1 Performance Summary Statement:**

Efficiency and Effectiveness of joint planning (e.g., workshops) with outside community;

- LBNL has improved its performance in joint planning with the outside community to be more commiserate with the labs standing with regard to ASCR research and facilities.

Articulation of scientific vision;

- LBNL staff has articulated a facilities vision but remains less clear with regard to the research vision.



Development of core competencies, ideas for new facilities and research programs;

- LBNL has yet to provide a viable plan for the future of NERSC.

Ability to attract and retain highly qualified staff.

- LBNL continues to attract and retain some of the best researchers from around the world.

However, LBNL participation in the ASCR Recovery Act projects has exceeded expectations and offset continuing concerns in this area.

### **Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 3.2

Grade: B+ Weighting: 40

#### **Objective 3.2 Performance Summary Statement:**

Quality of R&D and/or user facility strategic plans

- Here LBNL is among the very best internationally. NERSC and ESnet performance and the high quality of the research at LBNL is the most meaningful metric.

Adequacy in considering technical risks and success in identifying/avoiding technical problems;

- Here there have been some examples in FY09 where LBNL has failed to anticipate technical and organizational obstacles - notably, during the NERSC upgrade and with regard to the power and space needs of NERSC.

Effectiveness in leveraging (synergy with) other areas of research; and

- In ASCR space, LBNL is among the very best at integrating the core research areas and rapidly deploying research results in facilities and infrastructure. FY09 efforts such as the best practices workshop demonstrate improvement in exporting LBNL success.

Demonstration of willingness to make tough decisions (i.e., cut programs with sub-critical mass of expertise, divert resources to more promising areas, etc.).

- Ever rising LBNL overhead rates are the most important metric that LBNL needs to improve in this area.

However, LBNL planning for the ASCR Recovery Act projects has exceeded expectations and off-set continuing concerns in this area.

### **Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 3.1

Grade: B+

Weighting: 30

#### **Objective 3.3 Performance Summary Statement:**

The quality, accuracy and timeliness of response to customer requests for information;

In facilities, LBNL is meeting ASCR's very high expectations but this standard is not carried throughout LBNL leadership. For example, LBNL failed to notify ASCR of an OMB visit. The interim Deputy Director has not made ASCR a priority customer.



The extent to which the Contractor keeps the customer informed of both positive and negative events at LBNL so that the customer can deal effectively with both internal and external constituencies;

In general, LBNL meets ASCR's very high expectations in this area and LBNL communications staff are among the best in the DOE system. However, this standard is not carried throughout LBNL leadership.

The ease of determining the appropriate contact (who is on-point for what).

In general, LBNL meets expectations in its clear communication of roles and responsibilities. This is especially true for the ASCR Recovery Act projects.



## Laboratory Year-End Performance Assessment Report

Date:10/13/2009

Headquarters Program Office Fiscal Year 2009 Evaluation of The Regents of the University of California  
for Management and Operation of the Lawrence Berkeley National Laboratory

Agency:

U.S. Department of Energy

Program Office:

Office of Science - Biological and Environmental Research

FY Funding Level: (Budget Authority)

### Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 3.80

Goal Grade: A

#### Goal 1.0 Performance Summary Statement:

LBNL has a broad range of research across the Biological and Environmental Research (BER) program with a principal focus on the life sciences.

LBNL continues to exhibit exceptional scientific leadership and innovation in its management of the Joint BioEnergy Institute.

Biological scientists at the laboratory continue to be highly recognized, international leaders in many fields. As one of the parent laboratories for the DOE Joint Genome Institute and Production Genomics Facility, LBNL enables genome-based scientific progress in the scientific community especially as it relates to DOE's energy and environmental missions. LBNL scientists are developing new approaches to assess the sustainability of remediation strategies deployed at DOE sites, and they are productive scientific leaders in climate research.

#### Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field

Score: 3.9

Grade: A

Weighting: 30

#### Objective 1,1 Performance Summary Statement:

The structural biology beamlines at the Advanced Light Source (ALS) have published several noteworthy papers on the development and application of new technologies in the leading crossdisciplinary journals, particularly from the small-angle x-ray scattering (SAXS) and FTIR spectromicroscopy stations funded by BER. The high-throughput technology developed for SAXS has had a high impact worldwide, with the Nature Methods paper being among the most often read articles in that journal. The FTIR structural biology program has also received significant recognition for papers in PNAS and Analytical Chemistry that describe new sample management technologies and their application.

Overall the laboratory is recognized as a leading authority in biological systems sciences and genomic sequencing, and key researchers have been recognized in their fields. The laboratory is developing an integrated research framework, but it is still fragmented. The laboratory has done an excellent job in mentoring younger scientists.

The Joint Genome Institute (JGI), transitioning to complete oversight and management by the LBNL, continues to produce extraordinarily impactful publications grounded in the high throughput and high quality genomic sequencing of projects submitted by hundreds of scientific users and the three major BER-funded Bioenergy Research Centers. In FY2009, JGI-affiliated projects generated 108 total publications, 20

in high-impact, high-profile peer-reviewed journals such as *Nature*, *Science*, and *PNAS*. Critical recent (FY2009) results include the complete genome sequences of 56 previously unsequenced microbes from largely unexplored branches of the microbial tree of life providing new genes for novel enzymes (cellulases) available to the Bioenergy Research Centers for their work. Additionally, six major plant genomes are in various stages of completion (with sorghum recently published and the soybean manuscript under review.) JGI science is pioneering environmental metagenomics at DOE Free-Air Carbon Dioxide Enrichment (FACE) sites as well as Hanford subsurface and Colorado bioremediation field sites. JGI generates almost 800 billion base pairs of DNA sequence and is transitioning to a user facility capable of more than simply sequencing DNA but providing high throughput "added value" through development and application of tools and resources for genomic analysis.

The Radiochemistry SFA researchers are developing novel and highly innovative tools that will allow radiotracer techniques normally found in nuclear medical imaging to be applied to DOE mission needs including biofuels and environmental remediation. Specifically, they are developing techniques to use G11 imaging to elucidate biosynthetic pathways to enhance biofuel production, and to image the flow rates of heavy metal contaminants (Tc and Cr) through subsurface aquifers.

The Joint BioEnergy Institute (JBEI) has demonstrated excellent productivity during its second year of operation, with 34 research manuscripts submitted or published and 13 patent applications filed. They were highly responsive to budgetary redirections at the beginning of the fiscal year, and have met or surpassed most milestones for FY2009. JBEI researchers have demonstrated scientific leadership and merit in a variety of areas, with impacts ranging from development of improved bioenergy crops, engineering of improved deconstruction enzymes, optimization of ionic liquid pretreatment methods, and development of microorganisms producing advanced biofuels.

LBNL program leaders and many of the junior scientists are scientific leaders or emerging young leaders in the fields of systems biology, bioinformatics, cryo-EM, X-ray tomography, SAXS, mass spectrometry applied to metabolomics, three dimensional tracking single particle and Synchrotron FTIR based technology development. This group includes researchers who are members of the National Academy of Science and the National Academy of Engineering, are Fellows of professional societies, and winners of an R&D 100 award.

LBNL staff and their scientific discoveries are highly impactful. Through their Sustainable Systems SFA and their key role in the Old Rifle Integrated Field Research Challenge project LBNL researchers are helping to establish a more holistic and improved approach to subsurface environmental science. In recognition for her lead role in this effort Susan Hubbard was chosen to serve at the 2010 Geological Society of America Birdsall-Dreiss Lecturer (the first from a National Laboratory). LBNL's subsurface science program is also contributing fundamental knowledge to the cleanup of DOE sites - their novel approach to bioremediation/immobilization of chromium has been implemented at the Hanford site as a remediation strategy. The LBNL developed Phylochip, which won an R&D 100 award in 2008, has recently been recognized by the Wall Street Journal and Pollution Engineering Magazine for its scientific and technological impact in the area of environmental science.

### **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 3.9

Grade: A

Weighting: 20 **Objective**

#### **1.2 Performance Summary Statement:**

The structural biology programs at the ALS have developed new technologies that are unique and will be adopted at other light sources.

The JGI continues to be a world leader in the sequencing of microbes and plants of importance to energy and the environment. JGI has also initiated "grand challenge" scale projects in metagenomics of microbial communities in soils, the shipworm gut, and other complex cellulose-degrading communities. This also entails leading the way in technological developments (sample handling, analysis, etc.) to manage the demands of such projects. JGI scientists serve on 11 journal Editorial Boards, 15 Advisory Panels, and



serve on 8 Federal agency peer review panels. In 2009, JGI scientists gave over 100 invited lectures and seminars.

The five radiochemistry program scientists are world-renowned leaders in the fields of radiotracer development, imaging instrumentation, and data analysis. This group includes researchers who are members of the National Academy of Science and the National Academy of Engineering, are Fellows of professional societies, and four awards for technical excellence have been presented to members of this program in FY09. Two serve as Associate Editors of peer-reviewer journals, and program members serve on numerous review panels both within and outside of DOE (8 in FY2009).

LBNL Leadership and Recognition has been outstanding in radiation biology and cancer research. Drs. Bissell, Gray, Campisi, Cooper, Kohwi-Shigematsu, Kronenberg, and Wyrobek have all been recognized by their peers for leadership. Particularly impressive this year is Dr. Mina Bissell, whose awards include the American Cancer Society Medal of Honor for Basic Research, the newly-minted Mina J Bissell Award from the University of Porto, the Rothschild-Mayent Fellowship Institute Curie, and the Department of Defense Innovator Award.

LBNL scientists have provided exceptional leadership in the biological sciences through high profile presentations at conferences, professional service on numerous editorial boards and advisory panels, and outreach to both the general public and policymakers.

PI Collins has been providing scientific leadership for the recently initiated DOE Abrupt Climate Change modeling effort; he organized a kick-off session at the Fall AGU for the DOE project. He has also been an active participant at the Gordon Research Conference on Radiation and Climate. The LBNL Subsurface Science SFA is composed of three interdisciplinary challenges that span from Molecular to Field Scales. The challenges fully engage the LBNL team in collaborative research efforts that are highly impactful and uniquely leverage the organizational structure and research infrastructure at the National Laboratories. Thirteen LBNL staff serve as Editor or Associated Editor on nine high impact journals and five staff serve on scientific advisory panels. LBNL staff helped to organize two international and two national workshops.

**Objective 1.3 Provide and Sustain Outputs that Advance Program Objectives and Goals**

Score: 3.7

Grade: A-

Weighting: 20

**Objective 1.3 Performance Summary Statement:**

The structural biology programs at the ALS generally receive excellent peer reviews. An exception in FY 2009 was the x-ray tomography program which received only moderately supportive reviews and was given a one-year extension. The amended application for this program will be reviewed in FY 2010.

The JGI Scientific Programs in Microbes, Metagenomes, Fungi and Eukaryotes, and Plants continue to provide absolutely foundational sequence data for subsequent science for both DOE missions and wider scientific advance.

LBL radiochemistry research is widely disseminated. In FY09, they published or submitted 33 articles in peer-reviewed journals, 10 articles in conference publications, and made over 36 presentations at scientific meetings, of which 26 were invited presentations. A number of these were very high profile presentations, such as the conference summary at SCINT09 (an international conference on radiation detector development).

LBNL produced 90 scientific publications in plant and microbial systems biology, many in high impact journals. In particular, LBNL research has enabled a number of key technical breakthroughs by effectively utilizing its unique analytical resources to produce findings that would have been extremely difficult, if not impossible, to accomplish at other institutions.

PI Wehner participated in the development of several Synthesis and Assessment Reports, including the USGCRP Report "Global Climate Change Impacts in the United States." The LBNL ERSP SFA team continues to be very productive with 25 published articles in high-impact journals, 7 book chapters, two

patents and 74 invited presentations during this performance period.

**Objective 1.4 Provide for Effective Delivery of Products**

Score: 3.7

Grade: A-

Weighting: 30 **Objective**

**1.4 Performance Summary Statement:**

The JGI has developed successive iterations of its successful Integrated Microbial Genomes webbased utility The IMG system contains genomes from all three domains of life: as of April 2009, IMG included 1,284 bacterial, 59 archaeal, 49 eukaryotic genomes, as well as 2,524 viruses and 924 plasmids. IMG and its companion metagenome system, IMG/M, have been cited in over 200 publications and have been used in the analysis of dozen of genomes and metagenomes. Over the past FY, the JGI has consistently exceeded its quarterly milestones for sequence production and in fact exceeded its annual goal in the third quarter and its total FY09 production is expected to exceed the goal by a factor of three.

P. Is s funded by radiobiology and cancer biology gave 120 invited presentations, including 16 Keynote and 5 distinguished lectures, and organized 11 meetings.

PI Collins is working towards getting the Rapid Radiative Transfer Method into the Community Atmospheric Model. This would be a step in the direction of representing radiative processes more accurately in a climate model that is widely used by researchers. LBNL's ERSP SFA has demonstrated through their monthly updates, annual report and presentations to BER management that they are achieving the ambitious goals and milestones specified in their SFA Science Plan that was peer reviewed and approved last year by BER.

**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities**

Goal Score: 3.14

Goal Grade: B+

**Goal 2.0 Performance Summary Statement:**

The JGI continues to be one of the world's leading and most cost effective DNA sequencing centers. In terms of sequence throughput, the JGI continues to perform beyond expectations; however, the JGI does need to resolve some downstream problems and develop more proactive project management practices.

**Objective 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs (i.e., activities leading up to CD-2)**

Score: NA

Grade: NA

Weighting: 0

**Objective 2.1 Performance Summary Statement:**

**Objective 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components (execution phase, Post CD-2 to CD-4)**

Score: NA

Grade: NA

Weighting: 0

**Objective 2.2 Performance Summary Statement:**

**Objective 2.3 Provide Efficient and Effective Operation of Facilities**

Score: 3.1

Grade: B+

Weighting: 90

**Objective 2.3 Performance Summary Statement:**

To meet the demands of vastly increased sequence production, the JGI has been aggressively upgrading and adding to its infrastructure for information technology and analysis. Data storage capacity has doubled and its central computing cluster has tripled. ESNet access has been upgraded. New sequencing machines



(Illumina FLX) have been added and ABI3730 devices removed from the production line, all designed to optimize the cost-efficiency of sequence production. Resulting from the FY2008 month-long cessation of sequencing operations to address and correct ergonomic injuries, the JGI's FY2009 safety record was exemplary.

In terms of sequence throughput, the JGI continues to exceed expectations; however, the JGI moved too rapidly into new technologies, resulting in some downstream problems that are now being dealt with. The JGI was slow to recognize and address related significant challenges in project tracking; therefore, more proactive project management is desired for FY2010.

**Objective 2.4 Utilization of Facilities to Grow and Support Lab's Research Base and External User Community**

Score: 3.5

Grade: A-

Weighting: 10

**Objective 2.4 Performance Summary Statement:**

The structural biology beamlines supported by BER at the Advanced Light Source provide unique capabilities for applying soft x-ray and infrared beams to life science problems and are supporting growing internal and external communities.

The JGI has almost 1800 users around the world and maintains active linkages through conducting numerous workshops and participating in topical sessions at major scientific meetings. The annual user meeting was attended by close to 500 scientists, and the facility hosted hundreds of visitors. The JGI is actively used by researchers at LBNL involved in all three major BER mission areas, bioenergy, carbon cycling, and biogeochemistry research programs. The JGI actively engages with other large scale genome sequencing centers with broader mission goals.

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 3.60

Goal Grade: A

**Goal 3.0 Performance Summary Statement:**

LBNL has done an outstanding job in the management and development of its research programs across the BER portfolio including JBEI, the JGI, the low dose radiation research program, the ERSP activities, and climate research. Laboratory management is to be congratulated for the continued success of JBEI. The Laboratory is also commended for its broad-based planning for the future of the JGI and is encouraged to continue its inclusive approach to planning and management.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.7

Grade: A-

Weighting: 20

**Objective 3.1 Performance Summary Statement:**

The JGI recently recruited a Deputy Director for Production, Informatics and Operations to focus on JGI operations. New dashboards have been designed and implemented to begin monitoring internal processes and reporting to **DOE BER** management. In December, 2008, a major Science and Operations review was carried out leading to structural changes in the way JGI is operated and supported. A new Strategic Plan has been written that articulates the JGI's scientific vision and its importance for BER missions.

Collins participated in and presented a keynote presentation to the BER Climate Concept (modeling) group meeting. LBNL staff helped to lead several scientific planning activities for the ERSP and the DOE. This included an ERSP workshop on Subsurface Complex System Science, a report on "Scientific Opportunities to Reduce Risk in Groundwater and Soil Remediation," and an EM led initiative on "Advanced Subsurface Computing for Environmental Management."



### **Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 3.7

Grade: A-

Weighting: 30

#### **Objective 3.2 Performance Summary Statement:**

As part of the BER directed reconfiguration of funding to the overall JGI, as well as alterations in the profile of sequencing technologies to carry out JGI missions, a modest number of reassignments and layoffs became necessary. The JGI carried out this difficult program effectively and humanely, at a time of general economic difficulties across the nation. The new centralized funding structure makes redirection of resources administratively easier to do and allows more rapid adaptation to changing circumstances.

The project leaders and staff have developed successful experimental research approaches that are extensive and challenging across a spectrum of R&D related to such topics as characterization of biological complexes. The work requires attention to effective deployment of resources both on site and off site in order to address DOE/SC missions.

LBNL radiochemistry researchers are very effective in delivering their research to the public, with active collaborations with 6 public sector companies, ranging from small businesses (RMD, Inc., NewAbilities, Inc., and SensL) to large, multi-national corporations (GE, Philips, and Siemens). The LBNL Technology Transfer Department has been highly effective in translating research to the public. In the past year, the radiochemistry program has submitted or been awarded six patents.

Management is able to attract and retain world class scientist and technologists. They have developed and initiated efforts in areas such as multiscale imaging that have long term value to the laboratory, DOE programs and the larger biological community.

LBNL has been highly effective in developing opportunities for commercializing research findings and new technologies. During its second year of operation, the Joint Bioenergy Institute (JBEI) has actively pursued partnerships with industry and applied research endeavors to facilitate commercialization of JBEI research outputs.

Although individual divisions within LBNL have been highly effective in strategic planning and program management, it is less clear whether there is sufficient coordination across divisions necessary to facilitate multidisciplinary research endeavors.

LBNL provides effective and efficient management of their ERSP funded science programs. In response to the SFA process, LBNL reorganized a collection of individual research projects into a coherent interdisciplinary research effort focused on three broad themes. To support this change of focus, LBNL terminated several areas of research that were not well aligned with the new research direction and hired four new staff members (one senior and three junior scientists). This research program has been supported with LDRD investments from the Laboratory and leveraged strengths at LBNL (e.g., GTL science programs, the ALS), forged strong partnerships with other National Laboratories and University researchers, and contributed to important ERSP initiatives such as the Old Rifle and Oak Ridge Integrated Filed Research Challenge Projects.

### **Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 3.5

Grade: A-

Weighting: 50

#### **Objective 3.3 Performance Summary Statement:**

A major first step towards improving both communications and management was achieved by the redesign of JGI science programs into four themes: microbes, metagenomes, fungi, and plants. These correspond to



JGI science directions and make financial accountability and transparency easier. The JGI communicates closely with BER management and representatives of the various JGI partner organizations. JGI managers have been responsive to BER requests for information and generally visit quarterly to keep BER apprised of activities and developments. Improvements in tracking user satisfaction and JGI responsiveness to project status inquiries are necessary.

LBLN radiochemistry researchers communicate frequently with DOE program managers and consistently provide rapid response to their short-term inquiries. LBNL radiochemistry program researchers have assisted in developing new strategic directions by taking a leadership role in organizing the scientific content and writing the summary report from the Workshop on New Frontiers of Science in Radiochemistry and Instrumentation for Radionuclide Imaging. They have also been responsive in changing their program direction in response to DOE requests.

JBEI has been effective in publicizing the BRCs and reaching out to a broad community. They contribute high quality presentations at conferences and help coordinate BRC presence. JBEI has hosted many visitors and organized a successful summer research program for minority and disadvantaged students.

Management of the LBNL Physical Biosciences Division has been exceptionally responsive to DOE program staff and has played an active and effective role in facilitating the transition to the Science Focus Area funding structure.

JGI and JBEI have supplied the ARRA reporting and project management process with timely and careful documentation. LBNL ERSP staff clearly and efficiently communicate with BER management through monthly progress reports, frequent phone calls, and personal briefings at DOE headquarters, BERAC and other scientific meetings. LBNL management and staff respond in a timely manner to BER management requests with quality information and reports. This year the LBNL Environmental Geophysics Group authored ERSP's FY09 Quarterly PART Reports. All reports were of high quality and delivered ahead of schedule.

## Laboratory Year-End Performance Assessment Report

Date:

10/14/2009

Headquarters Program Office Fiscal Year 2009 Evaluation of The Regents of the University of California  
for Management and Operation of the Lawrence Berkeley National Laboratory

Agency:

U.S. Department of Energy

Program Office:

Office of Science - Basic Energy Sciences

FY Funding Level: (Budget Authority)

### Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 3.90

Goal Grade: A

#### Goal 1.0 Performance Summary Statement:

The BES supported research programs in chemical sciences, geosciences, biosciences, and materials sciences at LBNL continued to demonstrate scientific excellence and productivity. LBNL's success in the highly competitive EFRC funding opportunity and SISGR solicitation demonstrated scientific leadership and presents an excellent opportunity to enhance grand-challenge and use-inspired basic energy research in the laboratory.

The Gas Phase Chemical Physics (GPCP), Condensed Phase and Interfacial Molecular Science (CPIMS), and Chemical Dynamics Beamline programs were reviewed. The GPCP and CPIMS efforts were strongly praised for their world-leading quality, relevance, and scientific impact. The productivity of the GPCP and CPIMS activities were prodigious, with 65 and 52 publications in the review period, respectively; the work performed and planned is propelling the state of the art in these fields.

An early operations review of the LBNL Helios Solar Energy Research Center (SERC) provided a critical assessment of the center's strategic vision, management, resource allocations, and research objectives and approaches. The review demonstrated the basic soundness of the integrated systems approach toward solar fuel generation being taken by the SERC and confirmed that the science was of high quality. But the review identified gaps in leadership and expertise in key research areas, such as catalysis/electro-catalysis, that need to be addressed by successful recruiting.

LBNL received one EFRC award made by BES in FY 2009 and will be the lead institution on the EFRC: "Center for Nanoscale Control of Geologic CO<sub>2</sub>." In addition, LBNL is participating as a partner institution in five EFRCs led by other institutions. LBNL also received three Single-Investigator and Small-Group Research (SISGR) solicitation awards made by BES.

The Condensed Matter and Materials Physics programs supported by the BES Materials Sciences and Engineering (MSE) Division were reviewed; overall, the reviewers were impressed by the outstanding science that was presented and by the accomplishments of many of the principal investigators.

#### Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field

Score: 4.0

Grade: A

Weighting: 50

#### Objective 1,1 Performance Summary Statement:



Three programs supported by the BES Chemical Sciences, Geosciences, and Biosciences (CSGB) Division in Chemical Physics at Lawrence Berkeley National Laboratory (LBNL) were reviewed on site in May 2009. These were the Gas Phase Chemical Physics (GPCP), Condensed Phase and Interfacial Molecular Science (CPIMS), and Chemical Dynamics Beamline (CDB) programs. The GPCP and CPIMS efforts were strongly praised for their world-leading quality, relevance, and scientific impact. Reviewers applauded the strong synergistic collaborations and the interaction of theory and experiment in these two programs. This is all the more notable because they had previously been managed under seven separate Field Work Proposals. The productivity of the GPCP and CPIMS activities were prodigious, with 65 and 52 publications in the review period, respectively; the work performed and planned is propelling the state of the art in these fields.

The CDB program provides an invaluable capability to the research community, and the personnel associated with the beam line are to be commended for their excellence and tireless commitment. The CDB program is a unique resource that enables cutting-edge research at the ALS that would be extremely difficult to perform with other types of light sources. With recent innovations and upgrades the CDB program has allowed the U. S. to remain at the forefront of VLV research in chemical physics and chemical dynamics, with many applications having a direct relevance to energy, and with a significant output of 67 publications during the review period.

Ongoing CSGB Division-supported programs in Atomic, Molecular, and Optical Science; Ultrafast XRay Science; Catalysis Science; Heavy Element Chemistry; Geosciences; and Photo- and Biochemistry were not reviewed in FY 2009. The programs continued to be very productive and demonstrated sustained scientific progress.

An early operations review of the LBNL Helios Solar Energy Research Center (SERC) was conducted on-site in May 2009. The Center received operational funding at the level of \$5M annually in late FY 2008 from both BES research divisions. Reviewers provided a critical assessment of the center's strategic vision, management, resource allocations, and research objectives and approaches. The review demonstrated the basic soundness of the integrated systems approach toward solar fuel generation being taken by the SERC and confirmed that the science was of high quality. But the review identified gaps in leadership and expertise in key research areas, such as catalysis/electrocatalysis, that need to be addressed by successful recruiting.

The Condensed Matter and Materials Physics programs supported by the BES Materials Sciences and Engineering (MSE) Division were reviewed in FY 2009. Overall, the reviewers were impressed by the outstanding science that was presented and by the accomplishments of many of the principal investigators. However, one part of a project (Superconductivity -SQUID research) was discontinued as a consequence of the review which found it to be not well-aligned with the BES mission. Scientifically, the balance of the reviewed projects were exceptionally strong, productive, and generally well-aligned with the BES goals and mission. The laboratory successfully responded to reviewer concerns on these projects.

The LBNL Accelerator and Fusion Research Division was successful in receiving BES Scientific User Facility Division accelerator research funding to develop a low emittance room temperature RF gun for Free Electron Lasers.

### **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 3.8

Grade: A

Weighting: 20

#### **Objective 1.2 Performance Summary Statement:**

The Chemical Physics program on-site review in FY 2009 affirmed its high quality of scientific leadership. The program's group continued to develop innovative experimental and theoretical methods in chemical physics. Two of many examples are innovations to overcome limitations of the Density Functional Theory and probing ultrafast molecular dynamics using x-ray pulses produced by high harmonic generation. Through solid records of such progress, all of the senior investigators have earned international



reputations as leaders in the field. Similarly, CSGB Division-supported programs not reviewed in FY 2009 contain many world-class investigators, who continue to receive honors, accolades, and prizes from their peers in recognition of their scientific leadership.

LBNL received one of the forty-six Energy Frontier Research Center (EFRC) awards made by BES in FY 2009 and will be the lead institution on the EFRC: "Center for Nanoscale Control of Geologic CO<sub>2</sub>." In addition, LBNL is participating as a partner institution in five EFRCs led by other institutions. LBNL received three of the ninety-five awards in the Single-Investigator and Small-Group Research (SISGR) solicitation made by BES in FY 2009. LBNL's success in the highly competitive EFRC funding opportunity and SISGR solicitation demonstrated scientific leadership and presents an excellent opportunity to enhance grand-challenge and use-inspired basic energy research in the laboratory.

The LBNL materials science program has strong leadership in superconductivity, advanced NMR instrumentation development, nanomaterials synthesis, surface and interface science, and x-ray scattering and imaging of magnetic materials. LBNL has successfully established a large, interdisciplinary research program focused on effective and economic solar-produced fuel. LBNL provided leadership in developing new accelerator concepts and instrumentation.

**Objective 1.3 Provide and Sustain Outputs that Advance Program Objectives and Goals**

Score: 3.8

Grade: A

Weighting: 15

**Objective 1.3 Performance Summary Statement:**

The quantity and quality of CSGB Division-supported research outputs in peer-reviewed journals were excellent. In particular, the on-site review of LBNL Chemical Physics programs in FY 2009 revealed 184 publications in peer-reviewed journals during the previous three-year funding cycle.

The quantity and quality of MSE Division-supported research outputs in peer-reviewed journals were excellent. In particular, the on-site review of LBNL Condensed Matter Physics programs in FY 2009 revealed impressive, impactful scientific output during the previous three-year funding cycle.

**Objective 1.4 Provide for Effective Delivery of Products**

Score: 3.8

Grade: A

Weighting: 15

**Objective 1.4 Performance Summary Statement:**

CSGB Division-supported research programs were effective and efficient in meeting scientific objectives and milestones; the programs were responsive to requests from BES for information and research highlights.

**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities**

Goal Score: 4.14

Goal Grade: A+

**Goal 2.0 Performance Summary Statement:**

The BES supported scientific user facilities at LBNL continued to perform as worldwide leaders in their respective fields. Facility construction projects continued with steady progress, successfully responding to changing funding guidance in FY 2009.

The LBNL Advanced Light Source (ALS) operated at a reliability of 97 percent. The successful implementation of top-off storage ring operation allowed the ALS to increase scheduled user hours from 5000 hours to 5471 hours because of the increased efficiency and reliability of top-off operation. ALS was able to secure Recovery Act funding for sextupole magnets which will lead to a significant enhancement in ALS beam brightness.

The TEAM project continued with steady progress throughout FY 2009, culminating in successful completion of the project within cost and time baselines. Performance exceeded technical baselines. Due to savings in other areas, detectors were able to be included in the project, providing unprecedented sensitivity and recording speed.

The USB project was negatively impacted by the extended Continuing Resolution. However, it received Recovery Act funding of \$14.7M, and additional re-planning resulted in reductions in cost and schedule. The project is planned to achieve LEED `Silver' certification and is evaluating the potential to achieve LEED `Gold' certification.

**Objective 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs (i.e., activities leading up to CD-2)**

Score: NA

Grade: NA

Weighting: 0

**Objective 2.1 Performance Summary Statement:** No BES efforts.

**Objective 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components (execution phase, Post CD-2 to CD-4)**

Score: 4.2

Grade: A+

Weighting: 19

**Objective 2.2 Performance Summary Statement:**

The TEAM project continued with steady progress throughout FY 2009, culminating in successful completion of the project within cost and time baselines. Performance exceeded technical baselines. Due to savings in other areas, detectors were able to be included in the project, providing unprecedented sensitivity and recording speed. The TEAM stage, winner of an R&D- 100 award, was installed on TEAM I, continuing the tomographic capability demonstrated on the development column. TEAM achieved key performance specifications of 0.1 eV energy resolution, and 0.5 resolution in both TEM and STEM modes, making it the world's highest-resolution electron microscope. TEAM I has a 5 mm pole piece gap, and chromatic aberration (Cc) image corrector in addition to the spherical aberration (Cs) probe corrector. Remote operation of TEAM over ESnet was demonstrated. Critical Decision 4b, Approve Full Operations, was approved on September 16, 2009, allowing user operations on the TEAM I microscope.

The USB project was very successful in responding to changing funding guidance in FY 2009. The project was negatively impacted by the extended Continuing Resolution beyond the 3 months planned, and re-planning was required, which would have increased project cost and duration. In addition, the project received advance funding of \$14.7M from the American Recovery and Reinvestment Act (ARRA) of 2009, and additional re-planning was required resulting in reduction in cost and schedule. The project team was very responsive and proactive in working with the construction subcontractor to mitigate negative impacts on the project and to negotiate favorable terms where possible. Phase 1 of the project was completed in FY 2008, including demolition of Building 10 and construction of building foundations, embedded steel columns and concrete slab on-grade. Phase 2 was begun and the project is 44 percent complete; structural steel, 1st, 2nd and 3rd floor decking and concrete infill complete, metal decking at roof level complete, interior wall framing on 1st and 2nd floors complete. Installation of exterior framing and above ceiling rough HVAC, plumbing, and electrical systems are in progress. Installation of the building exterior is on track to have the building weather tight in FY 2010. The project is planned to achieve LEED `Silver' certification and is evaluating the potential to achieve LEED `Gold' certification.

**Objective 2.3 Provide Efficient and Effective Operation of Facilities**

Score: 4.2

Grade: A+

Weighting: 62

**Objective 2.3 Performance Summary Statement:**

The LBNL Advanced Light Source (ALS) operated at a reliability of 97 percent. The successful implementation of top-off storage ring operation allowed the ALS to increase scheduled user hours from 5000 hours to 5471 hours because of the increased efficiency and reliability of top-off operation.

As a result of receiving excellent ratings on a review of its ARRA proposals, ALS was able to secure funding for sextupole magnets which will lead to a significant enhancement in ALS beam brightness. The ALS also received funding for a new undulator for the femtosecond slicing beamline, beamline detectors, and a high field vector magnet for new soft x-ray magnetic dichroism experiments.

Both the Molecular Foundry and the National Center for Electron Microscopy (NCEM) user facilities operated efficiently and effectively with minimal downtime. NCEM continued to experience some staff turnover; in itself this is not a problem, but vacancies need to be rapidly addressed via aggressive and creative recruiting in order to maintain effective operation of the facility.

**Objective 2.4 Utilization of Facilities to Grow and Support Lab's Research Base and External User Community**

Score: 3.9

Grade: A

Weighting: 19

**Objective 2.4 Performance Summary Statement:**

The ALS was used by many research programs at LBNL. The Molecular Foundry staff and users were taking advantage of the ALS. The Molecular Foundry continued to carry out and facilitate a strong scientific program in FY 2009, and aggressively addressed BES recommendations from the initial operations review in FY 2007. Through leadership of the TEAM project, now brought to a very successful conclusion, the National Center for Electron Microscopy (NCEM) has substantially enhanced the laboratory's programs and visibility.

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 3.35

Goal Grade: B+

**Goal 3.0 Performance Summary Statement:**

Overall, LBNL provides program vision and effective stewardship of the chemical sciences, geosciences, biosciences, and materials sciences research supported by BES. LBNL has also shown considerable scientific vision in projecting the future of the scientific facilities at the laboratory.

Strategic Plans were developed for the ALS with input from advisory groups and users.

The newly appointed Materials Sciences Division leader has brought new vision and is expected to provide effective leadership for the program. He has been proactive in initial interactions with BES management. Prioritization of new directions for the program is in progress.

LBNL presentations at the Review of BES-supported materials sciences programs were not well managed or organized by the laboratory. In addition, several reviewers commented that sections of the review documents were poorly written and disorganized, making it challenging to assess the progress and proposed work.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.8

Grade: A

Weighting: 40

**Objective 3.1 Performance Summary Statement:**

Overall, LBNL provides compelling program vision and effective stewardship of the **BES CSGB** Division supported research. The Director of the LBNL Chemical Sciences Division is an effective leader of the CSGB research programs. The FY 2009 Chemical Physics on-site review demonstrated notable progress in aligning and coordinating efforts.

Overall, LBNL provides programmatic vision and effective stewardship of the BES MSE Division-supported research. In late FY 2009, the Director of the LBNL Materials Sciences Division was appointed as the LBNL Laboratory Director. The new Director of the LBNL Materials Sciences Division is expected to be a good steward and an effective leader of the BES MSE Division supported research programs.

The LBNL management has shown considerable scientific vision in projecting the future of the scientific facilities at the laboratory. The stewardship of the LBNL facilities is in excellent shape and a good model to follow.





**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 3.1

Grade: B+

Weighting: 30

**Objective 3.2 Performance Summary Statement:**

LBNL management presents clear descriptions of the CSGB Division-supported programs, synergies between them, and the context of those programs in the larger strategic vision of the laboratory.

Despite active recruiting efforts by LBNL, key scientific positions in the SERC remain unfilled.

It is expected that the newly appointed Materials Sciences Division leader will provide effective leadership for the program. He has been proactive in initial interactions with BES management. Prioritization of new directions for the program is in progress.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 3.0

Grade: B

Weighting: 30

**Objective 3.3 Performance Summary Statement:**

Communications between the CSGB Division and LBNL management in the Chemical Sciences, Earth Sciences, and Physical Biosciences Divisions were thorough and timely in FY 2009.

LBNL presentations at the Review of MSE Division-supported programs were not well managed or organized by the laboratory. In addition, several reviewers commented that sections of the review documents were poorly written and disorganized, making it challenging to assess the progress and proposed work.

## Laboratory Year-End Performance Assessment Report

Date:  
10/19/2009

Headquarters Program Office Fiscal Year 2009 Evaluation of The Regents of the University of California  
for Management and Operation of the Lawrence Berkeley National Laboratory

Agency:  
U.S. Department of Energy

Program Office:  
Office of Science - Fusion Energy Sciences  
FY Funding Level: (Budget Authority)  
\$4.941M

### Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 3.51

Goal Grade: A

#### Goal 1.0 Performance Summary Statement:

The mission of the Heavy Ion Fusion Science Virtual National Laboratory (HIFS-VNL ) is to carry out research on Heavy Ion Fusion Science (HIFS), including studies of Warm Dense Matter (WDM). This mission was advanced significantly in FY09 with the first measurements of the properties of ion beam heated WDM targets, which were reported in the 4th quarter of FY09. LBNL has operated the current experimental facility for HIF/WDM experiments, the Neutralized Drift Compression Experiment-I (NDCX-I), in a safe and efficient manner.

#### Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field

Score: 3.7

Grade: A-

Weighting: 30

##### Objective 1,1 Performance Summary Statement:

LBNL made the first measurements of WDM target temperature versus time on the nanosecond time scale by developing and using the world's fastest optical pyrometer. LBNL also reported new results using a state of the art inertial fusion code (HYDRA-3D) at the International Inertial Fusion Science and Applications conference in September 2009. These results show DT fuel capsules the same size as NIF can be driven to several times higher gain using less overall beam energy (500 kJ of heavy ions) versus 1.3 MJ for NIF lasers.

#### Objective 1.2 Provide Quality Leadership in Science and Technology

Score: 3.5

Grade: A-

Weighting: 20

##### Objective 1.2 Performance Summary Statement:

LBNL continues to be the lead lab managing the US Heavy Ion Fusion Science Virtual Laboratory, a research collaboration with LLNL, and PPPL. The current Memorandum of Agreement covering this collaboration was renewed in 2005 by then LBNL Director Steven Chu.

#### Objective 1.3 Provide and Sustain Outputs that Advance Program Objectives and Goals

Score: 3.5

Grade: A-

Weighting: 25

##### Objective 1.3 Performance Summary Statement:



The product of the HIFS-VNL is science for its mission, the science underlying the basis for heavy ion fusion and warm dense matter. The science was pursued in an optimal fashion by carrying out a coordinated set of experiments, theory and simulations, as documented in the 44 publications in refereed journals and 16 invited talks. The HIFS-VNL led and managed by LBNL has an even larger total for referred journal publications and invited papers.

**Objective 1.4 Provide for Effective Delivery of Products**

Score: 3.3 Grade: B+ Weighting: 25

**Objective 1.4 Performance Summary Statement:**

LBNL met all milestones on time. For example, a new and larger induction bunching module was completed and installed on NDCX-I during FY2009, which doubled the beam charge and energy delivered to the WDM target experiments, resulting in higher target temperatures using carbon targets.

The NDCX-II construction project, as an ARRA-funded new facility, commenced in July 2009. A very good initial design basis for NDCX-II had been advanced in the first half of FY2009 based on using available Advanced Test Accelerator (ATA) induction accelerator modules from LLNL.

**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities**

Score: 0.00 Grade: N/A Weighting: 0

**Goal 2.0 Performance Summary Statement:**

**Objective 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs (i.e., activities leading up to CD-2)**

Score: NA Grade: NA Weighting: 0 **Objective**

**2.1 Performance Summary Statement:**

**Objective 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components (execution phase, Post CD-2 to CD-4)**

Score: NA Grade: NA Weighting: 0

**Objective 2.2 Performance Summary Statement:**

**Objective 2.3 Provide Efficient and Effective Operation of Facilities**

Score: NA Grade: NA Weighting: 0

**Objective 2.3 Performance Summary Statement:**

**Objective 2.4 Utilization of Facilities to Grow and Support Lab's Research Base and External User Community**

Score: NA Grade: NA Weighting: 0

**Objective 2.4 Performance Summary Statement:**

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**



Goal Score: 3.36

Goal Grade: B+

**Goal 3.0 Performance Summary Statement:**

LBNL quickly established an effective project team as soon as OFES decided to select NDCX-II as an ARRA project. The new project team briefed OFES in April 2009 on the status of design for NDCX-II and readiness to proceed once ARRA funding arrived. LBNL completed performance tests on a test stand to verify the NDCX-II requirements could be met by ATA modules.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.4

Grade: B+

Weighting: 35

**Objective 3.1 Performance Summary Statement:**

LBNL, along with its partners LLNL and PPPL, participated in the FESAC panel on HEDLP. As a result of persuasive representation of research opportunities on intense beam physics and ion beam driven WDM physics using NDCX I and II, these research opportunities were subsequently endorsed by FESAC in January 2009. As one of the consequences, the organization of the HIFS-VNL was broadened in FY09 to include new work on heavy-ion beam driven target physics, responding to the recommendations of the FESAC report.

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 3.4

Grade: B+

Weighting: 30

**Objective 3.2 Performance Summary Statement:**

The VNL has developed a long range plan for research in WDM. In addition, a complete management plan and Work Breakdown Structure has been established as shown in the 4th QTR FY09) ARRA report for NDCX-II.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 3.3

Grade: B+

Weighting: 35

**Objective 3.3 Performance Summary Statement:**

Several white papers were written and sent as input to OFES during FY09, in preparation to the upcoming HEDLP ReNeW Workshop, explaining how both the current NDCX-I and how the new facility NDCX-II, can be used to advance goals for HIF science and WDM.



## Laboratory Year-End Performance Assessment Report

Date: 10/20/2009

Headquarters Program Office Fiscal Year 2009 Evaluation of The Regents of the University of California  
for Management and Operation of the Lawrence Berkeley National Laboratory

Agency: U.S. Department of Energy  
Program Office: Office of Science - High Energy Physics

FY Funding Level: (Budget Authority)

### Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 3.65

Goal Grade: A

#### Goal 1.0 Performance Summary Statement:

The HEP program at LBNL has strong components in proton-accelerator based research, nonaccelerator research and detector R&D, which are all based on strong technical capabilities.

#### Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field

Score: 3.8

Grade: A

Weighting: 30

#### Objective 1.1 Performance Summary Statement:

The programs in proton-based accelerator research, non-accelerator research and detector R&D are the dominant HEP-supported programs at LBNL in both size and impact. One typical comment from the recent OHEP proton program review: "LBNL has one of the premier particle physics groups in the world and by many measures, is an outstanding HEP laboratory facility." Similarly the work on cosmology has been very important. They have added a strong program in baryon acoustic oscillations to their long standing and world class program in using supernovae to study dark energy. Reviewers on the panel of the July 2009 Laboratory Detector R&D review felt that the scientific CCDs designed, developed, and fabricated by the LBNL Microsystems Laboratory has made an outstanding contribution to current particle astrophysics experiment instrumentation. In addition the program in laser plasma-wakefield particle accelerators continues to be a world leading effort. However, the overall rating of the small LBNL theory group in the recent peer review was middling.

#### Objective 1.2 Provide Quality Leadership in Science and Technology

Score: 3.7

Grade: A- Weighting: 30

#### Objective 1.2 Performance Summary Statement:

The laboratory staff leads important areas including design, fabrication, installation, and operation of large detector components for the ATLAS detector. In addition, they have played and continue to play leading roles in physics analysis and computing in support of ATLAS. The laboratory plays a pivotal role in the U.S. ATLAS collaboration and has exercised strong leadership in a number of technical and scientific areas, but in particular in the ATLAS pixel and silicon detectors. LBNL regularly attracts outstanding junior researchers and students. One reviewer commented "LBNL has an outstanding record of training and developing young scientists." It is expected that LBNL will play an important role in Phase II upgrades of the ATLAS detector.



The group has led several successful BaBar analysis efforts and has a small part in the growing US Super-B collaboration. The theory group has leaders in flavor physics, Soft Colinear Effective Theory. The accelerator group has played a strong role in understanding and mitigating electron cloud effects in high intensity accelerators.

**Objective 1.3 Provide and Sustain Outputs that Advance Program Objectives and Goals**

Score: 3.7

Grade: A-

Weighting: 20

**Objective 1.3 Performance Summary Statement:**

The recent review of proton accelerator-based research at LBNL yielded an evaluation of outstanding. The technical, scientific and leadership output of the staff regularly exceeds the expectations. One reviewer observed: "The past track record of scientific output from LBNL is really outstanding and I would expect it to continue." The laboratory staff is very responsive to review recommendations and headquarters guidance.

The progress in the laser plasma-wakefield program has been consistent with new ideas being implemented each year to advance the program. The LARP magnet program has consistently produced world-leading results, and the LARP accelerator systems also produced impressive productivity during this grading period.

**Objective 1.4 Provide for Effective Delivery of Products**

Score: 3.3

Grade: B+

Weighting: 20

**Objective 1.4 Performance Summary Statement:**

Program goals are primarily met on budget and on schedule and in accordance to the priorities of the national program. The LBNL program is fully responsive to Headquarters guidance.

**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities**

Goal Score: 3.20

Goal Grade: B+

**Goal 2.0 Performance Summary Statement:**

LBNL leads two projects for HEP, BELLA and the Daya Bay Reactor Experiment. Progress on BELLA has been good, but some problems with their foreign partners on Daya Bay were not addressed quickly enough.

**Objective 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs (i.e., activities leading up to CD-2)**

Score: 3.5

Grade: A-

Weighting: 40

**Objective 2.1 Performance Summary Statement:**

The BELLA Project had CD-0 during FY 2009 and received CD-1 in September 2009. The project is funded in part with Recovery Act funds. This has required additional effort on the part of the lab to comply with Recovery Act requirements in addition to the usual DOE project management requirements. Work on the project has been satisfactory and, the project was reviewed by the Office of Project Assessment prior to CD-1.

**Objective 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components (execution phase, Post CD-2 to CD-4)**

Score: 3.0

Grade: B

Weighting: 60

**Objective 2.2 Performance Summary Statement:**



LBNL has one project that is funded by HEP and is past CD-2, the Daya Bay Reactor Neutrino Experiment. LBNL is the laboratory for project management and works with BNL on the fabrication of the experiment. The Daya Bay Project saw delays this year due to problems with the civil construction being done in China by the Chinese members of the collaboration. Lab management did not proactively take steps to address this problem, but waited until it became necessary to rebaseline the project.

**Objective 2.3 Provide Efficient and Effective Operation of Facilities**

Score: NA Grade: NA Weighting: 0

**Objective 2.3 Performance Summary Statement:**

**Objective 2.4 Utilization of Facilities to Grow and Support Lab's Research Base and External User Community**

Score: NA Grade: NA Weighting: 0

**Objective 2.4 Performance Summary Statement:**

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 3.36

Goal Grade: B+

**Goal 3.0 Performance Summary Statement:**

Lab management has a strong vision of how to enable good science, but is not always as strong on implementing that vision transparently and efficiently.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.6 Grade: A- Weighting: 40

**Objective 3.1 Performance Summary Statement:**

Lab management continues to maintain and advance its core competencies in detector design and development and apply them to high-priority physics missions, as recognized by the outstanding peer reviews of the detector R&D and proton research efforts. Lab management also continues to deal effectively with an ever-changing landscape in dark energy research where it has a leadership role, and is positioning LBNL to continue as a leader in the field regardless of whether JDEM is eventually successful.

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 3.3 Grade: B+ Weighting: 40 **Objective 3.2**

**Performance Summary Statement:**

The LBNL research and technology programs are effectively managed and issues are usually dealt with proactively.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 3.0 Grade: B Weighting: 20 **Objective 3.3**

**Performance Summary Statement:**

LBNL management communicates regularly with OHEP and responds promptly to requests for information. However there are still instances where the lab did not present clear or consistent budget or



program plans for some efforts, including Theory and Non-accelerator physics. In the former case this contributed to a relatively poor peer review outcome.





## Laboratory Year-End Performance Assessment Report

Date: 10/15/2009

Headquarters Program Office Fiscal Year 2009 Evaluation of The Regents of the University of California  
for Management and Operation of the Lawrence Berkeley National Laboratory

Agency:

U.S. Department of Energy

Program Office:

Office of Science - Nuclear Physics

FY Funding Level: (Budget Authority)

30,981,000

### Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 3.56

Goal Grade: A

#### Goal 1.0 Performance Summary Statement:

The LBNL nuclear physics group performs at a high level in all areas in mission accomplishment and merits a grade of A-:

- Leadership roles in the national neutrino program with high impact in the field world-wide.
- Significant accomplishments in studies of heavy element physics and chemistry, including confirmation of synthesis of element 114.
- Leadership in Electron Cyclotron Resonance ion source and related technologies, important for advanced accelerator facilities.  
Strong contributions to the study of hot, dense nuclear matter at the Relativistic Heavy Ion Collider.
- Strong contributions to the theory of hot and dense QCD matter (viscosity, flow, parton energy loss, equation of state) and the QCD structure of the nucleon (transverse structure, single spin asymmetries)
- Effective leadership in detector technology and fabrication aimed at the areas of nuclear structure, neutrino physics, and heavy ion collisions.
- Strong publication record.

The scores and grades for Goals 1-3 are based on the communication to NP at the February Laboratory Managers' Briefings, joint Agency Review of the 88-Inch Cyclotron operations, Laboratory Theory Groups review (peer review), the LBNL Nuclear Science Division's self assessment, numerous Project Reviews (peer review), quarterly reports by project contract managers, NP program managers' site visits, observations at national meetings, and their judgments.

#### Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field

Score: 3.7

Grade: A-

Weighting: 35

#### Objective 1.1 Performance Summary Statement:

LBNL researchers carry out high priority research addressing national NP performance goals and milestones in relativistic heavy ion physics, neutrino physics, heavy element physics and chemistry, fundamental



interactions, nuclear structure and reactions, and nuclear theory. The nuclear data program compiles and evaluates experimental information on selected mass chains.

Nuclear chemists have used calcium-48 beam from the 88-Inch Cyclotron, a plutonium-244 target, and the Berkeley Gas-Filled Separator to produce two isotopes of element 114. This element was first produced by the Dubna group in Russia ten years ago, but has remained unconfirmed until now. This confirmation is essential for the chemistry community to determine that a new element has been discovered, and establishes that "hot fusion" is an effective mechanism to study superheavy elements.

LBNL scientists have scientific and management leadership roles in the international CUORE project in Italy to search for neutrino-less double beta decay, the international KamLAND experiment in Japan to measure neutrino mixing parameters with reactor antineutrinos and detection of lower energy solar neutrinos, analysis of data from the SNO experiment in Canada to determine neutrino mixing parameters with solar neutrinos, and R&D for the Majorana experiment to search for neutrino-less double beta decay of germanium-68. Combined results from the SNO and KamLAND experiments provide the most stringent constraints on neutrino mass differences and some of the mixing coefficients in the neutrino mixing matrix.

A controversial claim has been made that the electron-capture decay probability of promethium-142 oscillates with time; a proposed explanation is neutrino mass state mixing in the final state of the emitted neutrino. If this result is confirmed, and the explanation is correct, that neutrino oscillations could be studied with far cheaper, simpler experiments. Researchers produced promethium-142 at the 88-Inch Cyclotron and followed its decay by measuring emitted x-rays. The result is consistent with exponential decay, and any oscillating terms are 30 times smaller than previously reported results. Thus the decay oscillation of promethium-142 is not confirmed.

LBNL scientists are leaders in ECR based ion sources and continue to improve the design and performance of these sources. The ECR source group at LBNL is responsible for design and construction of a high intensity ECR source for the planned Facility for Rare Isotope Production at Michigan State University (FRIB). The LBNL accelerator and ion source group has taken the lead in a collaboration formed to propose the development of an accelerator for the Deep Underground Science and Technology Laboratory DUSEL.

The 2009 DOE Science and Technology (S&T) panel review evaluated the Relativistic Heavy Ion Collider (RHIC) STAR experiment as being high-quality as demonstrated by many scientific measurements and numerous publications that have appeared in refereed journals. The Relativistic Nuclear Collisions (RNC) group has a vital presence in STAR collaboration and its publications continue to have an important impact on the field.

LBNL nuclear theorists have had significant impact in relativistic heavy ion physics, providing interpretations for RHIC data, especially in jet physics.

The nuclear theory group continues to provide meaningful insights into the properties of hot and dense QCD matter. Theorists have recently used a general measure of "fluidity," which affords a more realistic comparison of fluid systems than earlier approaches. Progress was made in modeling the phase transition dynamics of baryon-dense matter via the inclusion of a density gradient term in the equation of state. This will impact the description of phase equilibrium. Jet transport and energy loss in medium was examined and connected to shear viscosity. The usefulness of photon jet correlations as tomographic tools was demonstrated.

LBNL theory researchers increased their contributions to the study of the QCD structure of the nucleon. Single spin asymmetries were investigated in heavy flavor production and they were found to be sensitive to the mechanism of heavy quarkonium production. It was demonstrated (in collaboration with non-LBNL theorists) that tri-gluon correlations are accessible in the nucleon via single-spin asymmetry in open-charm production. These accomplishments will impact experimental efforts directed toward the spin structure of



the nucleon.

The LBNL nuclear data group makes a consistent and effective contribution to the national nuclear data program, particularly in the traditional area of evaluation of nuclear mass chains.

### **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 3.6

Grade: A-

Weighting: 25

#### **Objective 1.2 Performance Summary Statement:**

LBNL researchers have leadership roles for a number of projects for low energy nuclear physics including the GRETINA gamma-ray detector array, the U.S. involvement in the CUORE experiment, and the U. S. involvement in KamLAND. They have played significant roles in the SNO data analysis, and research and development for the Majorana experiment.

Scientists at the 88-Inch Cyclotron continue to play a national role in developing best practice standards for dosimetry for electronics testing in radiation environments.

The RNC group is regarded has been successful in producing forefront physics and taking-on the leadership role in the development of the STAR Heavy Flavor Track (HFT) detector upgrade which is now advancing towards Critical Decision -1. While, the Heavy Flavor Tracker (HFT) project did pass a DOE CDO scientific review, the feasibility of the HFT proposal's broad scientific goals was not successfully demonstrated and has yet to be addressed by LBNL management.

The RNC group is a founding member of the ALICE-USA collaboration and provides strong scientific leadership. However, the ALICE-USA collaboration and the RNC group are significantly late in responding to the recommendations of the DOE ALICE-USA Science Review. The RNC group also plays the leading role in the management of the CERN ALICE Electromagnetic Calorimeter (EMCAL) project which is below cost and ahead of schedule. Some technical and engineering aspects of the RNC program are world-class.

NSD personnel work closely with the National Nuclear Data Center to provide leadership for the Nuclear Data Program and, with Recovery Act funds, are developing young talent for the field. They participate in workshops to train new evaluators, particularly internationally.

Daniela Leitner and Claude Lyneis shared the International Ion Source Prize "Brightness Award" in September 2009.

The Nuclear Science Division organized seven various conference, meetings, and workshops in Fiscal Year 2009, covering topics such as research with rare isotope beams, heavy ion physics, nucleon spin physics, and instrumentation.

### **Objective 1.3 Provide and Sustain Outputs that Advance Program Objectives and Goals**

Score: 3.6

Grade: A-

Weighting: 25

#### **Objective 1.3 Performance Summary Statement:**

The Nuclear Science Division (NSD) scientists produced a significant body of work published in peer-reviewed journals, with a total of 107 publications in heavy ions, low energy nuclear physics, neutrino astrophysics, nuclear theory, and accelerator physics. A total of 160 invited talks were presented by staff members.



A total of 8 theses were awarded for research performed under mentorship of NSD scientists or as a result of work done at the facility.

The NSD researchers for nuclear data provide evaluated data for a suite of mass chains on a regular rotating basis.

#### **Objective 1.4 Provide for Effective Delivery of Products**

Score: 3.1

Grade: B+

Weighting: 15

##### **Objective 1.4 Performance Summary Statement:**

The NSD-led GRETINA project is largely on schedule and is within budget. Although some schedule delays were beyond the control of the laboratory, some activities that have slipped were the sole responsibility of LBNL. GRETINA electronics modules are being adopted as standards or starting points for modern gamma-ray spectroscopy electronics.

The ALICE EMCaI project is proceeding ahead of schedule and below cost. The laboratory has done an outstanding job in meeting its commitments to date on this project.

The CUORE project is experiencing a delay in establishing its cost and schedule performance baseline. Delivery of requested project documentation is slow. The laboratory was asked to strengthen its project management oversight of this effort.

The researchers and personnel of the 88-Inch Cyclotron provide highly effective support of the applied programs that use the facility, particularly the irradiation of microelectronics for space applications. The National Reconnaissance Office and the U.S. Air Force, substantial users of beam time for testing, are renewing the DOE/NRO/USAF Memorandum of Agreement through 2015.

The 88-Inch Cyclotron staff proposed two accelerator upgrades for the facility utilizing Recovery Act funds: A High Voltage Injector Upgrade, and the Radio Frequency Amplifier Upgrade. The staff is effectively beginning the planning and design of these upgrades.

The RNC group has developed plans for the STAR Heavy Flavor Detector that have yet to be reviewed in preparation for a Critical Decision-1 review. The development of these project plans took longer than anticipated.

The NSD nuclear data program regularly publishes evaluations through the NNDC's on-line services.

#### **Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities**

Goal Score: 3.40

Goal Grade: B+

##### **Goal 2.0 Performance Summary Statement:**

The LBNL nuclear physics group performs at a high level in the design, fabrication, construction and operation of research facilities and merits a grade of B+:

- 88-Inch Cyclotron provided approximately 4000 hours of beam time with high reliability for basic research and applications
- Highly effective and efficient operations of the 88-Inch Cyclotron for both applied and basic research programs.
- Leadership for a number of important detector fabrication projects in nuclear structure, neutrino



physics, and heavy ion collisions for the national program.

- Leading competency in the development of Electron Cyclotron Resonance ion sources for accelerator applications.

**Objective 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs (i.e., activities leading up to CD-2)**

Score: NA                                      Grade: NA                      Weighting: 0

**Objective 2.1 Performance Summary Statement: NA**

**Objective 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components (execution phase, Post CD-2 to CD-4)**

Score: NA                                      Grade: NA                      Weighting: 0

**Objective 2.2 Performance Summary Statement: NA**

**Objective 2.3 Provide Efficient and Effective Operation of Facilities**

Score: 3.4                                      Grade: B+                      Weighting: 85

**Objective 2.3 Performance Summary Statement:**

The 88-Inch Cyclotron operated for approximately 5000 hours in FY 2009 with 94% availability. The National Reconnaissance Office (NRO) and the U. S. Air Force (USAF) utilized approximately 2000 hours of beam time for their applied programs.

Experiments include 87 using the BASE facility for radiation effects experiments, 31 for nuclear science runs, and 3 for beam studies. The 16 MeV/nucleon cocktail beam is being used increasingly and results from its use were featured in several talks at the 2008 Nuclear Space Radiation Effects Conference.

**Objective 2.4 Utilization of Facilities to Grow and Support Lab's Research Base and External User Community**

Score: 3.4                                      Grade: B+                      Weighting: 15

**Objective 2.4 Performance Summary Statement:**

The 88-Inch Cyclotron is used effectively as a base facility and infrastructure to develop capabilities for applied programs including those of the NRO and USAF. The accelerator capabilities enable the development of surrogate reaction techniques of interest to applied programs such as national security and advanced fuel cycles for reactors. One research area is devoted to the production and utilization of neutrons, which was enhanced in 2009 to provide more intense beams.

The 88-Inch Cyclotron staff exploits its competency in forefront Electron Cyclotron Resonance (ECR) ion sources to develop, test and utilize advanced ECR sources such as VENUS. VENUS is expected to be the prototype ECR source for the Facility for Rare Isotope Beams.

The accelerator physics staff members have utilized their expertise to be part of a collaboration that has successfully applied for funding under the NSF S4 solicitation to develop a low-energy accelerator facility for nuclear astrophysics research at the Deep Underground Science and Engineering Laboratory.



Goal Score: 3.38

Goal Grade: B+

**Goal 3.0 Performance Summary Statement:**

The LBNL nuclear physics group performs at a high level in all areas in science and technology program management and merits a grade of B+:

- Highly active and well-recognized for involvement and leadership in national and international neutrino experiments.
- Internationally recognized expertise, competency and leadership in the physics and chemistry of the heaviest elements.
- Recognized for stewardship of detector technologies for gamma rays, neutrinos, and high-energy particles and photons.
- Effectively manages the joint operations of the 88-Inch Cyclotron by the DOE, NRO, and USAF.
- Addition of joint faculty with the University of California (Berkeley) in an area that strengthens the NSD staff.
- Does a generally good job in the management of projects.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.5

Grade: A-

Weighting: 40

**Objective 3.1 Performance Summary Statement:**

The NSD is recognized for its strengths in all aspects of the design, development and fabrication of detector systems such as GRETINA, ALICE EMCal, CUORE and STAR HFT. However, the NSD has been showing weaknesses in the management of some of these project: GRETINA has been experiencing schedule challenges and CUORE experienced substantial slippage in preparing for Critical Decision -2. The NSD staff members continue to build on present efforts on the GRETINA project to plan for a full 47r gamma-ray detector array, GRETA.

The NSD staff members with nuclear chemistry expertise continue to nurture that small but vital field, while producing highly significant scientific results.

Staff members play a national leadership role in many aspects of non-accelerator neutrino physics, including a vision for the field, and are leaders or among the leaders of several experiments and R&D efforts.

The NSD has made a joint appointment with the University of California (Berkeley) for a prominent nuclear theorist with broad expertise in nuclear structure and nuclear astrophysics.

The NSD has developed a program plan for research and investment at the 88-Inch Cyclotron. The execution of this plan has been hampered by constraints on funding.

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 3.3

Grade: B+

Weighting: 40



### **Objective 3.2 Performance Summary Statement:**

The NSD manages the joint operations of the 88-Inch Cyclotron with the DOE, NRO, and USAF in a very effective manner, providing excellent capabilities for a spectrum of users.

The superconducting the VENUS ECR ion source suffered a significant failure two years ago. Management has devoted substantial non-DOE resources to the diagnosis, successful repair and improvement of the VENUS, recognizing the importance of this technology for not only the local program, but also the national program with the future FRIB.

The NSD has effectively managed the neutrino program transition from a program dominated by SNO and KamLAND to the new experiments, CUORE and Majorana R&D, as well as taking a lead role in the management of DUSEL planning. NSD is nurturing a potential interest in KATRIN by LBNL staff.

The NSD and the laboratory provide effective management for the GRETINA and ALICE EMCaI MIE projects. The DOE has concerns about the project management of CUORE, and the Associate Laboratory Director for General Sciences at LBNL has created a Project Oversight Group consisting of senior scientists and engineers drawn from multiple divisions in order to provide additional monitoring of, and management support for, General Sciences projects.

The DOE has concern that the feasibility of the HFT proposal's broad scientific goals was not demonstrated and the ALICE-USA collaboration and the RNC group is significantly late in responding to the DOE recommendations of the ALICE-USA Science Review.

The DOE has concern on the effective management of the CUORE project and has asked LBNL management to improve its oversight of the project.

### **Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 3.3

Grade: B+

Weighting: 20

### **Objective 3.3 Performance Summary Statement:**

The 88-Inch Cyclotron Staff organize a joint agency review of the operations of the facility each year to inform the agencies of status and progress and solicit input and guidance. It is clear that the 88-Inch staff members communicate effectively with the space security community who are users of its capabilities for applications.

NSD staff members take part in the NP February Laboratory Program Manager's briefings, and the Division Leader makes telephone calls from time-to-time to the Physics Research Division Director. He has expressed the desire for an annual review of NSD programs by the Office of Nuclear Physics.

The NSD effectively communicates through numerous heavy-ion and low-energy project reviews.

The NSD leadership is responsive to requests for information by the Office of Nuclear Physics. The project management team of CUORE is often slow in responding to requests. The project documentation for CD-2 was submitted at a late date and led to a delay in the approval of CD-2 and CD-3.



## Laboratory Year-End Performance Assessment Report

Date:10/13/2009

Headquarters Program Office Fiscal Year 2009 Evaluation of The Regents of the University of California  
for Management and Operation of the Lawrence Berkeley National Laboratory

Agency:

U.S. Department of Energy

Program Office:

Office of Science - Workforce Development for Teachers and Scientists

FY Funding Level: (Budget Authority)

### Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 3.45

Goal Grade: A

#### Goal 1.0 Performance Summary Statement:

The science education office at Berkeley is very successful in managing the WDTS sponsored programs. They do not report resource leveraging to the extent of other laboratories but are excellent in offering a continuum of science education opportunities and do transition participants through this suite of opportunities and graduate them through rigorous internships/fellowships.

The education office has developed a cooperative learning environment at the laboratory by designing programs that collaborative learning and facilitates interaction among participants from different programs.

The education office uses the internships/fellowships sponsored by WDTS as an opportunity to refresh the importance of safety and health. WDTS interns are immersed in the importance of safety are expected to advocate for it as agents improving the culture.

LBNL's office of science education is fully integrated into to the laboratory operation. The education office is used as an outreach mechanism providing many excellent recourses for "informal education" via the laboratory web page which tries to bridge the relationships among frontier science, technology, and society.

#### Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field

Score: 3.6

Grade: A-

Weighting: 25

#### Objective 1,1 Performance Summary Statement:

The corner stone of success in the education office is the careful attention given to pairing interns and educators with mentor researcher were their talents and science knowledge base can be developed while contributing to the research and be productive resource to their mentor.

#### Objective 1.2 Provide Quality Leadership in Science and Technology



Score: 3.3

Grade: B+

Weighting: 30

**Objective 1.2 Performance Summary Statement:**

The education office is very effective in providing resources required to ensure that the intern and the PI equally benefit from the mentor/mentee relationship. The ed staff are a very interactive participant in the intern experience monitoring success and progress as viewed by both intern and PI and are quick mediate potential difficulties. Mentors are very willing to host intern/educators as a result of the reputation and dependability of the intern talent provided by the education office.

**Objective 1.3 Provide and Sustain Outputs that Advance Program Objectives and Goals**

Score: 3.4

Grade: B+

Weighting: 30

**Objective 1.3 Performance Summary Statement:**

Research interns and educators are paired with PIs who are funded by the Office of Science (SC) and are thus contributing the mission of SC.

The education office is good in ensuring that program deliverables are complete and are continually working to improve the quality of the participant deliverables i.e. research abstracts, electronic portfolios, and participation in SERCh poster competition.

**Objective 1.4 Provide for Effective Delivery of Products**

**Objective 1.4 Performance Summary Statement:**

The large majority of WTDS supported interns/educators report through participant surveys a rewarding, but very challenging laboratory experience. Participants are involved in a demanding program where PI expect 30 hours of work per week contributed to their collaborative research. Quality contributions to research are validated through peer review abstract. Interns produce full length paper or poster presentation, in addition to attending research seminars, facilities training and other enrichment activities.

**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities**

Goal Score: 0.00

Goal Grade: NA

**Goal 2.0 Performance Summary Statement:**

**Objective 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs (i.e., activities leading up to CD-2)**

Score: NA

Grade: NA

Weighting: 0

**Objective 2.1 Performance Summary Statement:**

**Objective 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components (execution phase, Post CD-2 to CD-4)**

Score: NA

Grade: NA

Weighting: 0

**Objective 2.2 Performance Summary Statement:**

**Objective 2.3 Provide Efficient and Effective Operation of Facilities**



Score: NA

Grade: NA

Weighting: 0

**Objective 2.3 Performance Summary Statement:**

**Objective 2.4 Utilization of Facilities to Grow and Support Lab's Research Base and External User Community**

Score: NA

Grade: NA

Weighting: 0

**Objective 2.4 Performance Summary Statement:**

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 3.48

Goal Grade: A

**Goal 3.0 Performance Summary Statement:**

Participants' survey data validated that the research experiences were in keeping with their expectations, that the mentor/mentee relationships were managed effectively to the advantage of both, and that the laboratory ran a well managed program. All participants were fully informed in advance of their internship what the expectations and required deliverables.

The education office is fully integrated in to the operation of the laboratory. Research divisions are fully confident that the office will provide well prepared, industrious students that are capable of quality contribution to the research.

The education office ensures that each host PI has a work plan suitable for the research intern prior to their arrival. The interns reported the mentor/mentee relationships were good, the research experience exceeded expectations, and the overall laboratory experience has strengthened commitments to pursue science/math/engineering degrees.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.6

Grade: A-

Weighting: 40

**Objective 3.1 Performance Summary Statement:**

Participants are exposed to the research throughout the laboratory through enrichment activities, science seminars, and collaborations with other interns, graduate students and post docs. LBNL has a created a very positive science education culture across the laboratory and the entire community is very proud of its commitment to science education and the benefits derived inspiring the next generation of scientist and engineers.

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 3.4

Grade: B+

Weighting: 40

**Objective 3.2 Performance Summary Statement:**

Interns/educators are given opportunities to see science career that are available to them and provided direction and encouragement to pursue them.



The education office is fully aware of DOE and SC's future research thrusts and manages placements that are of mutual benefit to the laboratory, and future research.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 3.4

Grade: B+

Weighting: 20

**Objective 3.3 Performance Summary Statement:**

The science education office is responsive to customer needs and do effectively communicate and complete program deliverables.

The management of the education office has been instrumental in gaining visibility for WDIS's model of experiential learning for pre-service teachers and has leveraged that into collaboration with California State University with corporate funding.

**APPENDIX B**  
**NON-OFFICE OF SCIENCE**  
**FY 2009**  
**SCIENCE AND TECHNOLOGY EVALUATION**  
**OF**  
**LAWRENCE BERKELEY NATIONAL LABORATORY**

<b>Program Area</b>	<b>Page</b>
<b>Office of Energy Efficiency and Renewable Energy (EERE)</b>	<b>B-2</b>
Building Technologies Program (BTP)	B-7
Federal Energy Management Program (FEMP)	B-10
Geothermal Technologies Program (GTP)	B-12
Hydrogen, Fuel Cells and Infrastructure Technologies Program (HT)	B-16
Industrial Technologies Program (ITP)	B-19
Vehicle Technologies Program (VTP)	B-21
<b>Office of Fossil Energy (FE)</b>	<b>B-25</b>

These narratives have been converted using optical character reading software. While reasonable attempts were made to correct any errors resultant from the conversion process some errors may exist and we apologize in advance for them. Original documents obtained by the Berkeley Site Office are available upon request.



U.S. Department of Energy

Office of Energy Efficiency and Renewable Energy

Performance Evaluation Report of the

University of California for

Management and Operations of Science and Technology at the

**Lawrence Berkeley National Laboratory**

For the period October 1, 2008, to September 30, 2009

**EXECUTIVE SUMMARY**

The Office of Energy Efficiency and Renewable Energy (EERE) participates in the award-fee evaluation process to assess the performance of a National Laboratory in the area of science and technology. This requirement originates from the annual "Standards of Performance-based Fee" clauses negotiated between the U. S. Department of Energy (DOE) and a contractor managing and operating (M&O) a National Laboratory. Existing contracts call for annual evaluations. The result of the evaluation — the overall weighted score for the science and technology goals awarded by all DOE programs — determines the percentage of the available performance-based fee that the M&O contractor earns. EERE prepared this evaluation as its input to the DOE award-fee evaluation of the University of California’s performance for the management and operation of science and technology at the Lawrence Berkeley National Laboratory (LBNL). It assesses LBNL'S performance of work for programs in EERE from October 1, 2008, to September 30, 2009.

Each reporting EERE program, having obligated \$1.0 million or more to LBNL during the performance period, evaluated the Laboratory's performance using the Performance Goals and Objectives specified by DOE. The overall rating for each Performance Goal represents a weighted average grade of ratings received from EERE program offices. The computation uses each program's year-to-date obligations at LBNL as of August 31, 2009, as the weighting factor.

The following EERE programs submitted evaluations: Building Technologies Program (BTP), Federal Energy Management Program (FEMP), Geothermal Technologies Program (GTP), Hydrogen, Fuel Cells and Infrastructure Technologies Program (HT), Industrial Technologies Program (ITP), and Vehicle Technologies Program (VTP).

EERE rated the LBNL's performance for fiscal year 2009 with a score of 3.7 for Goal 1: Provide for Efficient and Effective Mission Accomplishment, and 3.7 for Goal 3: Provide Effective and Efficient Science and Technology Program Management. The Office of Science asked EERE not to review Goal 2 because it addresses the construction and operation of facilities, which is under the purview of the Office of Science. LBNL's total score for fiscal year 2009 is 3.7.

<b>Numerical Grades by Performances Goal</b>	<b>Goal 1: Provide for Efficient and Effective Mission Accomplishment.</b>	<b>Goal 3: Provide Effective and Efficient Science and Technology Program Management.</b>
Building Technologies Program	3.5	3.4
Federal Energy Management Program	3.8	3.8
Geothermal Technologies Program	3.6	3.8
Hydrogen, Fuel Cells and Infrastructure Technologies Program	3.2	3.4
Industrial Technologies Program	3.5	3.5
Vehicle Technologies Program	4.1	4.0
<b>Weighted Average Grade</b>	<b>3.7</b>	<b>3.7</b>
<b>Final Numerical Score</b>	<b>3.7</b>	

Grades of 3.3 or higher signify that LBNL's work toward a goal translates to substantive performance and results for the program. The following chart illustrates how numerical scores translate into letter grades.

<b>Score</b>	<b>0.1-0.7</b>	<b>0.8-1.0</b>	<b>1.1-1.7</b>	<b>1.8-2.0</b>	<b>2.1-2.4</b>	<b>2.5-2.7</b>	<b>2.8-3.0</b>	<b>3.1-3.4</b>	<b>3.5-3.7</b>	<b>3.8-4.0</b>	<b>4.1-4.3</b>
<b>Grade</b>	<b>F</b>	<b>D</b>	<b>C-</b>	<b>C</b>	<b>C+</b>	<b>B-</b>	<b>B</b>	<b>B+</b>	<b>A-</b>	<b>A</b>	<b>A+</b>

## INTRODUCTION

This evaluation has been prepared as part of the DOE contractual obligation to assess the University of California's performance for the management and operation of science and technology at LBNL. Specifically, it assesses LBNL'S support of EERE program offices in science and technology and its ability to assist these program offices in maintaining the overall EERE mission: to strengthen America's energy security, environmental quality and economic vitality through public-private partnerships.

## PERFORMANCE GOALS, OBJECTIVES, AND MEASURES

This evaluation focuses on grading the contractor's performance against Performance Goals as described below. Each evaluator measures progress against these Performance Goals using a set of Performance Objectives and Performance Measures, defined as follows:

- Performance Goal: This is a general overarching statement of the desired outcome for each major performance area.
- Performance Objective: An objective is a statement of desired results for an organization or activity within a major performance area.
- Performance Measure: A performance measure provides a reviewer a quantitative or qualitative method for characterizing performance to assist in assessing achievement of the corresponding Performance Objective.

The Performance Goals and Performance Objectives used by EERE, for the most part, adopt the standardized versions of goals and objectives defined by the Office of Science, as stated in the following:

- Goal 1: Provide for Efficient and Effective Mission Accomplishment.
  - ♦ Objective 1.1: Science and Technology Results Provide Meaningful Impact on the Field.
  - ♦ Objective 1.2: Provide Quality Leadership in Science and Technology.
  - ♦ Objective 1.3: Provide and sustain Science and Technology Outputs that Advance Program Objectives and Goals.
  - ♦ Objective 1.4: Provide for Effective Delivery of Products.
- Goal 3: Provide Effective and Efficient Science and Technology Program Management.
  - ♦ Objective 3.1: Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision.
  - ♦ Objective 3.2: Provide Effective and Efficient Science and Technology Project/Program Planning and Management.
  - ♦ Objective 3.3: Provide Efficient and Effective Communications and Responsiveness to Customer Needs.

EERE also adjusted the Performance Measures under Goal 1 to include success in meeting program milestones and other criteria appropriate to applied research.

## EVALUATION PROCESSES: NUMERICAL SCORES AND AVERAGING

After collecting the scores, EERE weighted them against specific program obligations for fiscal year 2009 at LBNL, as reported in the DOE Standard Accounting and Reporting System as of August 31, 2009. The following table lists the total funding obligated by each program.

Program Office	Year-To-Date Obligations at LBNL as of August 31, 2009
<b>Building Technologies Program</b>	<b>\$9,424,993.00</b>
<b>Federal Energy Management Program</b>	<b>\$3,415,000.00</b>
<b>Geothermal Technologies Program</b>	<b>\$5,807,709.00</b>
<b>Hydrogen, Fuel Cells and Infrastructure Technologies Program</b>	<b>\$4,251,686.00</b>
<b>Industrial Technologies Program</b>	<b>\$2,362,294.00</b>

<b>Vehicle Technologies Program</b>	<b>\$11,175,293.00</b>
<b>Total</b>	<b>\$36,436,975.00</b>

EERE then computed a weighted average score for each Performance Goal.

### OUTCOME BY PERFORMANCE GOAL

EERE rated the LBNL's performance for fiscal year 2009 with a score of 3.7 for Goal 1: Provide for Efficient and Effective Mission Accomplishment, and 3.7 for Goal 3: Provide Effective and Efficient Science and Technology Program Management. The Office of Science asked EERE not to review Goal 2 because it addresses the operation of facilities, which is under the purview of the Office of Science. LBNL's total score for fiscal year 2009 is 3.7.

The following table highlights the numerical equivalent of the grade issued by each of the program offices by Performance Goal and the overall grade for EERE:

<b>Numerical Grades by Performances Goal</b>	<b>Goal 1: Provide for Efficient and Effective Mission Accomplishment.</b>	<b>Goal 3: Provide Effective and Efficient Science and Technology Program Management.</b>
Building Technologies Program	3.5	3.4
Federal Energy Management Program	3.8	3.8
Geothermal Technologies Program	3.6	3.8
Hydrogen, Fuel Cells and Infrastructure Technologies Program	3.2	3.4
Industrial Technologies Program	3.5	3.5
Vehicle Technologies Program	4.1	4.0
<b>Weighted Average Grade</b>	<b>3.7</b>	<b>3.7</b>

Based upon the scores assigned by each program office for each Performance Goal and Objective, LBNL's overall final numeric score is 3.7, as calculated below:

<b>Goal</b>	<b>Weight</b>	<b>Weighted Numerical Score (All Programs)</b>	<b>Portion of Final Score</b>
<b>Goal 1: Provide for Efficient and Effective Mission Accomplishment.</b>	70.00%	3.7	2.59
<b>Goal 3: Provide Effective and Efficient Science and Technology Program Management.</b>	30.00%	3.7	1.11
<b>Final Numerical Score</b>	<b>3.7</b>		

The following chart illustrates how numerical scores translate into letter grades.

<b>Score</b>	<b>0.1-0.7</b>	<b>0.8-1.0</b>	<b>1.1-1.7</b>	<b>1.8-2.0</b>	<b>2.1-2.4</b>	<b>2.5-2.7</b>	<b>2.8-3.0</b>	<b>3.1-3.4</b>	<b>3.5-3.7</b>	<b>3.8-4.0</b>	<b>4.1-4.3</b>
<b>Grade</b>	<b>F</b>	<b>D</b>	<b>C-</b>	<b>C</b>	<b>C+</b>	<b>B-</b>	<b>B</b>	<b>B+</b>	<b>A-</b>	<b>A</b>	<b>A+</b>



## **APPENDIX**

### **List of programs:**

Building Technologies Program (BTP)  
Federal Energy Management Program (FEMP)  
Geothermal Technologies Program (GTP)  
Hydrogen, Fuel Cells and Infrastructure Technologies Program (HT)  
Industrial Technologies Program (ITP)  
Vehicle Technologies Program (VTP)

**Building Technologies Program  
Lawrence Berkeley National Laboratory  
Fiscal Year 2009 Performance Evaluation  
Office of Energy Efficiency and Renewable Energy**

**Goal 1: Provide for Efficient and Effective Mission Accomplishment.**

<b>Weight:</b> 70.00%	<b>Score:</b> 3.5	<b>Grade:</b> A-
<b>Goal Evaluation:</b>		
<p>LBNL has been highly supportive of the Buildings Program by achieving a windows-related major milestone two years early, by being very responsive in the appliance standards area, and by progress on analysis tools, to name a few accomplishments.</p>		
<b>Objective 1.1: Science and Technology Results Provide Meaningful Impact on the Field.</b>		
<b>Weight:</b> 35.00%	<b>Score:</b> 3.7	<b>Grade:</b> A-
<b>Objective Evaluation:</b>		
<ul style="list-style-type: none"> <li>• LBNL achieved a major milestone two years early. LBNL initiated a new R&amp;D project in response to a formal DOE lab call for a reflective hydride dynamic window in FY 2005. LBNL licensed its technology to Soladigm and initiated a Cooperative Research and Development Agreement (CRADA). While LBNL support is still required, achieving a major manufacturer partner at this stage is a major accomplishment. LBNL continues to make a major industry impact with its sophisticated software design and performance tools.</li> <li>• LBNL's progress on analysis tools is generally consistent with plans but program and project reviews are infrequent.</li> <li>• LBNL staff have been hard working supporting the appliance standards program and are very responsive to the fast changing needs of the appliance standards program.</li> </ul>		
<b>Objective 1.2: Provide Quality Leadership in Science and Technology.</b>		
<b>Weight:</b> 35.00%	<b>Score:</b> 3.3	<b>Grade:</b> B+
<b>Objective Evaluation:</b>		
<ul style="list-style-type: none"> <li>• In support of ORNL's advanced zero energy homes research project, LBNL provided excellent support and window integrated solutions. Modeling included fixed highly insulating, as well as dynamic window products.</li> <li>• LBNL's work on developing analysis tools is recognized within the community for consistently high quality work and outputs.</li> <li>• LBNL is doing a good job working cooperatively with the appliance standards DOE staff to insure meeting deadlines through technical analysis.</li> </ul>		
<b>Objective 1.3: Provide and sustain Science and Technology Outputs that Advance Program Objectives and Goals.</b>		
<b>Weight:</b> 15.00%	<b>Score:</b> 3.4	<b>Grade:</b> B+
<b>Objective Evaluation:</b>		
<ul style="list-style-type: none"> <li>• LBNL investigated a fundamental new scientific approach to harvesting krypton from the</li> </ul>		

<p>air. Krypton, an inert gas, can offer significant window performance improvements. The new method if validated, could offer dramatic cost reduction to eliminate a major barrier to the implementation of krypton. While this was a fairly small activity, it demonstrates LBNL's scientific results.</p> <ul style="list-style-type: none"> <li>• Work developing analysis tools is consistently high quality in results and output.</li> <li>• Support on appliance standards has shown improvement over the prior year.</li> </ul>
<p><b>Objective 1.4: Provide for Effective Delivery of Products.</b></p>
<p><b>Weight:</b> 15.00%      <b>Score:</b> 3.6      <b>Grade:</b> A-</p>
<p><b>Objective Evaluation:</b></p> <ul style="list-style-type: none"> <li>• LBNL provided a major technical support role in the design of the electrochromic window demonstration in the EE-1 conference room.</li> <li>• LBNL also is collecting energy data on the system and provided extensive input to fact sheet materials.</li> <li>• Analysis tools projects are on schedule and within budget with some exceptions.</li> <li>• With regards to appliance standards, the combination of simultaneous work on multiple rulemakings and endless edits to receive concurrence presents a real challenge.</li> <li>• LBNL staff has done an admiral job in turning around edits on very tight schedules.</li> </ul>

**Goal 3: Provide Effective and Efficient Science and Technology Program Management.**

<p><b>Weight:</b> 30.00%      <b>Score:</b> 3.4      <b>Grade:</b> B+</p>
<p><b>Goal Evaluation:</b></p> <p>LBNL is highly recognized by outside parties as a major leader in the building science arena, and has a commendable spirit of collaboration with the Buildings Program and industry-related groups.</p>
<p><b>Objective 3.1: Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision.</b></p>
<p><b>Weight:</b> 50.00%      <b>Score:</b> 3.5      <b>Grade:</b> A-</p>
<p><b>Objective Evaluation:</b></p> <ul style="list-style-type: none"> <li>• LBNL is highly recognized by outside parties as a major leader in the building science arena. LBNL is routinely sought after as a major leader in cutting edge technology and their input is highly desired within various fora, such as the National Fenestration Rating Council and various trade associations.</li> <li>• Generally good at collaborating with others within California on developing analysis tools.</li> <li>• LBNL staff commits notable effort to supporting activities such as American Society of Heating, Refrigerating and Air-Conditioning Engineers' committees and the American Council for an Energy-Efficient Economy summer study program to develop new knowledge on appliance codes and standards. The balance between gaining new knowledge through these activities versus jeopardizing project deadlines by over commitment is important.</li> </ul>
<p><b>Objective 3.2: Provide Effective and Efficient Science and Technology Project/Program Planning and Management.</b></p>
<p><b>Weight:</b> 25.00%      <b>Score:</b> 3.4      <b>Grade:</b> B+</p>

**Objective Evaluation:**

- LBNL plans work schedules in an efficient manner and works to achieve key goals of DOE. Overall planning performance is excellent. However, fiscal year 2009 had several challenges with multiple requests for stimulus funding proposals. In addition, further work is needed to harmonize the component and systems integration programs.
- Work scopes and analysis tool plans generally require several iterations to clarify specific deliverables.
- Staff adapt their existing codes and standards knowledge very well to the potential future consequences of standards rulemakings.

**Objective 3.3: Provide Efficient and Effective Communications and Responsiveness to Customer Needs.**

**Weight:** 25.00%      **Score:** 3.2      **Grade:** B+

**Objective Evaluation:**

- LBNL provides very good customer service to DOE and responds to requests in a timely manner. LBNL is highly cognizant of DOE priorities and works to achieve the Zero Energy Buildings mission.
- Formal reporting on analysis tools projects is generally on time. Informal reporting and discussion of potential issues is frequent and useful.
- Reporting on appliance standards is irregular, but improving.

**Guidance for the next performance year.**

LBNL will have a significant challenge with a doubling of activity in fiscal year 2010.

- Greater attention to integrated milestones and deliverables is expected.
- LBNL is expected to fill its window R&D manager position and provide improved communication with DOE.
- Analysis tools projects that have been delayed need to be completed in the next FY.
- New National Accounts projects need to be carefully monitored and managed for budget and schedule. Need to focus more of CBI attention outside of California, particularly other National Laboratories.
- Given the tight schedule of appliance standards rulemaking, LBNL needs to increase communication with headquarters to insure adequate time to consider LBNL inputs/analysis before briefings and issuance of rulemakings.

**Federal Energy Management Program  
Lawrence Berkeley National Laboratory  
Fiscal Year 2009 Performance Evaluation  
Office of Energy Efficiency and Renewable Energy**

**Goal 1: Provide for Efficient and Effective Mission Accomplishment.**

<b>Weight:</b> 70.00%	<b>Score:</b> 3.8	<b>Grade:</b> A
<b>Goal Evaluation:</b> LBNL is very responsive providing timely quarterly reports and project reports as requested.		
<b>Objective 1.1: Science and Technology Results Provide Meaningful Impact on the Field.</b>		
<b>Weight:</b> N/A	<b>Score:</b> N/A	<b>Grade:</b> N/A
<b>Objective Evaluation:</b> N/A		
<b>Objective 1.2: Provide Quality Leadership in Science and Technology.</b>		
<b>Weight:</b> 35.00%	<b>Score:</b> 3.8	<b>Grade:</b> A
<b>Objective Evaluation:</b>  LBNL is very effective with technology transfer activities. The lab supports FEMP technology transfer program activities including: conducting technology evaluations and demonstrations, publishing Federal emerging technology awareness and education documents, and assessing emerging technologies for use by Federal sites.		
<b>Objective 1.3: Provide and sustain Science and Technology Outputs that Advance Program Objectives and Goals.</b>		
<b>Weight:</b> N/A	<b>Score:</b> N/A	<b>Grade:</b> N/A
<b>Objective Evaluation:</b> N/A		
<b>Objective 1.4: Provide for Effective Delivery of Products.</b>		
<b>Weight:</b> 15.00%	<b>Score:</b> 3.8	<b>Grade:</b> A
<b>Objective Evaluation:</b>  LBNL staff is very involved in GovEnergy, agency consultations, and FEMP sponsored workshops to support delivery of FEMP energy efficiency and renewable energy products to Federal agencies.		

**Goal 3: Provide Effective and Efficient Science and Technology Program Management.**

<b>Weight:</b> 30.00%	<b>Score:</b> 3.8	<b>Grade:</b> A
<b>Goal Evaluation:</b>  LBNL provides high quality technical assessments, product guidelines and outreach materials in support of the FEMP Technology Transfer and Product Specifications programs.		

<b>Objective 3.1: Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision.</b>
<b>Weight:</b> N/A <b>Score:</b> N/A <b>Grade:</b> N/A
<b>Objective Evaluation:</b> N/A
<b>Objective 3.2: Provide Effective and Efficient Science and Technology Project/Program Planning and Management.</b>
<b>Weight:</b> N/A <b>Score:</b> N/A <b>Grade:</b> N/A
<b>Objective Evaluation:</b> N/A
<b>Objective 3.3: Provide Efficient and Effective Communications and Responsiveness to Customer Needs.</b>
<b>Weight:</b> 25.00% <b>Score:</b> 3.8 <b>Grade:</b> A
<b>Objective Evaluation:</b> LBNL is highly responsive to Federal agency customer needs providing highly skilled technical support and coordinating effectively with Federal agencies.

**Guidance for the next performance year.**

Continue to report quarterly and add FEMP Program Element Leads to the quarterly report distribution list. Also recommend meeting with Leads monthly to track progress.

**Geothermal Technologies Program  
Lawrence Berkeley National Laboratory  
Fiscal Year 2009 Performance Evaluation  
Office of Energy Efficiency and Renewable Energy**

**Goal 1: Provide for Efficient and Effective Mission Accomplishment.**

**Weight:** 70.00%    **Score:** 3.6    **Grade:** A-

**Goal Evaluation:**

Lawrence Berkeley National Laboratory's geothermal research group focuses on the Geothermal Technologies Program vision and mission. The mission focus is Enhanced Geothermal Systems (EGS) and LBNL provides both scientific and management support. LBNL provides support to EGS field demonstration sites, the International Partnership for Geothermal Technology, risk analysis, and other areas as requested by the Geothermal Technologies Program.

**Objective 1.1: Science and Technology Results Provide Meaningful Impact on the Field.**

**Weight:** 35.00%    **Score:** 3.8    **Grade:** A

**Objective Evaluation:**

- LBNL investigated novel approaches for obtaining critical characterization data for EGS reservoirs. For the Desert Peak project, LBNL performed chemical stimulation modeling and published a paper in *Geofluids* on the modeling. LBNL has also incorporated tracer thermal decay into the reservoir model TOUGHREACT and wrote a paper titled "A computational technique for estimating the fracture surface area adjacent to a newly stimulated well within an engineered geothermal system."
- Accurately estimating fracture surface area for EGS is important to the ultimate commercial application of EGS technology. LBNL also wrote an extended abstract submitted to the World Geothermal Congress describing a geochemical study of Krafla and Nesjavellir geothermal systems in Iceland.
- In prior years, LBNL organized an international committee to evaluate induced seismicity at EGS sites leading to a published report and a set of protocols for mitigating the potential societal impact of induced seismicity. In 2009, LBNL expanded the protocol document and modified it to fit specific needs for the vast variety of geologic/social environments of planned EGS sites.
- LBNL also is developing a comprehensive public access web site that will be easily read, accessed, and understood, containing all the microearthquake data and available analyses from all the DOE-funded EGS sites.

**Objective 1.2: Provide Quality Leadership in Science and Technology.**

**Weight:** 35.00%    **Score:** 3.5    **Grade:** A-

**Objective Evaluation:**

- LBNL works collaboratively with the U.S. Geological Survey, Foulger Consulting, Massachusetts Institute of Technology, and the geothermal industry in the operation of seismic arrays at multiple Enhanced Geothermal Systems sites. The purpose is to gather high resolution microearthquake data before, during, and after stimulation activities. The seismic data are also provided to the research community in order to develop, test, and apply microearthquake analysis to EGS systems. High quality data are necessary to determine the success of stimulation activities as well as to obtain public acceptance of

EGS.

- LBNL also works collaboratively with the geothermal company Calpine at the Northwestern Geysers Geothermal Field to develop a three dimensional geological model of the proposed EGS site, to conduct geomechanical analysis of the proposed stimulation of two existing wells that penetrate the deep high temperature zone, and to review historic data of injection induced seismicity in the area.
- Under the International Partnership for Geothermal Technology, LBNL worked collaboratively on the development of improved geochemical and isotopic exploration technologies for identifying supercritical zones in high temperature geothermal fields to guide drilling for either conventional or enhanced geothermal resources.
- At the Desert Peak geothermal site in Nevada, LBNL works with the geothermal company Ormat to study the impact of fluid injection on natural isotopic systems, image the subsurface using active and passive seismic, develop a geological model of Desert Peak, and analyze synthetic aperture radar data of the area.

**Objective 1.3: Provide and sustain Science and Technology Outputs that Advance Program Objectives and Goals.**

**Weight:** 15.00%      **Score:** 3.0      **Grade:** B

**Objective Evaluation:**

- LBNL conducts innovative research on the source mechanisms of induced seismicity, the patterns of induced seismicity, and the use of seismic methods such as surface reflection and vertical seismic profiling to map permeable fracture controlling fluid flow.
- LBNL also examines innovative ways to determine fracture surface area available for heat transfer using sorbing and reversibly sorbing tracers, and from non-isothermal, single well injection/backflow tests. The incorporation of tracer thermal decay kinetics into the TOUGHREACT reservoir model provides an innovative tool for modelers of geothermal reservoirs. New, seminal laboratory research is being conducted by LBNL on the seismic signatures of sheared fractures during fluid injections.

**Objective 1.4: Provide for Effective Delivery of Products.**

**Weight:** 15.00%      **Score:** 3.8      **Grade:** A

**Objective Evaluation:**

- Funding for Lawrence Berkeley National Laboratory (LBNL) was not completely received until the fourth quarter of fiscal year 2009. Despite this, LBNL completed nine technical reports.
- LBNL consistently meets its deadlines unless field operations, over which LBNL has no control, delay LBNL research activities.

**Goal 3: Provide Effective and Efficient Science and Technology Program Management.**

**Weight:** 30.00%      **Score:** 3.8      **Grade:** A

**Goal Evaluation:**

- LBNL provided support to the Geothermal Technologies Program through technical management and monitoring of field demonstration sites at various locations in the western United States.
- LBNL provided science and technology program management through support of the International Partnership for Geothermal Technology, which includes Iceland and Australia.



- LBNL also provided support for the 2009 Geothermal Risk analysis for exploration, reservoir engineering, drilling, and energy conversion.

**Objective 3.1: Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision.**

**Weight:** 50.00%      **Score:** 3.8      **Grade:** A

**Objective Evaluation:**

- The LBNL geothermal research group is a highly trained and experienced research group. All principal investigators are PhDs with many years of experience in the geothermal field. The group shares the Office of Geothermal Technologies vision that geothermal energy will be a major source of clean, renewable, domestic baseload electricity and that Enhanced Geothermal Systems will be a major contributor for electricity generation.
- LBNL successfully planned with the U.S. Geological Survey, Foulger Consulting, Massachusetts Institute of Technology, and the geothermal industry the operation of seismic arrays at multiple EGS sites. LBNL also planned successfully with the geothermal company Calpine at the Northwestern Geysers to develop a three dimensional geological model of the proposed EGS site, to conduct geomechanical analysis of the proposed stimulation of two existing wells that penetrate the deep high temperature zone, and to review historic data of injection induced seismicity in the area.
- Under the International Partnership for Geothermal Technology, LBNL successfully planned with Icelandic researchers on the development of improved geochemical and isotopic exploration technologies for identifying supercritical zones in high temperature geothermal fields to guide drilling for either conventional or enhanced geothermal resources.
- At the Desert Peak geothermal site in Nevada, LBNL successfully planned with the geothermal company Ormat to study the impact of fluid injection on natural isotopic systems, image the subsurface using active and passive seismic, develop a geological model of Desert Peak, and analyze synthetic aperture radar data of the area.

**Objective 3.2: Provide Effective and Efficient Science and Technology Project/Program Planning and Management.**

**Weight:** 25.00%      **Score:** 3.7      **Grade:** A-

**Objective Evaluation:**

- LBNL is part of a committee to encourage the development of a U.S. Enhanced Geothermal Systems industry by providing support to DOE through planning, technical management, and monitoring of field enhanced geothermal systems demonstration projects and direct technical assistance in areas of geology, geochemistry, geophysics, hydrology, and evaluation of new technology. Cost-shared field projects are a major and critical component of the DOE's efforts to demonstrate that EGS can provide a substantive contribution to the Nation's future power generation needs. In order for the field projects to contribute to the realization of future U.S. EGS development, they are carefully planned and managed.
- LBNL planning activities also include the development of go/no-go decision points to re-focus or end research activities associated with field demonstration projects.
- The LBNL geothermal research group works and interacts with LBNL's Advanced Light Source group, LBNL's Energy Environmental Technology Division, LBNL's Material Science Division, and strongly leverages with the research conducted for the DOE Office of Science. The geothermal research group also interacts with the University of California at Berkeley faculty. LBNL also interacts frequently with other national laboratories

conducting geothermal research such as Sandia National Laboratories and the National Renewable Energy Laboratory.

- LBNL's Field Work Proposals and Annual Operating Plans are submitted on time and rarely require revision.
- LBNL also contributes to the geothermal risk assessment lead by the National Renewable Energy Laboratory.

**Objective 3.3: Provide Efficient and Effective Communications and Responsiveness to Customer Needs.**

**Weight:** 25.00%      **Score:** 3.8      **Grade:** A

**Objective Evaluation:**

- LBNL responds promptly to all requests for information. Their responses are of a consistent high quality and accuracy.
- LBNL keeps HQ staff informed through teleconferences, site visits to HQ, visits by HQ personnel to LBNL, and joint meetings at the annual Stanford Workshop and the annual Geothermal Resources Council meeting.
- In 2009, LBNL technical staff presented a technical briefing on induced seismicity to Under Secretary for Science Steven Koonin, and additional briefings with congressional committees and staffers are being scheduled.

**Guidance for the next performance year.**

Headquarters Geothermal Technology Program staff enjoy working with the professionals at LBNL and look forward to a continued strong working partnership.

**Hydrogen, Fuel Cells and Infrastructure Technologies Program  
Lawrence Berkeley National Laboratory  
Fiscal Year 2009 Performance Evaluation  
Office of Energy Efficiency and Renewable Energy**

**Goal 1: Provide for Efficient and Effective Mission Accomplishment.**

**Weight:** 70.00%      **Score:** 3.2      **Grade:** B+

**Goal Evaluation:**

LBNL conducts a portfolio of research activities for the Hydrogen Program. The research is classified into three primary categories related to hydrogen storage, fuel-cell component R&D, and manufacturing R&D. Below, each category is considered in turn.

**Objective 1.1: Science and Technology Results Provide Meaningful Impact on the Field.**

**Weight:** 35.00%      **Score:** 3.1      **Grade:** B+

**Objective Evaluation:**

- Fuel Cell Component Studies: For fuel cell membranes, John Kerr has demonstrated phase-separated block copolymer structures for fuel cell membranes that can achieve practical conductivities (0.1 S/cm) with tethered heterocyclic bases such as imidazole to solvate the protons in place of water. Short side chain tethers for the heterocyclic bases facilitate fast proton transport by the Grothuss mechanism.
- Hydrogen Storage: By addition of 10 wt% magnesium fluoride, Richardson has demonstrated the utilization of 100% of the hydrogen content of magnesium hydride. The fluoride ions coat the surface of the magnesium particles and inhibit coarsening and sintering, which cause hydrogen capacity loss.
- Fuel Cell R&D: Adam Weber has demonstrated the impact of cation contamination in fuel cells using mathematical modeling and concentrated solution theory. With the results the allowable concentration of cation contamination was determined.

**Objective 1.2: Provide Quality Leadership in Science and Technology.**

**Weight:** 35.00%      **Score:** 3.1      **Grade:** B+

**Objective Evaluation:**

- LBNL led development of two project proposals that were awarded from the DOE fiscal year 2008 fuel cell solicitation. Partners included LANL, 3M, United Technologies Research Center, and Pennsylvania State University.
- LBNL participates in the DOE high-temperature membrane working group and participated in the Fuel Cell Freeze Workshop at Nuvera Fuel Cells.
- John Kerr is on the board of the Golden Gate Polymer Forum. Adam Weber served as Former Chair of the San Francisco section of the Electrochemical Society. Adam Weber also sat on the Executive Committee for both the Energy Technology and the Industrial Electrochemistry and Electrochemical Divisions and participated in the Electrochemical Society Fuel Cell subcommittee meetings.

**Objective 1.3: Provide and sustain Science and Technology Outputs that Advance Program Objectives and Goals.**

**Weight:** 15.00%      **Score:** 3.1      **Grade:** B+

**Objective Evaluation:**

LBNL productivity is evidenced by the 10 fuel cell and storage publications and presentations written in fiscal year 2009, many of which are invited publications and lectures.

**Objective 1.4: Provide for Effective Delivery of Products.**

**Weight:** 15.00%      **Score:** 3.8      **Grade:** A

**Objective Evaluation:**

LBNL meets milestones in its projects.

**Goal 3: Provide Effective and Efficient Science and Technology Program Management.**

**Weight:** 30.00%      **Score:** 3.4      **Grade:** B+

**Goal Evaluation:**

LBNL provides effective and efficient science and technology program management.

**Objective 3.1: Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision.**

**Weight:** 50.00%      **Score:** 3.3      **Grade:** B+

**Objective Evaluation:**

- In response to the DOE FOA: DE-PS36-08GO98010, LBNL was awarded two projects, and four projects as a subcontractor.
- The LBNL efforts in hydrogen and fuel cell technologies map directly to EERE priorities, goals and objectives, and to the Hydrogen Program's Multi-Year Program Plan. The effort has been reviewed and redirected as needed each year to match the highest priority needs of EERE.
- LBNL has been involved with helping LANL with their modeling effort to compliment their experimental impacts on water transport knowledge. LBNL is also helping 3M with understanding their system through modeling.

**Objective 3.2: Provide Effective and Efficient Science and Technology Project/Program Planning and Management.**

**Weight:** 25.00%      **Score:** 3.1      **Grade:** B+

**Objective Evaluation:**

- For the fuel-cell activities, Adam Weber is the manager and has responsibilities for specific projects and communication/reporting to specifically identified DOE technology managers. These responsibilities include overall project management, product delivery, reporting and sponsor interface which includes negotiations of scope and budget through AOPs.
- LBNL has regular meetings with collaborators both within and outside LBNL to review results and plan work. LBNL has biweekly Electrochemistry-Group Principal Investigator planning and discussion meetings.
- LBNL has effective management of intellectual property through patenting, invention disclosure, agreements, and license negotiations.
- LBNL has effective implementation of documentation and procedures for multi-institution collaboration including non-disclosure, confidentiality, and intellectual property development agreements.

**Objective 3.3: Provide Efficient and Effective Communications and Responsiveness to**

**Customer Needs.**

**Weight:** 25.00%      **Score:** 3.8      **Grade:** A

**Objective Evaluation:**

LBNL rapidly responds to feedback from DOE, Tech Teams and Annual Merit Review reviewers, including requests for documentation and information from EERE program staff. LBNL delivers reports, documents, AOPs, etc. as requested and on-time with edits being conducted quickly, often in direct communication with DOE program management.

**Guidance for the next performance year.**

The membrane project needs to show some substantial progress next year. The proton conductivities of the current membranes and model compounds are not close to the DOE targets.

**Industrial Technologies Program  
Lawrence Berkeley National Laboratory  
Fiscal Year 2009 Performance Evaluation  
Office of Energy Efficiency and Renewable Energy**

<b>Goal 1: Provide for Efficient and Effective Mission Accomplishment.</b>		
<b>Weight:</b> 70.00%	<b>Score:</b> 3.5	<b>Grade:</b> A-
<b>Goal Evaluation:</b>		
LBNL is a key player in developing ISO 50001 energy management standards, ANSI system standards and Superior Energy Performance (SEP) program strategy with the Superior Energy Performance steering committee (now the U.S. Council for Energy Efficient Manufacturing).		
<b>Objective 1.1: Science and Technology Results Provide Meaningful Impact on the Field.</b>		
<b>Weight:</b> 35.00%	<b>Score:</b> 3.5	<b>Grade:</b> A-
<b>Objective Evaluation:</b>		
LBNL produced draft measurement and verification (M&V) protocol to baseline and measure energy intensity performance improvement		
<b>Objective 1.2: Provide Quality Leadership in Science and Technology.</b>		
<b>Weight:</b> 35.00%	<b>Score:</b> 3.5	<b>Grade:</b> A-
<b>Objective Evaluation:</b>		
LBNL is a key participant in US/ANSI Technical Advisory Group and ISO PC 242 meetings to move toward the ISO 50001 Committee Draft.		
<b>Objective 1.3: Provide and sustain Science and Technology Outputs that Advance Program Objectives and Goals.</b>		
<b>Weight:</b> 15.00%	<b>Score:</b> 3.5	<b>Grade:</b> A-
<b>Objective Evaluation:</b>		
LBNL is a key leader in Superior Energy Performance pilot projects which have been instrumental in helping shape the SEP strategy-plan, M&V protocol and Best Practices scorecard.		
<b>Objective 1.4: Provide for Effective Delivery of Products.</b>		
<b>Weight:</b> 15.00%	<b>Score:</b> 3.5	<b>Grade:</b> A-
<b>Objective Evaluation:</b>		
LBNL and the Alliance to Save Energy have supported the System Assessment Standards. The work has included testing and revising four draft American Society of Mechanical Engineers' standards (pump, steam, process heating and compressed air).		
<b>Goal 3: Provide Effective and Efficient Science and Technology Program Management.</b>		
<b>Weight:</b> 30.00%	<b>Score:</b> 3.5	<b>Grade:</b> A-

**Goal Evaluation:**

LBNL is a key leader in the Superior Energy Performance program strategy and management.

**Objective 3.1: Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision.**

**Weight:** 50.00%      **Score:** 3.5      **Grade:** A-

**Objective Evaluation:**

LBNL staff are part the team which developed the Superior Energy Performance program strategy with the SEP steering committee (now the U.S. Council for Energy Efficient Manufacturing).

**Objective 3.2: Provide Effective and Efficient Science and Technology Project/Program Planning and Management.**

**Weight:** 25.00%      **Score:** 3.5      **Grade:** A-

**Objective Evaluation:**

LBNL staff are part the team which developed the Superior Energy Performance program strategy with the SEP steering committee.

**Objective 3.3: Provide Efficient and Effective Communications and Responsiveness to Customer Needs.**

**Weight:** 25.00%      **Score:** 3.5      **Grade:** A-

**Objective Evaluation:**

LBNL kept key customers and the steering committee up to date on SEP Program Plan, M&V strategy/workshop findings, and Best Practices scorecard which LBNL either had lead responsibility to develop or significantly contributed to.

**Guidance for the next performance year.**

Continue leadership on Superior Energy Performance work, SEP Program plan, measurement and verification (M&V) strategy/workshop, M&V protocols to baseline and measure energy intensity performance improvement. Participate in US/ANSI Technical Advisory Group and ISO PC 242 meetings to move toward ISO 50001 and ANSI standards.

**Vehicle Technologies Program  
Lawrence Berkeley National Laboratory  
Fiscal Year 2009 Performance Evaluation  
Office of Energy Efficiency and Renewable Energy**

**Goal 1: Provide for Efficient and Effective Mission Accomplishment.**

**Weight:** 70.00%      **Score:** 4.1      **Grade:** A+

**Goal Evaluation:**

Thirteen LBNL researchers in the Batteries for Advanced Transportation Technologies (BATT) Program gave invited talks at international conferences in 2009. Several patents and licenses were finalized in 2009, including:

- High-rated LiFePO<sub>4</sub> (lithium ion phosphate) material has been licensed to two companies.
- Tin-based anode materials has been licensed to one company.
- Composite cathode materials has been licensed to one materials company and one battery company.

**Objective 1.1: Science and Technology Results Provide Meaningful Impact on the Field.**

**Weight:** 35.00%      **Score:** 4.1      **Grade:** A+

**Objective Evaluation:**

Some notable examples of specific progress made in 2009 by BATT researchers include:

- **Electrolytes for Lithium-Ion Batteries:** Researchers have been investigating the behavior of electrolytes which are rigorously dried with particular attention to interfacial impedance behavior, which has an influence on the power and energy density. Under study are electrolyte additives that are designed to allow the presence of some moisture in the battery components. The goal is to relax the stringent manufacturing conditions and thereby reduce manufacturing costs while also extending battery life.
- **Novel High-Capacity Reversible Anodes for Lithium-ion Batteries:** Researchers at the University of Pittsburgh have been studying new silicon-based anodes that will provide gravimetric and volumetric energy density greater than those of graphite while exhibiting similar durability.
- **Computational Modeling and Design of New Electrode Materials:** In a joint program with SUNY Stony Brook, MIT uses computational modeling to design electrode materials for lithium batteries. In a recent finding the MIT team established that some active battery materials can exchange lithium so rapidly that they could lead to batteries that can be charged extremely fast and deliver very high power. Charging times of 10 seconds were established. While significant engineering will be needed to design such extreme power rate batteries, this finding shows how the development of new materials can enable novel battery systems and battery applications.
- **Characterization of Phosphate Cathodes for Lithium-Ion Batteries:** Although LiMnPO<sub>4</sub> (lithium manganese phosphate) has the same crystal structure as LiFePO<sub>4</sub>, it exhibits poorer performance and lower utilization of the active lithium. By studying high-quality hydrothermally-prepared crystals of these materials, it has been found that localized strain at the phase boundaries between the lithiated and delithiated components impedes the charging and discharging, and results in decrepitation of the active particles. This behavior becomes substantially less problematic when a small portion of the manganese is substituted by magnesium or when the particle size is reduced.

**Objective 1.2: Provide Quality Leadership in Science and Technology.**



**Weight:** 35.00%    **Score:** 4.1    **Grade:** A+

**Objective Evaluation:**

- LBNL scientists, and BATT Principal Investigators (PIs) include some of the most recognized researchers in the energy storage field. PIs include Drs. Goodenough, Whittingham, Thackeray, and Newman – all leaders in electrochemistry in general, and lithium-ion battery technology in particular.
- External recognition: A team with LBNL members, led by Dr. Thackeray of Argonne National Laboratory, won a 2009 R&D100 award. An Argonne/Envia Systems Team is working to commercialize this high voltage, high capacity cathode material, which provides more energy than any other lithium-ion cathode material, potentially improving the operation of plug-in hybrids and all-electric vehicles.
- Collaborations: On average, each LBNL BATT PI has ongoing collaborations with 4-5 other BATT PIs and numerous researchers at other U.S. and international research institutions.

**Objective 1.3: Provide and sustain Science and Technology Outputs that Advance Program Objectives and Goals.**

**Weight:** 15.00%    **Score:** 3.8    **Grade:** A

**Objective Evaluation:**

The LBNL BATT program funds most of the major contributors and leading researchers in the energy storage field. Those researchers are:

- Commercializing a new electrolyte that may enable the use of lithium metal anodes and thus some extremely high energy batteries.
- Developing a new first principles materials screening program that will be used to identify promising high energy and high power electrode materials.
- Leading the effort to characterize and understand the conduction mechanism in the commercially important phosphate class of cathode materials.
- Developing a simulation that is shedding light on the critical issue of Solid-Electrolyte Interface formation and composition.

**Objective 1.4: Provide for Effective Delivery of Products.**

**Weight:** 15.00%    **Score:** 4.1    **Grade:** A+

**Objective Evaluation:**

The LBNL BATT program has achieved a 92 percent rate of either Complete or On Schedule for project milestones in 2009. Detailed quarterly reports for battery research (including up to 29 R&D projects at six different laboratories and 12 universities) are completely on time and provide keen insight and understanding of the fundamental issues regarding advanced battery development.

**Goal 3: Provide Effective and Efficient Science and Technology Program Management.**

**Weight:** 30.00%    **Score:** 4.0    **Grade:** A

**Goal Evaluation:**

LBNL program management has consistently identified critical research directions and instituted new projects, often involving outside experts and non-LBNL national laboratories, to pursue them. They have awarded contracts in the BATT program to 19 non-LBNL researchers out of 29 projects total.

**Objective 3.1: Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision.**

**Weight:** 50.00%      **Score:** 4.1      **Grade:** A+

**Objective Evaluation:**

- The managers at LBNL seek out the most qualified PIs for specific research tasks regardless of their organizational affiliation. In 2008-2009, they initiated five new research projects with PIs outside of the laboratory. Overall, 65 percent of the BATT projects are carried out by non-LBNL entities, including commercial organizations, universities, and other national laboratories.
- In 2009, LBNL brought into the lab two new hires from leading research groups in the United States. Kristen Perrson's project is "Predicting and Understanding New Li-ion Materials Using *Ab Initio* Atomistic Computational Methods" and Jordi Cabana's project is "Positive and negative electrodes: novel and optimized materials."

**Objective 3.2: Provide Effective and Efficient Science and Technology Project/Program Planning and Management.**

**Weight:** 25.00%      **Score:** 3.8      **Grade:** A

**Objective Evaluation:**

- LBNL is in the process of implementing a process to periodically solicit and evaluate proposals in each program area. Each year, LBNL will issue Request for Proposal Letter of Inquiries for white papers on new concepts in one of the major focus areas of the program: anodes, cathodes, electrolytes, cell analysis, and modeling/diagnostics. After an initial review, a subset of the respondents will be asked to submit full proposals in response to the RFP.
- As part of the BATT program, LBNL oversees and/or directs the research of 29 principal investigators who come from LBNL, five other national labs, eleven universities, and one commercial institution.
- LBNL meets with DOE management each summer to recommend and discuss new and promising research areas, to review and implement results of the annual merit review, and is able to implement changes including new work the following fiscal year.
- LBNL BATT management has consistently sought out programmatic advice from DOE management, provided guidance and recommendations on new research directions, and has implemented program changes, new projects, and approaches in a timely and accurate manner.

**Objective 3.3: Provide Efficient and Effective Communications and Responsiveness to Customer Needs.**

**Weight:** 25.00%      **Score:** 3.8      **Grade:** A

**Objective Evaluation:**

- LBNL staff consistently informs HQ management of major scientific advances, staffing issues, and respond to requests for information on time or ahead of time consistently and accurately.
- BATT management publishes a comprehensive (100+ page) progress report each quarter that contains updates on all projects under the program's management. This progress report provides critical updates to EERE/VTP management, and has served as a model reporting mechanism that is being applied to the energy storage applied battery research



program.

**Guidance for the next performance year.**

- In the coming year, BATT cross-cutting research efforts should focus on size control for olivine cathodes and alloy anodes and on control of interfaces for the SEI on alloy anodes and at the cathode/electrolyte interface.
- Intermediate term R&D should focus on developing high voltage electrolytes and on additives to promote stable SEI formation and provide overcharge protection.
- Electrode research should focus on structured anodes and cathodes.

Department of Energy  
Washington, DC 20585

October 13, 2009  
MEMORANDUM

TO: Joseph Krupa  
Institutional Program Manager  
U.S. DOE Berkeley Site Office

FROM: James J. Markowsky  
Assistant Secretary  
Office of Fossil Energy

SUBJECT: Department of Energy (DOE) Evaluation of Science and Technology  
Programs at the University of California Lawrence Berkeley National  
Laboratory for FY 2009.

Objective 1.2 Provide Quality Leadership in Science and Technology  
Score: A Grade: 4.0 Weighting: 25

Objective 1.2 Performance Summary Statement:  
Objective 1.2 Provide Quality Leadership in Science and Technology

Attached are the reviews obtained from Office of Fossil Energy project managers regarding evaluation of Science and Technology Programs at the University of California Lawrence Berkeley National Laboratory for FY 2009. These reviews represent work actively being performed for and funded by the Office of Fossil Energy during this period. In soliciting input for this review, the only performance evaluations that were requested were for R&D-type projects, and of those only the ones that were valued at \$50,000 or more in FY09. The individual evaluations that were received are attached and account for projects totaling over \$5.7 million.

No attempt was made to screen, blend or summarize any reviewer comments; they represent the verbatim remarks that were submitted by each contributor. Should you need any further information, please contact William Fernald at 301-903-9448 ([william.fernald@hg.doe.gov](mailto:william.fernald@hg.doe.gov)).

Attachment

cc: Aundra Richards, Site Manager Berkeley Site Office

Laboratory Year-End Performance Assessment Report

Date:  
9/30/09

Headquarters Program Office Fiscal Year 2009 Evaluation of Science and Technology Program  
Performance at the Lawrence Berkeley National Laboratory

Agency: U.S. Department of Energy

Program Office: Assistant Secretary for Fossil Energy

FY Funding Level: (Budget Authority) \$300,000

Goal 1.O Provide for Efficient and Effective Mission Accomplishment

Goal Score: 4.0 Goal Grade: A

Goal 1.O Performance Summary Statement:

My experience with and evaluation of LBNL in FY09 is limited to a Field Work Proposal (FWP) project with Dr. Ted Chang, Principal Investigator: Project No. ED33EE for reducing the cost of CO<sub>2</sub> removal from coal-fired flue gas with amine-and other aqueous-based scrubbing processes. As described in Objective 1.1 below, Ted has been an invited lecturer at international conferences. He submitted two articles in FY09 for publication in peer-reviewed scientific journals. In March 2009, Ted made a presentation on his FWP project at the 2009 DOE NETL CO<sub>2</sub> Capture Technology Conference.

LBNL received DOE funding in FY09 Quarter 2 to start their FY09 FWP for post-combustion CO<sub>2</sub> capture technology. LBNL has targeted 90% removal at a cost not to exceed a 20% increase in the Cost of Electricity compared to a power plant with no CO<sub>2</sub> capture. Their R&D program is making good progress to develop a high capacity solvent for post-combustion removal of CO<sub>2</sub> and to reduce the cost of regenerating the solvent. They plan to finish the FY09 FWP scope within their proposed 12-month schedule, and are nearing the point of filing a patent application for their improvements in CO<sub>2</sub> capture solvents.

Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field  
Score: 4.0 Grade: A Weighting: 25

Objective 1.1 Performance Summary Statement:

LBNL's current investigation on CO<sub>2</sub> removal has targeted 90% removal at a cost not to exceed a 20% increase in the Cost of Electricity compared to a power plant with no CO<sub>2</sub> capture. If successful, this will meet or exceed the Fossil Energy CO<sub>2</sub> Capture Program goals for existing coal-fired power plants. Their R&D program is making good progress to develop a high capacity solvent for post-combustion removal of CO<sub>2</sub> from power plant flue gas and to reduce the cost of regenerating the solvent. This work is of national and global importance, because successful development of the technology could provide a high level of CO<sub>2</sub> capture at an attractive cost, for potential application to most or all coal-fired power plants.

Ted Chang reported that:

1. LBNL has worked with industries (Bechtel, Parsons, and Dow Chemicals), and academics (Tokyo Institute of Technology, Japan; Academic Sinica, China; Peking University, China; Zhejiang University, China; Shanghai Jiao Tong University, China; Cheng-KWlg University, Taiwan).
2. Ted has been invited to present papers at International Conferences and Meetings. He was an invited lecturer on "Developing Technologies for the Control of Mercury Emissions from Coal Fired Power Plants," at Department of Environmental Engineering, National Taiwan ChengKWlg University, Tainan, Taiwan, Nov. 13-16,2006. Ted was also an invited lecturer on "The Role of Halides on Hg Removal from Coal-Fired Flue Gas by Carbonaceous Materials," at Department of Environmental Engineering, National Taiwan Cheng-KWlg University, Tainan, Taiwan, May 14, 2008.
3. Because LBNL is nearing the point of filing a patent application for their improvements in CO<sub>2</sub> solvents, Ted Chang declined invitations in FY09 to present at internationally at the Pollution Control Conference at Wroclaw University of Technology in Poland, Zhejiang University in China, and the National Cheng-KWlg University in Taiwan.

Objective 1.2 Provide Quality Leadership in Science and Technology

Score: 4.0 Grade: A Weighting: 25

Objective 1.2 Performance Summary Statement:

LBNL has been a consistent contributor in the development of innovative technology to control air emissions from coal-fired power plants. As Fossil Energy's R&D funding has shifted from mercury control to CO<sub>2</sub> control, LBNL adapted and provided innovative and meaningful bench-scale research to support changing R&D needs.

Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals

Score: 4.0 Grade: A Weighting: 25

Objective 1.3 Performance Summary Statement:

Ted Chang has been a regular presenter at DOE/NETL Innovations for Existing Plants Annual Technology Conferences, and contributed the following articles for publication in peer reviewed scientific journals:

. Yan, Z. Qu, Y. Chi, S.H. Qiao, R. L. Dod, S.O. Chang, and C. Miller, "Enhanced Elemental Mercury Removal from Coal-fueled Flue Gas by Sulfur-chlorine Compounds," *Environ. Sci. Technology*, 43, 5410-5415, 2009 (published July 15, 2009)

. Qu, N.Q. Yan, J. I. Chang, S.O. Chang, and C. Miller, "The Role of Halide on HgO Removal from Coal-fired Flue Gas by Carbonaceous Materials," submitted for publication, 2009

These articles publicly reported the work performed under the DOE Fossil Energy Mercury Control Technology Program.

Ted Chang previously won an LBNL's Technology Transfer Award. Following LBNL's patent application on a DOE-sponsored process for gaseous oxidation of power plant flue gas mercury with halides, LBNL partnered with Mobotec for field testing of this process with subsequent coremoval of oxidized mercury in

wet Flue Gas Desulfurization systems. As stated above LBNL is nearing the point of filing a patent application for their current process to improve solvent-based post-combustion capture of CO<sub>2</sub> from power plant flue gas.

Objective 1.4 Provide for Effective Delivery of Science and Technology

Score: 4.0 Grade: A Weighting: 25

Objective 1.4 Performance Summary Statement:

As described in 3.0 below, LBNL completed their work on annual Field Work Proposals (FWP) within 12 months of receiving DOE funding, and met planned milestones. Ted Chang, the PI, has willingly accommodated my requests and technical direction. Ted submitted his quarterly and final FWP reports to NETL in a timely manner.

Goa12.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities (*Not applicable to FE*)

Goa13.0 Provide Effective and Efficient Science and Technology Program Management

Goal Score: 4.2 Goal Grade: A+

Goa13.0 Performance Summary Statement:

Ted Chang offline effectively managed multiple Field Work Proposals (FWP) during the transition between mercury R&D and CO<sub>2</sub> capture R&D in FY08, and is currently performing and managing an FWP for post-combustion CO<sub>2</sub> capture R&D. LBNL accomplished the work proposed in each annual Field Work Proposal within 12 months of receiving DOE funding. When DOE/IEEP funding for mercury control research was eliminated, LBNL adapted well by submitting a Field Work Proposal and initiated bench-scale research in CO<sub>2</sub> post-combustion capture. By not duplicating the work of others, they used DOE funding in a cost-effective way to broaden the emissions control options available to power plant owners. They independently developed and proposed an innovative idea for improvement of post-combustion CO<sub>2</sub> capture technology. Ted Chang has effectively served as my single point of contact with LBNL, and responded to my customer needs in a timely manner. He has efficiently and effectively communicated with me via E-mail, telephone, face-to-face conversations, and written proposals and progress reports.

Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Score: 4.0 Grade: A Weighting: 40

Objective 3.1 Performance Summary Statement:

LBNL proposed uniquely innovative technology for CO<sub>2</sub> capture. By not duplicating the work of others, they used DOE funding in a cost-effective way to broaden the emissions control options available to power plant owners. They independently developed and proposed an innovative idea for improvement of post-combustion CO<sub>2</sub> capture technology.

Objective 3.2 Provide Effective and Efficient Science and Technology Project Program Planning and Management

Score: 4.3 Grade: A+ Weighting: 30

Objective 3.2 Performance Summary Statement:

LBNL carefully planned their work and documented the plan in their Field Work Proposals. They proactively identified potential problems and risks, and dealt with unplanned occurrences as they developed. They accomplished the work proposed in each annual Field Work Proposal within 12 months of receiving DOE funding. When DOE/IEEP funding for mercury control Research was eliminated, LBNL adapted well by submitting a Field Work Proposal and initiated innovative bench-scale research in CO<sub>2</sub> post-combustion capture.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 4.3 Grade: A+ Weighting: 30

**Objective 3.3 Performance Summary Statement:**

Ted Chang of LBNL has effectively served as my single point of contact with LBNL, and responded to my customer needs in a timely manner. He has efficiently and effectively communicated with me via E-mail, telephone, face-to-face conversations, and written proposals and progress reports. Ted has proactively advised me of potential problems and the range of outcomes.



Laboratory Year-End Performance Assessment Report

Date:  
9/28/2009

Headquarters Program Office Fiscal Year 2009 Evaluation of Science and Technology Program

Performance at the Lawrence Berkeley National Laboratory Agency: U.S. Department of Energy Program

Office: Assistant Secretary for Fossil Energy

FY Funding Level: (Budget Authority) \$270,000;B&R AA3010000;C02SINK FWP ESD07-011

Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 4.0 Goal Grade: A

Goal 1.0 Performance Summary Statement:

LBNL has continued to produce high-quality, original, and creative results that advance science and technology; demonstrated sustained scientific progress and impact; received high external recognition of accomplishments; and have made step-change contributions to research and development goals of the Department and its customers. This is supported by the following.

LBNL's research in the C02SINK project has produced science and technology results that have a high impact on the field. In this project, GeoForschungsZentrum, Potsdam (GFZ, the German federal geologic institute responsible for project coordination) along with LBNL have entered into an agreement for the acquisition and analysis of distributed thermal perturbation data at the Ketzin, Germany CO<sub>2</sub> injection site. More specifically GFZ has installed fiber-optic distributed temperature perturbation sensors (DTPS) in external casing centralizers in two CO<sub>2</sub> plume monitoring boreholes with the assistance of LBNL. LBNL, which pioneered the use of active thermal perturbation sensing, has provided heating equipment necessary to incorporate DTPS monitoring into the C02SINK experiment to better understand CO<sub>2</sub> plume emplacement. LBNL is also providing reservoir modeling necessary for interpretation of DTPS data as well as petrophysical property measurement of core obtained from the C02SINK site. C02SINK is a highly integrated international demonstration project, supported under the FP6 framework by the European Union commission. C02SINK has been endorsed by the Carbon Sequestration Leadership Forum, an initiative important to DOE. Further support is described in 1.1, 1.2, 1.3, and 1.4.

Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field

Score: 4.0 Grade: A Weighting: 25

Objective 1.1 Performance Summary Statement: LBNL's research in the C02SINK project has produced science and technology results that have a high impact on the field. In this project, GFZ, Potsdam along with LBNL have entered into an agreement for the acquisition and analysis of distributed thermal perturbation data at the Ketzin, Germany CO<sub>2</sub> injection site. More specifically GFZ has installed fiber-optic distributed temperature perturbation sensors (DTPS) in external casing centralizers in two CO<sub>2</sub> plume monitoring boreholes with the assistance of LBNL. LBNL, which pioneered the use of active thermal perturbation sensing, has provided heating equipment necessary to incorporate DTPS monitoring into the C02SINK experiment to better understand CO<sub>2</sub> plume emplacement. LBNL is also

providing reservoir modeling necessary for interpretation of DTSP data as well as petrophysical property measurements of core obtained from the C02SINK site. C02SINK is a highly integrated international demonstration project, supported under the *FP/6* framework by the European Union commission. C02SINK has been endorsed by the Carbon Sequestration Leadership Forum, an initiative important to DOE.

- Tools and techniques developed in the project are becoming widely-used in the scientific community. An example is the use of the DTSP. The DTSP thermal monitoring technique was first developed for evaluating groundwater flow at the proposed High-Level radioactive waste repository site at Yucca Mountain, Nevada. The field system developed at C02SINK was subsequently used to process data collected from the NASA funded study at the High Lake Site in Nunuvut Territory Canada.
- The impact to DOE for R&D undertaken/accomplished by LBNL is enormous and exemplified by the following. The thermal testing technique that was first applied to the CO<sub>2</sub> storage project at Ketzin, Germany is going to be used at the SECARB Cranfield Project and also as part of the Australian C02CRC Otway Stage II testing in Victoria, Australia.

Resulting publications for the project have had an impact on the field. The following are selected examples.

Freifeld, B.M., Daley, T.M., Hovorka, S., Henniges, J., Underschultz, J., and Shanna, S.,(2008) Recent advances in well-based monitoring of CO<sub>2</sub> sequestration. 9th International Conference on Greenhouse Gas Control Technologies (GHGT-9), Washington D.C" Nov 16,20.

HelUlinges, J.; Freifeld, B. M.; Norden, B.; Huenges, E. (2009): Thermal perturbation sensing for monitoring subsurface CO<sub>2</sub> transport, General Assembly European Geosciences Union (Vienna, Austria 2009).

Freifeld, B. M.; Kryder, L.; Gilmore, K.; Henniges, I.; Onstott, T. C.; Lisa, P. (2007): The distributed thermal perturbation sensor: A new tool for *in situ* estimation of formation thermal properties and geothermal heat flux, AGU 2007 Fall Meeting (San Francisco 2007).

#### Objective 1.2 Provide Quality Leadership in Science and Technology

Score: 4.0 Grade: A Weighting: 25

Objective 1.2 Performance Summary Statement: LBL provides quality leadership in science and technology as supported in the following.

LBL's willingness to pursue novel approaches and demonstrate innovative solutions to problems is exemplified by deploying the DTSP at the C02SINK field site. The DTSP thermal monitoring technique was first developed for evaluating groundwater flow at the proposed High-Level radioactive waste repository site at Yucca Mountain, Nevada. The field system developed at C02SINK was subsequently used to process data collected from the NASA funded study at the High Lake Site in Nunuvut Territory Canada.

LBL's extensive collaborative efforts for the C02SINK project are demonstrated by their participation in this German-led CO<sub>2</sub> injection project. C02SINK is a highly integrated international demonstration project, supported under the *FP/6* framework by the European Union commission. GFZ, Potsdam is the

lead, with numerous other academic, industry, and other research entities collaborating. LBNL is providing DTSP monitoring support to better understand CO<sub>2</sub> plume emplacement. LBNL is also providing reservoir modeling necessary for interpretation of DTSP data as well as petrophysical property measurements of core obtained from the C02SINK site.

The impact of the C02SINK research has a high impact on the DOE mission because of the international and collaborative nature of the German-led C02SINK project. C02SINK has also been endorsed by the Carbon Sequestration Leadership Forum, an initiative important to DOE. U.S. DOE world leadership in science and technology is showcased due to LBNL's participation.

Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals

Score: 4.0 Grade: A Weighting: 25

Objective 1.3 Performance Summary Statement:

LBNL's research in C02SINK provides and sustains science and technology output that advances program objectives and goals as exemplified by peer-reviewed publications as noted in 1.1 above.

Objective 1.4 Provide for Effective Delivery of Science and Technology

Score: 4.0 Grade: A Weighting: 25

Objective 1.4 Performance Summary Statement:

LBNL's research in the C02SINK project provides for effective delivery of science and technology as supported by the following.

LBNL is effective in meeting goals and milestones such as the FY09 FWP quarterly project milestones that are reported on by the program.

LBNL is effective in FY09 FWP quarterly and annual reporting, and providing necessary DOE documents for strategic planning such as the annual FY FWP/proposal.

LBNL is effective in delivering on promises; they provided field and modeling support for deployment of the DTSP in wellbores, as well as lab measurement of petrophysical properties of core from C02SINK. LBNL researchers have showcased U.S. and DOE scientific expertise in this international, German-led C02SINK project aimed at demonstrating CO<sub>2</sub> storage in Germany.

LBNL is effective in transmitting results to the scientific community as supported by numerous peer-reviewed publications and extensive collaboration with peer-researchers in carbon sequestration (see \.I).

LBNL is effective in getting instruments to work as promised. They provided field and modeling support for deployment of the DTSP in wellbores at C02SINK project.

Goa12.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities (*Not applicable to FE*)

Goa13.0 Provide Effective and Efficient Science and Technology Program Management

Goal Score: 4.0 Goal Grade: A

Goa13.0 Performance Summary Statement:

LBNL provides highly effective program vision and leadership; strategic planning and development of initiatives; and retains a high quality scientific workforce. The researchers provide a high degree of effective and efficient science and technology research project/program management. This is supported by the following.

Highly efficient and effective joint planning with the outside scientific community is demonstrated by their participation in the German-led C02SINK project that is endorsed by the Carbon Sequestration Leadership Forum.

The researchers have articulated scientific vision well with respect to their specialty of development and application of monitoring tools for geologic storage of carbon dioxide based on geophysics, geochemistry, and simulations.

Additional support is provided in 3.1, 3.2, and 3.3.

Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Score: 4.0 Grade: A Weighting: 40

Objective 3.1 Performance Summary Statement:

The researchers have provided effective and efficient stewardship of scientific capabilities and program vision. This is supported by the following achievements.

- Efficiency and effectiveness of joint planning with outside community.
- Articulation of scientific vision.
- Development of core competencies.

Highly efficient and effective joint planning with the outside scientific community is demonstrated by their participation in the international German-led C02SINK project as described in 1. 1.

The researchers have articulated scientific vision well with respect to their specialty of development and application of monitoring tools for geologic storage of carbon dioxide based on geophysics, geochemistry, well bore engineering, and simulations. They are world leaders in this area as supported by their unique participation in this Carbon Sequestration Leadership Forum project, as well as the invitation to participate in similar geologic storage projects. Their articulation of the science is supported by the numerous publications as provided in 1.1.

Core competencies have been developed in these research areas of applying geophysics, geochemistry, wellbore engineering, and simulations for monitoring geologic storage of carbon dioxide as a GHG mitigation technology.

Objective 3.2 Provide Effective and Efficient Science and Technology Project Program Planning and Management

Score: 4.0 Grade: A Weighting: 30

Objective 3.2 Performance Summary Statement:

Highly effective and efficient science and technology project/program planning and management have been provided by the researchers. This is supported by the high quality Field Work Proposal submitted, the quarterly and annual reporting of project status, and the leveraging/synergy with other areas of research as described in 1.1.

Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs

Score: 4.0 Grade: A Weighting: 30

Objective 3.3 Performance Summary Statement:

LBNL provides highly efficient and effective communications, as well as high responsiveness to the DOE customer. The researchers provide high quality, accurate, and timely responses to DOE and other stakeholder requests. Examples include timely and high quality responses to calls for annual Field Work Proposals and special requests for project status information. Communications channels are well-defined and there is good interaction between researchers and the DOE Project Manager with respect to project status and project planning.

Laboratory Year-End Performance Assessment Report

Date:  
10/5/2009

Headquarters Program Office Fiscal Year 2009 Evaluation of Science and Technology Program

Performance at the Lawrence Berkeley National Laboratory Agency: u.s.Department of Energy Program

Office: Assistant Secretary for Fossil Energy FY Funding Level: (Budget Authority) AA3010 \$750,000

FWP: LBL-9-ESD09-030

Science Needs for Risk Assessment of Large-Scale Geologic CO<sub>2</sub> Storage

Goal 1.0 Provide for Efficient and Effective Mission Accomplishment Goal Score: 4 Goal Grade: A

Goal 1.0 Performance Summary Statement:

Although this project on risk assessment only began towards the end of FY09, it builds on a continuing effort from over the last couple of years. In that context, LBNL has been one of the leaders for DOE in this field, helping to define how the community approaches risk assessment and helping to resolve critical issues.

Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field Score: 4 Grade:

A Weighting: 25 Objective 1.1 Performance Summary Statement:

Although this project on risk assessment only began towards the end of FY09, it builds on a continuing effort from over the last couple of years. In that context, LBNL has been one of the leaders for DOE in this field, helping to define how the community approaches risk assessment and helping to resolve critical issues.

Objective 1.2 Provide Quality Leadership in Science and Technology Score: 4

Grade: A Weighting: 25

Objective 1.2 Performance Summary Statement:

LBNL has been and continues to be a leader research institution in the science base for risk assessment (including MV A) for CCS, as reflected by its publications and visibility within the technical community. The research staff that LBNL has brought to this problem is broad and world class.

Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and

Goals Score: 4 Grade: A Weighting: 25

Objective 1.3 Performance Summary Statement:

Because this project began recently, it is not possible to evaluate LBNL's outputs for this objective. The score reflects LBNL's related output from previous projects, in anticipation that it will continue for this project. LBNL has a long track record of publication of results in this field.

Objective 1.4 Provide for Effective Delivery of Science and Technology Score: 4 Grade: A Weighting: 25

Objective 1.4 Performance Summary Statement:

Because this project began recently, it is not possible to evaluate LBNL's outputs for this objective. The score reflects LBNL's related output from previous projects, in anticipation that it will continue for this project.

Goal 12.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities (*Not applicable to FE*)

Goal 3.0 Provide Effective and Efficient Science and Technology Program Management Goal Score: 4  
Goal Grade: A

Goal 13.0 Performance Summary Statement:

LBNL has been and continues to be a strong leader in this area and is demonstrating a strong willingness to work in the unique collaborative environment of this project.

Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision  
Score: 4 Grade: A Weighting: 40

Objective 3.1 Performance Summary Statement:

This project is part of a coordinated multi-lab collaboration, including LANL, LBNL, LLNL, NETL (lead), and PNNL. The collaboration has included workshops to define needs/goals and collaborative research as well as telecons. LBNL has been very active in this process and has demonstrated a strong willingness to work collaboratively. In addition, LBNL has contributed significantly to the development of joint white papers detailing research needs that will guide the effort. As noted, LBNL has brought a broad and technically strong team to support this project.

Objective 3.2 Provide Effective and Efficient Science and Technology Project Program Planning and Management

Score: 4 Grade: A Weighting: 30

Objective 3.2 Performance Summary Statement:

As lead of a DOE-SC EFRC related to sequestration, LBNL has been in a unique position to leverage its basic research with the needs of this applied research project. LBNL has been proactive in this context, including consideration of the applied effort from the beginning of the project. LBNL has also taken initiative in other areas to consider opportunities for effective leveraging (e.g., in an opportunity with DUSEC).

Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs

Score: 4 Grade: A Weighting: 30

Objective 3.3 Performance Summary Statement:

LBNL has been very responsive to communications on this project. There is a clear lead (Oldenburg) and clear points for technical responsibility within the LBNL team.



Laboratory Year-End Performance Assessment Report

Date:  
9/28/2009

Headquarters Program Office Fiscal Year 2009 Evaluation of Science and Technology Program

Performance at the Lawrence Berkeley National Laboratory Agency: u.s. Department of Energy Program

Office: Assistant Secretary for Fossil Energy FY Funding Level: (Budget Authority) \$1,575,000; B&R

3010000; GEO-SEQ FWP G204

Goal1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 4.3 Goal Grade: A+

Goal1.0 Performance Summary Statement: LBNL has continued to produce high-quality, original, and creative results that advance science and technology; demonstrated sustained scientific progress and impact; received high external recognition of accomplishments; and have made step-change contributions to research and development goals of the Department and its customers. The following achievements are provided as support.

The science and technology results of the researchers have continued to provide high and meaningful impact on the field. The researchers continue to contribute to DOE's Carbon Sequestration Program that supports the Global Climate Change initiative by conducting studies that focus on the Greenhouse Gas (GHG) mitigation technology of geologic storage of carbon dioxide (CO<sub>2</sub>). LBNL researchers are investigating carbon dioxide storage processes and mechanisms through: (1) developing field and computational methods to improve predictions of injectivity and capacity of saline formations and depleted gas reservoirs, and (2) developing and testing innovative high-resolution methods for monitoring carbon dioxide in the subsurface. In this project, LBNL leverages scientific understanding and technology development from three highly visible ongoing world-class geologic CO<sub>2</sub> storage projects (all three are Carbon Sequestration Leadership Forum (CSLF)-recognized) through leadership and collaboration in the scientific and engineering objectives. The CSLF is a major international initiative for DOE, and LBNL is providing step-change contributions leading to the success of these CSLF-endorsed projects.

The three CSLF-endorsed projects are the: (1) Frio, Texas Brine Pilot Tests; (2) Australian Otway Basin Pilot Project; and (3) In Salah, Algeria Industrial-Scale CO<sub>2</sub> Storage Project. Within these projects, LBNL has led the development of downhole fluid and gas sampling by U-tube, downhole Continuous Active Source Seismic Monitoring (CASSM), Vertical Seismic Profiling (VSP), microseismic monitoring, satellite-based InSAR and other techniques, and development of reservoir simulation capabilities incorporating reactive geochemistry, multicomponent gas mixtures, and geomechanical coupling. Advances derived from LBNL's efforts also support the DOE Regional Partnership Projects through the involvement of the investigators, and will likely be used in commercial-scale CO<sub>2</sub> operations in the future. The impact on DOE and its mission for GHG mitigation has been enormous because LBNL researchers are developing new tools and methodologies for geologic storage, and successfully applying them. They are also representing the U.S. and DOE's science expertise in the above named international projects, and are fully engaged with international colleagues on the design, field testing, and analyses of results.

The researchers are highly successful stewards in the research for geologic storage of carbon dioxide. Their work on numerous types of seismic monitoring, as well as development of U-tube for reservoir fluid sampling are just several examples. The development of these and other tools and techniques are likely to

become standards and widely-used in the scientific community. In addition, they are resolving critical questions and moving the research area forward. For example, they are continuing to answer the question "can the injected carbon dioxide plume and reservoir be remotely monitored with adequate resolution" with techniques such as crosshole seismic tomography, VSP, and satellite-based InSAR.

The results of their research have generated huge interest/enthusiasm in the field; the request for their continued participation in numerous international projects listed above is just one supportive achievement.

Additional details of achievements are elaborated on in 1.1, 1.2, and 1.3.

#### Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field

Score: 4.3 Grade: A+ Weighting: 25

##### Objective 1.1 Performance Summary Statement:

I.1 S&T Impact on Field The science and technology results of the researchers continue to provide high and meaningful impact on the field. The following achievements are noted as support .

- The researchers continue to contribute to DOE's Carbon Sequestration Program that supports the Global Climate Change initiative by conducting studies that focus on the Greenhouse Gas (GHG) mitigation technology of geologic storage of carbon dioxide. LBNL researchers are investigating carbon dioxide (CO<sub>2</sub>) storage processes and mechanisms through: (1) developing field and computational methods to improve predictions of injectivity and capacity of saline formations and depleted gas reservoirs, and (2) developing and testing innovative high-resolution methods for monitoring carbon dioxide in the subsurface. In this project, LBNL leverages scientific understanding and technology development from three highly visible ongoing world-class geologic CO<sub>2</sub> storage projects (all three are Carbon Sequestration Leadership Forum (CSLF)-recognized) through leadership and collaboration in the scientific and engineering objectives. The CSLF is also an important initiative for DOE, and LBNL is providing step-change contributions leading to the success of these CSLF-endorsed projects.

The GEO-SEQ program has supported two international programs during FY09, the In Salah Industrial-Scale CO<sub>2</sub> Storage Project, and the Australian CO<sub>2</sub>CRC Otway Project, along with acquiring a final VSP survey at the Frio Pilot and concluding interpretation of Frio data. The In Salah project represents one of only a handful of commercial scale CO<sub>2</sub> injection operations in the world, and the Otway Project is the first demonstration of CO<sub>2</sub> storage in a depleted gas reservoir. The Frio Pilot, which concludes in FY09, successfully demonstrated numerous monitoring technologies -integrating hydrologic, geochemical, and geophysical monitoring techniques into a comprehensive MY A program. Within these projects, LBNL has led the development of downhole fluid and gas sampling by U-tube, downhole Continuous Active Source Seismic Monitoring (CASSM), Vertical Seismic Profiling, microseismic monitoring, satellite-based InSAR and other techniques, and development of reservoir simulation capabilities incorporating reactive geochemistry, multicomponent gas mixtures, and geomechanical coupling. Advances derived from LBNL's efforts also support the DOE Regional Partnership Projects through the involvement of the investigators, and will likely be used in commercial-scale CO<sub>2</sub> operations in the future.

- The impact on DOE and its mission for GHG mitigation, has been enormous because LBNL researchers are developing new tools and methodologies for geologic storage, and successfully applying them. They are also representing the U.S. and DOE's science expertise in the above named international projects, and are fully engaged with international colleagues on the design, field testing, and analyses of results.



- The researchers are highly successful stewards in the research for geologic storage of carbon dioxide. Their work on numerous types of seismic monitoring, development of U-tube for reservoir fluid sampling, and use of InSAR satellite-based data to monitor CO<sub>2</sub> reservoirs are just several examples. The development of these and other tools and techniques are likely to become standards and widely-used in the scientific community. In addition, they are resolving critical questions and moving the research area forward. For example, they are answering the question "can the injected carbon dioxide plume be remotely monitored with adequate resolution" with techniques such as crosshole seismic tomography.

- The results of their research have generated huge interest/enthusiasm in the field; the request for their continued participation in numerous international projects listed above is just one supportive achievement. LBNL excels in making high-quality data available to the scientific community. This achievement is supported by an extensive list of publications, invited talks, and other technology transfer. These have generated high impact on the field. Several supportive achievements follow.

-Through extensive collaboration with the C02CRC team for the Otway. Australia injection project, the researchers continue monitoring and modeling support for the Naylor-1 observation well bottom hole assembly and borehole monitoring instrumentation. A milestone for this project was reached in June 2009 when over 57,000 tO2 of CO2 had been injected. A Phase II is now being planned at Otway and LBNL is actively involved in the design of the planned injection.

-Through extensive collaboration with the InSalah, Algeria CO2 storage project industry operator, BP, the researchers have completed a study that uses satellite-based InSAR observations to monitor the reservoir and overburden. The results have been published in two benchmark papers in Geophysics. The study is likely to bring great interest to the scientific community for this monitoring tool.

-Continued to complete an extensive list of publications and presentations that have had high impact on the field; a partial list includes the following:

Dodds, K., Daley, T., Freifeld, B., Urosevic, M., Kepic, A. and Sharma, S., 2009, Developing a monitoring and verification plan with reference to the Australian Otway CO2 pilot project, *The Leading Edge*, v28, n7, 812-818, LBNL-2310E.

Freifeld, B.M., Daley, T.M., Hovorka, S.D., Hennings, J., Underschultz, J., and Sharma S, 2009, Recent advances in well-based monitoring of CO2 sequestration, *Energy Procedia*, Elsevier, Vol. I, Issue I, 2277 -2284.

Daley, T.M., Sandeep Shanna, Aleksander Dzunic, Milovan Urosevic, Anton Kepic, Don Sherlock, 2009, Borehole Seismic Monitoring at Otway Using the Naylor-1 Instrument String, Lawrence Berkeley National Laboratory Report, LBNL-2337E.

Freifeld, B. M., 2009, The U-tube: a new paradigm in borehole fluid sampling, *Scientific Drilling*, 8, doi:10.2204/iodp.sd.8.07.2009 (in press)

Freifeld, B. M., Perkins, E., Underschultz, J., Boreham, C., The U-tube Sampling Methodology and Real-Time Analysis of Geofluids, in *Proceedings of the 24th International Applied Geochemistry Symposium*. Fredericton, New Brunswick, Canada. 2009.

Kirste, D, E. Perkins, C. Boreham, B. Freifeld, L. Stalker, U. Schacht, and J. Underschultz, 2009, Geochemical modeling and formation water monitoring at the C02CRC Otway Project, Victoria, Australia in *Proceedings of the 24th International Applied Geochemistry Symposium*, 14 June, 2009, Fredericton, N.B., Canada.

Liu H.H. and Rutqvist J., Use of a Dual-Continuum Approach for Modeling Coupled Hydro mechanical Processes of CO2 Injection at In Salah, Algeria. 8<sup>th</sup> annual conference on carbon capture and sequestration, Pittsburgh, Pennsylvania, May 4 to 7, 2009.

Rutqvist J. and Vasco D., Numerical Analysis of Deep Underground CO<sub>2</sub> Injection and Ground  
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Surface Deformations at In Salah, Algeria. annual conference on carbon capture and sequestration,  
Pittsburgh, Pennsylvania, Paper# 1319, May 4 to 7, 2009.

Rutqvist J., Vasco D W, Myer L., Coupled reservoir-geomechanical analysis of CO<sub>2</sub> injection and ground  
deformations at In Salah, Algeria. Submitted to International Journal of Greenhouse Gas Control.

- There has been enormous impact of these publications on the field. This is exemplified by the following.

BP had decided that from the early work on using InSAR to trace CO<sub>2</sub> plume movement and growth, that it would be one of their primary monitoring tools. Berkeley's pioneering work has since been independently duplicated by T. Onuma, and S. Ohkawa from Japan Petroleum Exploration Company and they presented their results at the GHGT-9 Conference.

There have been numerous outside requests to use OED-SEQ published results and presentations have been made by other scientists including: Craig Hartline, Conoco Phillips; Javier Ferrandis, Shell; Andy Chadwick, British Geologic Survey; Sue Hovorka, Texas Bureau of Economic Geology, Ali Oncel, University of Alberta; and the IEA OHO program prominently references work on the CASSM source and also the InSAR results on their web pages.

- LBNL has published in journals outside the field indicating broad impact of research. An example includes: Freifeld, B. M., 2009, The U-tube: a new paradigm in borehole fluid sampling, *Scientific Drilling*, 8, doi: 10.2204/iodp.sd.8.07.2009

- The impact to DOE for R&D undertaken/accomplished by LBNL is enormous and exemplified by the following. The techniques developed in GEO-SEQ, especially U-tube sampling and CASSM have been directly transferred to the DOE Sequestration Regional Partnership program via participation in WESTCARB and SECARB. Additionally, the CASSM technique is now planned for use in DOE ER program at Warren AFB.

- Examples of invited talks, citations, and making high-quality data available to the scientific community include the following.

Daley, T., 2009, Borehole Seismic Monitoring for Small Scale Sequestration Pilots, Society of Exploration Geophysicists' Summer Research Workshop, Banff, Canada, August 25, 2009.

Ajo-Franklin, J.B., Daley, T., 2009, Using Optimal Experiment Design to Improve CO<sub>2</sub> Sequestration Monitoring Strategies, Society of Exploration Geophysicists' Summer Research Workshop, Banff, Canada, August 26, 2009.

Daley, T.M., Shanna, S., Drunic, A., Vrosevic, V., Kepic, A., 2009, Otway Project Seismic Monitoring: V-tube use of multi-purpose borehole seismic sensors for CO<sub>2</sub> injection monitoring, 8 Annual Conference on Carbon Capture and Sequestration, May 2009.

Daley, T., 2009, Seismic Monitoring of Carbon Sequestration, Electric Power Research Institute (EPRI) Workshop on Costs of CO<sub>2</sub> Transport and Storage.

Freifeld, B., 2009, Update on Otway Project Geochemistry Results, presented at the 12th CO<sub>2</sub>SINK General Assembly meeting, Feb 18 -19, 2009, Potsdam, Germany

• Examples of the development of tools and techniques that become standards or widely-used in the scientific community include the following. The V-tube fluid sampler, which was initially developed during the Frio Project to overcome limitations of other sampling techniques, has since been copied and used at numerous other sites. For CO<sub>2</sub> sequestration research programs, V-tubes have been installed or plan to be installed as part of the PennWest experiment in Canada, at the Otway Project in Australia, the SECARB Cranfield Experiment and for the WESTCARB California Pilot. For non-CO<sub>2</sub> related research V-tubes have been used at the High Lake astrobiology research site in Nunavut Territory, Canada, and also by a team of Swedish and Finnish research as part of the Greenland Analogue Project in Kangerlussuaq, Greenland.

Objective 1.2 Provide Quality Leadership in Science and Technology

Score: 4.3 Grade: A+ Weighting: 25

Objective 1.2 Performance Summary Statement:

The researchers have continued to provide high quality leadership in science and technology. Research results have had high and meaningful impact on the field. The following achievements are provided as support.

The LBNL scientific research pursued is unique and a challenge with respect to monitoring geologic storage as a GHG mitigation technology. The lab is a trendsetter in the field with respect to the scientific approach and application of geophysics, geochemistry, and simulations; these approaches are proving to be critical tools to verify safe and permanent storage in the subsurface. They are in a leadership role in these specialized studies and their excellence is demonstrated in numerous ways described in 1.1, including the following. The researchers have played instrumental roles in three CSLF-endorsed projects: (1) Frio, Texas Brine Pilot Tests; (2) Australian Otway Basin Pilot Project; and (3) In Salah, Algeria Industrial-Scale CO<sub>2</sub> Storage Project. Within these projects, LBNL has led the development of downhole fluid and gas sampling by V-tube, downhole Continuous Active Source Seismic Monitoring (CASSM), VSP, microseismic monitoring, tracer injection and reservoir monitoring, satellite-based InSAR observations, and other geophysical techniques, and reservoir simulation capabilities incorporating reactive geochemistry, multicomponent gas mixtures, and geomechanical coupling. Advances derived from LBNL's efforts also support the DOE Regional Partnership Projects through the involvement of the investigators, and will likely be used in commercial-scale CO<sub>2</sub> operations in the future.

As supported above and in 1.1, LBNL has achieved the following .

• LBNL researchers have pursued novel approaches and demonstrated innovative solutions to problems. Examples of pursuing novel approaches and/or demonstration of innovative solutions to problems include the following. LBNL's development of a 'resonant bar' technique for CO<sub>2</sub> brine mixtures is a novel approach to look at frequency dependent velocity effects -this has potential to improve our understanding of the quantitative measurement of CO<sub>2</sub> saturation in brine reservoirs. Very few teams in the world have a

resonant bar apparatus and it is believed Berkeley Lab is the first group applying this technique to looking at the effects of CO<sub>2</sub> on seismic wave propagation.

-LBNL researchers have addressed high-risk/high pay off long-term research problems.

·LBNL is recognized for doing the best work in the field. The list of publications provided above in just one supportive example.

·LBNL researchers have collaborated extensively with both U.S. and international colleagues working on geologic storage of carbon dioxide as described above.

· LBNL have been very effective in driving the direction and setting the priorities of the research community.

·LBNL is a trendsetter in the field. An example includes the following. The InSAR approach to imaging a deep subsurface plume was predicted at Berkeley Laboratory through geomechanical modeling. It was not seriously considered as a monitoring technique even by the other members of the In Salah project team until Berkeley Lab presented and published the definitive results. BP now presents InSAR as a primary monitoring technique for their MVA program.

-The science pursued by LBNL is unique and a challenge. An example includes the following. Development of the piezo-tube source (patent pending) to allow subsurface crosswell monitoring during injection is unique. The patent search found no similar device, worldwide.

·LBNL's research pursued included extensive collaborative efforts. The Frio VSP data has been used for collaboration with LANL, Univ. of Alberta and Schlumberger. The Otway Project U-tube geochemistry data is used throughout the entire Otway collaborative team including researchers from Australia's CSIRO, Alberta Research Council, and Simon Fraser University .

•LBNL's scientific staff is highly visible in leadership positions in the scientific community. Examples include the following.

-Society of Exploration Geophysicists:

Member: Research subcommittee on CO<sub>2</sub> storage

Co-organizer: 2009 Summer research workshop on CO<sub>2</sub> Sequestration Geophysics

-Society of Petroleum Engineers: Co-organizer: 2009 International Conference on CO<sub>2</sub> Capture, Storage and Utilization

-American Geophysical Union: Co-convener: 2009 Annual Meeting Special Session on Geophysical Monitoring, Verification, and Accounting for Geologic Carbon Sequestration

-Dept. Of Energy: Member: Sequestration Regional Partnership MV A Working Group

Member: Subsurface Monitoring Risk Assessment White Paper working group

-Guest editor (Curt Oldenburg) for a special issue in Transport in Porous Media on Geologic Carbon Sequestration. There are approx. 16 papers in various stages of review/revision.

Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals

Score: 4.3 Grade: A+ Weighting: 25

Objective 1.3 Performance Summary Statement: This research provides and sustains science and technology outputs that advance program objectives and goals. This is supported by:

- The number of publications in peer-reviewed journals (see list provided in 1.1).
- The quantity of output from applied field and computational research through their highly collaborative research endeavors including the following:
  - The LBNL researchers are part of the benchmark Frio, Texas pilot study that is a CSLF endorsed project and has international participation and recognition. Their expertise continues to be sought after for participation in other key carbon dioxide geologic storage projects.
  - The LBNL researchers are part of the Australian Otway pilot geologic storage project. This is CSLF-endorsed project and has international participation and recognition. -The LBNL researchers are part of the Algerian In Salah Joint Industry commercial-scale which is also a CSLF-endorsed project.
- Demonstrated progress against peer reviewed recommendations. As part of the Frio, Texas pilot team, the researchers collaborated extensively with their peer researchers in the design and conduct of the fieldwork, analyses of the field data, and publications that resulted. As part of the Australian Otway project and the Algerian In Salah project, they have also collaborated extensively with their peer researchers on these teams.
- Research accomplishments from experimental and theoretical research have importance outputs. An example includes the following. The final Frio VSP was the first know long term (5 year) VSP monitoring of a CO<sub>2</sub> injection in a brine aquifer.



Objective 1.4 Provide for Effective Delivery of Science and Technology

Score: 4.3 Grade: A+ Weighting: 25

Objective 1.4 Performance Summary Statement: The researchers have been very effective and efficient in the delivery of the science. This has been demonstrated by the following achievements.

- Effective in meeting goals and milestones such as the FY09 FWP quarterly project milestones that are reported on by the program.
- Effective in FY09 FWP reporting and providing necessary DOE documents for strategic planning. Effective in delivering on promises; LBNL researchers have showcased U.S. and DOE scientific expertise in numerous international project including Frio, Australian Otway, and Algerian In Salah.
- Effectively transmitting results to the scientific community as supported by numerous peer-reviewed publications and extensive collaboration with peer researchers in carbon sequestration (see 1.1).
- LBNL is effective in getting instruments to work as promised. An example includes the following. Initial calibration of the resonant bar petrophysical apparatus was completed in 2009. Also, the U-tube sampling system installed at the Otway Project Site started having difficulty recovering samples because of naturally occurring waxes coating the sample tubes. Berkeley Lab and the CO2CRC worked together to first analyze geochemistry data on the wax composition and devised a sequence of remediation approaches to overcome the wax problem. The final solution included a high pressure piston pump to dislodge the initial wax blockage followed by monthly solvent flushes to keep the U-tube operating. They have now been operating over 18 months since their initial installation.

Goa12.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities (*Not applicable to FE*)

Goa13.0 Provide Effective and Efficient Science and Technology Program Management Goal Score: 4.3

Goal Grade: A+ Goa13.0 Performance Summary Statement:

LBNL provides highly effective program vision and leadership; strategic planning and development of initiatives; and retains a high quality scientific workforce. The researchers provide a high degree of effective and efficient science and technology research project/program management. This is demonstrated by achievements in the following.

Highly efficient and effective joint planning with the outside scientific community is demonstrated by their participation in the research teams for the Frio pilot project, the Australian Otway project, and the Algerian In Salah project. All three projects are endorsed as Carbon Sequestration Leadership Forum projects and have international participation and recognition; results are being provided to the U.S. and international community. Other supportive examples of joint planning are provided in 1.1.

The researchers have articulated scientific vision well with respect to their specialty of development and application of monitoring tools for geologic storage of carbon dioxide based on geophysics, geochemistry, and simulations. They are world leaders in this area as supported by their unique participation in these CSLF projects, as well as the invitation to participate in similar geologic storage projects. Their articulation of the science is supported by the numerous publications as provided in 1.1.

Highly effective and efficient science and technology project/program planning and management have been provided by the researchers. This is supported by the high quality Field Work Proposal submitted, the quarterly and annual reporting of project status, and the leveraging/synergy with other areas of research including the Frio injection pilot study, the Australian Otway project, and the Algerian In Salah project.

Further details are elaborated on in 3.1, 3.2, and 3.3

Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Score: 4.3 Grade: A+ Weighting: 40

Objective 3.1 Performance Summary Statement:

The researchers have provided effective and efficient stewardship of scientific capabilities and program vision. This is supported by the following achievements.

- Efficiency and effectiveness of joint planning with outside community.
- Articulation of scientific vision.
- Development of core competencies.

Highly efficient and effective joint planning with the outside scientific community is demonstrated by their participation in the research teams for the Frio pilot project, the Australian Otway project, and the Algerian In Salah project. All three projects are endorsed as Carbon Sequestration Leadership Forum projects and have international participation and recognition; results are being provided to the U.S. and international community. For example, Berkeley Laboratory typically sends scientists to participate in the Australian C02CRC Symposium for planning and review of C02CRC research activities. In 2008 Tom Daley and Barry Freifeld made presentations, and for 2009, Yingqi Zhang, Barry Freifeld, and Tom Daley will be traveling to Australia to make presentations and participate in planning for the Otway Stage II injection test. Also, Tom Daley is on the Society of Exploration Geophysicists research subcommittee for CO<sub>2</sub> sequestration, and on the organizing committee for the SEG swrner research workshop on CO<sub>2</sub> geophysics, and the SPE CO<sub>2</sub> technical meeting and the AGU special session on MVA. Other supportive examples of joint planning are provided in 1.1.

The researchers have articulated scientific vision well with respect to their specialty of development and application of monitoring tools for geologic storage of carbon dioxide based on geophysics, geochemistry, and simulations. They are world leaders in this area as supported by their unique participation in these CSLF projects, as well as the invitation to participate in similar geologic storage projects. Their articulation of the science is supported by the numerous publications as provided in 1.1.

Core competencies have been developed in these research areas of applying geophysics, geochemistry,

wellbore engineering, and simulations for monitoring geologic storage of carbon dioxide as a GHG mitigation technology.

Objective 3.2 Provide Effective and Efficient Science and Technology Project Program Planning and Management

Score: 4.3 Grade: A+ Weighting: 30

Objective 3.2 Performance Summary Statement:

Highly effective and efficient science and technology project/program planning and management have been provided by the researchers. This is supported by the high quality Field Work Proposal submitted, the quarterly and annual reporting of project status, and the leveraging/synergy with other areas of research including the Frio injection pilot study, the Australian Otway project, and the Algerian In Salah project.

LBNL's research is effective in considering technical risks. An example follows. For the resonant bar apparatus, they limited the pressure range of the proposed apparatus to increase the likelihood of success. They also have a process where engineers from Berkeley Lab's Engineering Division participate in the design review and analysis of the safety of the high pressure system. Working with outside professional engineers increases the chances for identifying problems early in the design phase and planning.

LBNL's research is effective in identifying/avoiding technical problems. An example follows. The U-tube sampling system installed at the Otway Project Site monitoring borehole encountered difficulty recovering samples because of naturally occurring waxes coating the sample tubes. Berkeley Lab and the C02CRC worked together to first analyze geochemistry data on the wax composition and devised a sequence of remediation approaches to overcome the wax problem. The final solution included a high pressure piston pump to dislodge the initial wax blockage followed by monthly solvent flushes to keep the U-tube operating. They have now been operating over 18 months since their initial installation.

LBNL's research is effective in leveraging (synergy with) other areas of research. Several examples follow. The CASSM technique is being applied in DOE ER program and in NSF funded work in monitoring stress near earthquake faults (SAFOD Project, Parkfield, California), and is proposed for monitoring of oil shale recovery. The resonant bar technique is being developed for use in microbially enhanced oil recovery. The U-tube has been used as part of a NASA funded study in Canada and also for hydrological research in Greenland. The development of a way to perform ultra pure biological sampling which was used in Greenland is now going to be applied to the SECARB Cranfield experiment for looking at the effect of CO<sub>2</sub> on existing microbial communities in the deep subsurface.

Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs

Score: 4.3 Grade: A+ Weighting: 30

Objective 3.3 Performance Summary Statement:

LBNL provides highly efficient and effective communications, as well as high responsiveness to the DOE customer. The researchers provide high quality, accurate, and timely responses to DOE and other stakeholder requests. Examples include timely and high quality responses to calls for annual Field Work Proposals and special requests for project status information. Communications channels are well-defined and there is good interaction between researchers and the DOE Project Manager with respect to project



status and project planning.

Laboratory Year-End Performance Assessment Report

Date:  
10/02/2009

Headquarters Program Office Fiscal Year 2009 Evaluation of Science and Technology Program  
Performance at the Lawrence Berkeley National Laboratory

Agency: U.S. Department of Energy

Program Office: Assistant Secretary for Fossil Energy

FY Funding Level: (Budget Authority) \$1,470,082

Goal 1.O Provide for Efficient and Effective Mission Accomplishment

Goal Score: 4.25 Goal Grade: A+

Goal 1.O Performance Summary Statement:

LBNL is performing field activities for the WESTCARB Regional Partnership reporting to DOE in quarterly and monthly reports. Their quarterly reports show great progress in the field as well as any lessons learned from field activities. They have contributed to DOE's mission for Carbon Sequestration with this highly visible project. Their staff members are very visible in the Carbon Sequestration community and are regarded as experts in the technology area.

Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field

Score: 4.3 Grade: A+ Weighting: 25

Objective 1.1 Performance Summary Statement:

LBNL submits a variety of publications for the WESTCARB Regional Partnership including quarterly and monthly reports. Their quarterly reports show great progress in the field as well as any lessons learned from field activities. Their publications and results from field tests have a significant impact on DOE's Carbon Sequestration Program as well as their regional community. Public outreach efforts on this project have been very successful. LBNL staff is very responsive to DOE requests and keeps DOE management informed of any successes or issues in the field.

Objective 1.2 Provide Quality Leadership in Science and Technology Score: 4.3 Grade: A+ Weighting: 25  
Objective 1.2 Performance Summary Statement: LBNL staff is key for coordinating field activities for WESTCARB. They coordinate more than 80 project partners from both public and private entities for this project. LBNL staff members are regarded as experts in the Carbon Sequestration Technology area.  
Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals

Score: 4.3 Grade: A+ Weighting: 25 Objective 1.3 Performance Summary Statement: Quality of the reports

received from LBNL is excellent. LBNL is repeatedly asked to represent the entire WESTCARB Partnership at various Carbon Sequestration events. They have demonstrated progress against peer reviewed recommendations and headquarter guidance.

Objective 1.4 Provide for Effective Delivery of Science and Technology

Score: 4.1 Grade: A+ Weighting: 25

Objective 1.4 Performance Summary Statement:

LBNL has demonstrated efficiency and effectiveness in meeting their goals and milestones. They also demonstrate excellent leadership skills and a true understanding of issues related to Carbon Sequestration. Most milestones for FY2009 were met. One missed milestone was due to technical issues in the field and out of the control of LBNL staff.

Goal 12.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities (*Not applicable to FE*)

Goal 13.0 Provide Effective and Efficient Science and Technology Program Management Goal Score: 4.3

Goal Grade: A+ Goal 13.0 Performance Summary Statement:

LBNL provides strong programmatic vision and they achieve superior scientific excellence in high-risk research that is vital to DOE's mission. They effectively manage their injection projects through a Project Management Plan and coordination with the COR. They express their concerns or issues about any part of the project to their COR and always respond to requests in a timely manner.

Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Score: 4.3 Grade: A+ Weighting: 40

Objective 3.1 Performance Summary Statement:

LBNL provides strong programmatic vision and they achieve superior scientific excellence in high-

risk research that is vital to DOE's mission. They effectively manage their injection projects through a Project Management Plan and coordination with the COR. During field operation communication between LBNL and DOE occurs daily. The technical expertise of the LBNL staff is evident in their field reports and is vital to successful field operations.

Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management

Score: 4.3 Grade: A+ Weighting: 30

Objective 3.2 Performance Summary Statement:

LBNL's research plans are detailed in several documents they submitted to their COR and they plan against budget fluctuations. LBNL is responsible for project coordination on the field projects and track budget and progress on operations.

Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs

Score: 4.3 Grade: A+ Weighting: 30

Objective 3.3 Performance Summary Statement:

LBNL's communication channels are well defined. They express their concerns about their research and discuss all technical matters with DOE. In addition, they keep DOE informed of all decisions regarding the field projects. In addition, they respond to all requests in a timely manner.

Laboratory Year-End Performance Assessment Report

Date:  
10/02/2009

Headquarters Program Office Fiscal Year 2009 Evaluation of Science and Technology Program

Performance at the Lawrence Berkeley National Laboratory Agency: U.S. Department of Energy Program

Office: Assistant Secretary for Fossil Energy FY Funding Level: (Budget Authority) I 610248/AA 2530000

Goal 1.0 Provide for Efficient and Effective Mission Accomplishment Goal Score: 3.10 Goal Grade: B+

Goal 1.0 Performance Summary Statement:

Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field Score: 3.3

Grade: B+ Weighting: 25 Objective 1.1 Performance Summary Statement:

The LBNL research team, led by Dr. Lutgard De Jonghe, is a productive part of the SolidState Energy Conversion Alliance's (SECA) R&D program. The results of LBNL's Field Work Proposal (FWP) do impact the field of solid-oxide fuel cell research, which is significant considering the FWP's limited budget (300k). In fiscal year 2009, LBNL's FWP resulted in the filing of one patent disclosure, the publishing of one peer-reviewed journal article, and delivery of three presentations. Overall, LBNL's performance is satisfactory.

Objective 1.2 Provide Quality Leadership in Science and Technology

Score: 3.3 Grade: B+ Weighting: 25

Objective 1.2 Performance Summary Statement: The personnel who manage and implement LBNL's FWP are thoughtful and proactive. LBNL seems well-suited to produce and research innovative technologies to advance the state of the art in solid-oxide fuel cell component technology. As an example, in fiscal year 2009 LBNL developed an innovative solution to thermal management of solid-oxide fuel cells. LBNL's propensity to produce such innovations demonstrates their quality leadership and exhibits their value in advancing technology.

Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals

Score: 2.9 Grade: B Weighting: 25

Objective 1.3 Performance Summary Statement:

LBNL has a history of producing innovative solutions to address SECA R&D needs. From intercollect coatings, to catalyst infiltration, to SOFC thermal management solutions -LBNL does a good job of



providing science and technology advances that further program objectives and goals. LBNL's research continues to generate SECA Industry Team interest. The research team publishes their results in high-quality journals and presents those results at technical conferences, SECA workshops, and DOE-organized Peer Reviews.

Objective 1.4 Provide for Effective Delivery of Science and Technology

Score: 2.9 Grade: B Weighting: 25

Objective 1.4 Performance Summary Statement:

LBNL is effective in communicating their results to the DOE and larger research community. Given their high level of output and modest budget, there is little doubt that LBNL is efficient. A minor drawback is that LBNL is sometimes tardy in submitting their deliverables, but never to the point where it's significantly problematic.

Goa12.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities (*Not applicable to FE*)

Goa13.0 Provide Effective and Efficient Science and Technology Program Management Goal Score: 3.11

Goal Grade: B+ Goa13.0 Performance Summary Statement:

Overall, the LBNL effort lead by Dr. Lutgard De Jonghe is well-managed, and accomplishes planned technical objectives and milestones in an effective and efficient manner.

Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Score: 3.2 Grade: B+ Weighting: 40 Objective 3.1 Performance Summary Statement:

LBNL coherently articulates their scientific vision, while incorporating good ideas from external research communities. LBNL has no problem attracting high-quality staff whom are talented and motivated.

Objective 3.2 Provide Effective and Efficient Science and Technology Project Program Planning and

Management Score: 2.9 Grade: B Weighting: 30 Objective 3.2 Performance Summary Statement:

LBNL produces high quality R&D and they are able to effectively consider and mitigate (or avoid) unreasonably large technical risks. The LBNL team always accomplishes what they set out to do, so their work definitely follows the Office of Fossil Energy's SOFe related objectives.

Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs

Score: 3.2 Grade: B+ Weighting: 30 Objective 3.3 Performance Summary Statement:

Deliverables received from LBNL are generally accurate, timely, and of satisfactory quality. The project lead ensures the DOE is informed of events (both positive and negative) occurring at the lab,



allowing us to develop contingency plans if necessary.

Laboratory Year-End Performance Assessment Report

Date: 09-  
21-2009

Headquarters Program Office Fiscal Year 2009 Evaluation of Science and Technology Program  
Performance at the Lawrence Berkeley National Laboratory

Agency: U.S. Department of Energy

Program Office: Assistant Secretary for Fossil Energy

FY Funding Level: (Budget Authority) \$375,000

Goal1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: Goal Grade:

Goal1.0 Performance Summary Statement:

The project team is very well qualified to perform the research work with significant expertise in hydrate formation/decomposition processes performed in conjunction with CT X-ray scanning / analysis of the process. Coupling of these high quality measurements with the simulations being performed by George Moridis et al. at LBNL presents a very powerful method of assessing hydrate structure.

*Note: George Moridis is listed as PI and Tim Kneafsey as co-PI. Tim actually is the principal researcher on this FWP.*

Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field

Score: A Grade: 4.0 Weighting: 25

Objective 1.1 Performance Summary Statement:

Kneafsey and his team continue to produce cutting edge work relative to understanding the formation / dissociation processes of methane hydrate and have also continued to push the envelope relative to the testing of geomechanical properties of hydrate bearing sediment through the design, build, testing and initial use of innovative lab testing equipment for this purpose. This team has published quality papers in conference proceedings and peer-reviewed journals. Their work has also been presented at appropriate meetings, drawing a lot of interest in their work and helping to lead discussions in the advancement of hydrate experimentation. Peer review results from late FY2008 were extremely positive, prompting the inclusion of additional funding under this FWP in FY2009 to expand the effort to include the investigation of a novel phenomenon of hydrate migration in samples noticed during other FWP activity.

Tim Kneafsey has presented his team's work at many, if not all, the principal US and international

TO: Joseph Krupa  
Institutional Program Manager  
U.S. DOE Berkeley Site Office

FROM: James J. Markowsky  
Assistant Secretary  
Office of Fossil Energy

hydrate conferences. He has been involved in the analysis of sediment cores from nearly every hydrate program field excursion. This group is very visible in the hydrates community and is a national and international leader in the field of laboratory hydrate experiments. Tim continues to push the envelope in developing new techniques and approaches to hydrate formation that more closely resemble natural samples and in the testing of the geomechanical properties of hydrate bearing sediment.

Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals

Score: B+ Grade: 3.4 Weighting: 25

Objective 1.3 Performance Summary Statement:

Work under the effort consistently receives extremely positive response through independent expert and peer review. The work produces extremely high quality publications in well respected peer reviewed technical scientific journals. The performers readily incorporate new ideas into their efforts resultant from valuable collaborations, peer reviews or DOE guidance / request. In FY2009, due to delays caused by implementation of lab safety audits and associated equipment testing, not all planned activities were completed on schedule, but plans are well in hand for assuring work is performed as the effort moves forward.

Objective 1.4 Provide for Effective Delivery of Science and Technology

Score: B+ Grade: 3.4 Weighting: 25

Objective 1.4 Performance Summary Statement:

The project team is making steady progress towards stated objectives for FY09 FWP. Most Milestones have been met on time. In one instances there are delays caused in part by lab wide safety audits and the certification of a new geomechanical test cell for use in the FWP. The team is responsive in providing information on status and results of the work, as well as justification of delays, in a timely manner. The team has shown exceptional flexibility to the needs of the program by taking on critical, timely analyses based on newly developing needs and! or for support of other projects being conducted under the program.

Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities (*Not applicable to FE*)

Goal 3.0 Provide Effective and Efficient Science and Technology Program Management

Goal Score: Goal Grade:

Goal 3.0 Performance Summary Statement:

Currently provide strong scientific stewardship, core competency and excellent research and scientific personnel. Strength of personnel available under this FWP was enhanced in FY2009 through additional project support. LBNL continues to provide leadership in the area of hydrate formation / dissociation studies as well as study of the geomechanical properties of hydrate bearing sediment through work in this FWP. They also demonstrate continued improvement in the process by which the research is carried out, striving to improve both the efficiency and effectiveness of the activity.

Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Score: A+ Grade: 4.1 Weighting: 40

Objective 3.1 Performance Summary Statement:

Tim Kneafsey continuously leads and participates in cutting edge collaborations in the areas of hydrate formation / dissociation and testing of geomechanical properties of hydrate bearing sediment. Dr. Kneafsey's participation in these collaborations helps provide programmatic vision beyond LBNL to help define the needs and future steps in the area of lab studies. The LBNL lab studies group continues to be recognized as a leader in this field of research for the hydrate scientific community.

Objective 3.2 Provide Effective and Efficient Science and Technology Project Program Planning and Management

Score: A Grade: 4.0 Weighting: 30

Objective 3.2 Performance Summary Statement:

Research plans proposed under this FWP continue to develop in response to results as well as program and scientific community needs. Work tends to be very well planned against budget fluctuations. The group has, on several occasions, proactively proposed new areas of cutting edge research based on new hypothesis or observed phenomena which occur as a part of planned performance of tasks. LBNL facilities, equipment and scientific approach continue to develop and are considered state-of-the-art for this specific area of research. Work is proposed along those areas where the strongest programmatic needs exist and where available resources are considered to be sufficient to make meaningful and timely contribution. It should also be noted that the coupling of this team's work with the simulation work being performed by Moridis (under separate FWP) is extremely critical to the DOE hydrate program goals and objectives, and presents a very powerful method of assessing hydrate structure and behavior in support of other program activities.



Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs

Score: A Grade: 4.0 Weighting: 30

Objective 3.3 Performance Summary Statement:

The project team provides periodic detailed progress reports as well as intermittent updates upon request that are accurate, timely and succinct. Milestones are typically met on time and when they are not, the team provides good documentation as to why. Dr. Kneafsey is extremely good about reporting interesting results (both good and bad) or issues relative to performance of planned work to the program in real time. Any issues are presented with mitigation strategies and revised plans of action.

Laboratory Year-End Performance Assessment Report

Date:  
09/23/09

Headquarters Program Office Fiscal Year 2009 Evaluation of Science and Technology Program

Performance at the Lawrence Berkeley National Laboratory Agency: u.s. Department of Energy Program

Office: Assistant Secretary for Fossil Energy FY Funding Level: (Budget Authority) \$50K

Goal1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: A+ Goal Grade: 4.1

Goal1.0 Performance Summary Statement:

Lawrence Berkeley National Laboratory (LBNL) produces high quality, original and creative results which are helping to advance accelerometer technology specifically for seismic imaging applications. This research is key to meeting industry needs with its greatest impact being on the seismic exploration and monitoring industry for oil and gas applications. The PI, Ernest Majer, is well respected in his field and is recognized by other experts as making real and valuable scientific contributions.

Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field

Score: A+ Grade: 4.1 Weighting: 25

Objective 1.1 Performance Summary Statement:

LBNL research on advance accelerometer technology is cutting edge and clearly has the potential to significantly move forward the field of research in which the work is being performed. The project PI Ernest Majer has been heavily involved in this research area and is considered a leader in the scientific community.

Objective 1.2 Provide Quality Leadership in Science and Technology

Score: A+ Grade: 4.2 Weighting: 25

Objective 1.2 Performance Summary Statement: The project PI Ernest Majer and support personnel are strong leaders in this field. Dr. Majer holds multiple degrees with a Ph.D. in Geophysics and has many years of research experience in this area and is considered a leader in the scientific community. LBNL personnel work extensively to foster collaborations on work in their field.

Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals

Score: A+ Grade: 4.1 Weighting: 25

Objective 1.3 Performance Summary Statement: The scientists performing activities under this effort have received high commendation from Lwnedyne, the prime recipient of the NETL agreement which LBNL supports.

Objective 1.4 Provide for Effective Delivery of Science and Technology

Score: A+ Grade: 4.3 Weighting: 25

Objective 1.4 Performance Summary Statement: The LBNL scientists performing research under this effort consistently meet or exceed planned goals and milestones. The project team has completed FY09 activities as described in the FWP and their effort has added value to the research. The contractor continues to support this research and they effectively transmit research results to both DOE and the greater scientific community.

Goal2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities (*Not applicable to FE*)

Goal3.0 Provide Effective and Efficient Science and Technology Program Management Goal Score: A+

Goal Grade: 4.3



Goa13.0 Performance Summary Statement: The LBNL provides strong scientific stewardship, core competency and excellent research and possesses scientific personnel. Personnel recruited and retained within this research area are highly qualified.

Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Score: B+ Grade: 3.4 Weighting: 40

Objective 3.1 Performance Summary Statement: LBNL exhibits coherent programmatic vision within the laboratory, holds strong core competency, and retains talented and valuable scientific personnel.

Objective 3.2 Provide Effective and Efficient Science and Technology Project Program Planning and Management

Score: B+ Grade: 3.4 Weighting: 30

Objective 3.2 Performance Summary Statement: The LBNL research plan includes expert input, is consistent with known budgets, and is well aligned with the DOE interests. The activity conducted by LBNL follows the plan and scope defined by the FWP.

Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs

Score: A+ Grade: 4.2 Weighting: 30

Objective 3.3 Performance Summary Statement: LBNL personnel under this funded effort are extremely effective at maintaining communication channels with the customer. They also are efficient at conveying critical information in a timely manner and in a clear and concise fashion. They are very good at keeping the DOE NETL project manager well informed of how project activity is progressing as well as producing external communications of excellent quality for distribution to the wider scientific community.

Laboratory Year-End Performance Assessment Report

Date:  
9/29/2009

Headquarters Program Office Fiscal Year 2009 Evaluation of Science and Technology Program

Performance at the Lawrence Berkeley National Laboratory Agency: u.s. Department of Energy Program

Office: Assistant Secretary for Fossil Energy FY Funding Level: (Budget Authority) \$155,000;B&R

AA301 OOOO;Geochemical Assessment

FWP ESD08-029

**Goal 1.0 Provide for Efficient and Effective Mission Accomplishment**

Goal Score: 3.8 Goal Grade: A

**Goal 1.0 Performance Summary Statement:**

LBNL has continued to produce high-quality, original, and creative results that advance science and technology; demonstrated sustained scientific progress and impact; received high external recognition of accomplishments; and have made valuable contributions to research and development goals of the Department and its customers. This is supported by the following.

LBNL's research is providing the geochemical components of a methodology for assessing saline reservoirs and depleted oil reservoirs for large-scale CO<sub>2</sub> injection with respect to the permanence of sequestration over potentially long time periods and expanded Areas of Review. This assessment will be an integral part of any CO<sub>2</sub> accounting for credit for the owners and operators of sequestration operations. A secondary objective of this research is to address the need to assess the geochemical appropriateness of proposed commercial scale CO<sub>2</sub> injection sites in a time frame to allow rapid permitting of these sites. Objectives are being achieved using combined lab experiments, field studies/sampling, and reactive transport modeling approach. The geochemical components of a standard operating procedure for assessing CO<sub>2</sub> storage performance and reservoir chemistry to determine suitability for commercial scale operations in saline formations and depleted oil reservoirs will be a product of this research.

Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field

Score: 3.8 Grade: A Weighting: 25

Objective 1.1 Performance Summary Statement:

LBNL's research in this geochemical assessment for CO<sub>2</sub> storage project has produced science and technology results that have an impact on the field. LBNL is providing the geochemical components of a methodology for assessing saline reservoirs and depleted oil reservoirs for large-scale CO<sub>2</sub> injection with respect to the permanence of sequestration over potentially long time periods and expanded Areas of Review. This assessment will be an integral part of any CO<sub>2</sub> accounting for credit for the owners and operators of sequestration operations. A secondary objective of this research is to address the need to assess the geochemical appropriateness of proposed commercial scale CO<sub>2</sub> injection sites in a time frame to allow

rapid permitting of these sites. Objectives are being achieved using combined lab experiments, field studies/sampling, and reactive transport modeling approach. The geochemical components of a standard operating procedure for assessing CO<sub>2</sub> storage performance and reservoir chemistry to determine suitability for commercial scale operations in saline formations and depleted oil reservoirs will be a product of this research.

LBL provides quality leadership in science and technology as supported in the following.

LBL's research demonstrates willingness to pursue novel approaches and demonstrate innovative solutions to problems. Their use of a novel, LBNL-built Hydrothermal Atomic Force Microscope to study carbonate mineral dissolution and growth at elevated temperatures and pressures over a wide range of solution composition is very unique.

Staff members have visible leadership roles in the scientific community. In related research, LBL was awarded funds by DOE to establish the Center for Nanoscale Control of Geologic CO<sub>2</sub> (one of the Energy Frontier Research Centers -EFRC). Dr. Knauss is co-PI of this center.

TO: Joseph Krupa  
Institutional Program Manager  
U.S. DOE Berkeley Site Office

FROM: James J. Markowsky  
Assistant Secretary  
Office of Fossil Energy

LBL's has built collaborative efforts from this project. Dr. Knauss was asked by Prof. Per Aagaard (Univ. Oslo) to collaborate on a research proposal to form the Norwegian Research Centre for Environmentally-friendly Energy.

Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals

Score: 3.8 Grade: A Weighting: 25

Objective 1.3 Performance Summary Statement:

LBNL's research in this project provides and sustains science and technology output that advances program objectives and goals as described in 1.1 and 1.2 above.

Objective 1.4 Provide for Effective Delivery of Science and Technology

Score: 3.8 Grade: A Weighting: 25

Objective 1.4 Performance Summary Statement: LBNL's research in this project provides for effective delivery of science and technology as supported by the following.

LBNL is effective in meeting goals and milestones such as the FY09 FWP quarterly project milestones that are reported on by the program.

LBNL is effective in FY09 FWP quarterly and annual reporting, and providing necessary DOE documents for strategic planning such as the annual FY FWP/proposal. This was accomplished in FY09 even with the

delay of funding to the project in FY09.

LBNL is effective in transmitting results to the scientific community as described in 1.1 and 1.2 above.

Goa12.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities (*Not applicable to FE*)

Goa13.0 Provide Effective and Efficient Science and Technology Program Management

Goal Score: 3.8 Goal Grade: A

Goa13.0 Performance Summary Statement: LBNL provides highly effective program vision and leadership; strategic planning and development of initiatives; and retains a high quality scientific workforce. The researchers provide a high degree of effective and efficient science and technology research project/program management. This is supported by the following.

The researchers have articulated scientific vision well with respect to providing the geochemical components of a methodology for assessing saline reservoirs and depleted oil reservoirs for large-scale CO<sub>2</sub> injection with respect to the permanence of sequestration over potentially long time periods and expanded Areas of Review. This assessment will be an integral part of any CO<sub>2</sub> accounting for credit for the owners and operators of sequestration operations. Additional support is provided in 3.1, 3.2, and 3.3.

Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Score: 3.8 Grade: A Weighting: 40

Objective 3.1 Performance Summary Statement: The researchers have provided effective and efficient stewardship of scientific capabilities and program vision. This is supported by the following achievements.

- Efficiency and effectiveness of joint planning with outside community.
- Articulation of scientific vision.
- Development of core competencies.

Highly efficient and effective joint planning with the outside scientific community is demonstrated. One example is their association with Prof. Per Aagaard (Univ. Oslo) to collaborate on a research proposal to form the Norwegian Research Centre for Environmentally-friendly Energy as described in 1.1.

The researchers have articulated scientific vision well with respect to their development of geochemical components of a methodology for assessing saline reservoirs and depleted oil reservoirs for large-scale CO<sub>2</sub> injection with respect to the permanence of sequestration over potentially long time periods and expanded Areas of Review. This assessment will be an integral part of any CO<sub>2</sub> accounting for credit for the owners and operators of sequestration operations.

Core competencies have been developed in these research areas of applying geochemistry, reservoir simulations, and field studies for development of geochemical components of a methodology for assessing saline reservoirs and depleted oil reservoirs for large-scale CO<sub>2</sub> injection with respect to the

permanence of sequestration over potentially long time periods.

Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management

Score: 3.8 Grade: A Weighting: 30

Objective 3.2 Performance Summary Statement:

Highly effective and efficient science and technology project/program planning and management have been provided by the researchers. This is supported by the high quality Field Work Proposal submitted, the quarterly and annual reporting of project status, and the leveraging/synergy with other areas of research as described in 1.1. This was accomplished in FY09 even with the delay of funding to the project in FY09.

Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs

Score: 3.8 Grade: A Weighting: 30

Objective 3.3 Performance Summary Statement: LBNL provides highly efficient and effective communications, as well as high responsiveness to the DOE customer. The researchers provide high quality, accurate, and timely responses to DOE and other stakeholder requests. Examples include timely and high quality responses to calls for annual Field Work Proposals and special requests for project status information . Communications channels are well-defined and there is good interaction between researchers and the DOE Project Manager with respect to project status and project planning.

Laboratory Year-End Performance Assessment Report

Date:  
9/21/09

Headquarters Program Office Fiscal Year 2009 Evaluation of Science and Technology Program  
Performance at the Lawrence Berkeley National Laboratory

Agency: u.s. Department of Energy

Program Office: Assistant Secretary for Fossil Energy

FY Funding Level: (Budget Authority) \$480,000

Goal1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: Goal Grade:

Goal1.0 Performance Summary Statement:

The contractor produces high quality, original and creative results which are helping to truly advance hydrate science in key areas including simulation of both hydrate production and the geomechanics of hydrate bearing sediments. The researcher is well respected in his field and recognized by other experts as making real and valuable scientific contributions.

Objective 1.1 Science and Technology Results Provide Meaningful Impact to the Field

Score: 4.2 Grade: A+ Weighting: 25

Objective 1.1 Performance Summary Statement:

Work on the hydrate reservoir simulation activities is cutting edge and clearly has the potential to significantly move forward the field of research in which the work is being performed. Significant publications are produced from this work in reputable scientific / technical journals and serve to lead the scientific community in discussions about anticipated behavior of gas hydrate reservoirs. The project PI has been invited to participate as an SPE invited lecturer and frequently receives special recognition for his contributions to the field of hydrate science.

Objective 1.2 Provide Quality Leadership in Science and Technology Score: 4.2 Grade: A+ Weighting: 25

Objective 1.2 Performance Summary Statement:

The project PI George Moridis and support personnel are strong leaders in this field. Dr. Moridis is a trend setter in the hydrate scientific community and is performing work which is cutting edge. He is considered by experts in the field to be one of the best and most highly qualified scientists in the field of hydrate modeling. Dr. Moridis continues to push the envelope in evaluating production potential of different types of hydrate reservoirs and in FY2009 initiated efforts for simulating "challenging" hydrates where boundary conditions of the reservoir make numerical modeling extremely difficult. This effort is the first time simulation of this type of conditions have ever been attempted. The LBNL personnel work extensively to foster collaborations on work in their field including participation in hydrate simulation code comparison studies and collaboration with international hydrate programs with which DOE has research cooperation agreements.

Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals

Score: 4.3 Grade: A+ Weighting: 25

Objective 1.3 Performance Summary Statement:

Both the specific work and the scientists performing work under this effort have received high commendation from executed peer review of their specific work. The level and quality of publication from their efforts is considered excellent for the work and level of funding. The effort produces a fairly prolific number of scientific and technical articles / presentations through appropriate publications and technical conferences. Based on the extremely positive feedback from a late FY2008 independent peer review of national lab and interagency efforts being carried out under the DOE Methane Hydrate Program this FWP was given additional FY09 funding to expand the work to be carried out.

Objective 1.4 Provide for Effective Delivery of Science and Technology

Score: 4.3 Grade: A+ Weighting: 25

Objective 1.4 Performance Summary Statement:

Scientists performing under this effort consistently meet or exceed planned goals and milestones within their work and are both effective and efficient in both performance of work and transmitting of results to both DOE and the greater scientific community.

Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities (*Not applicable to FE*)

Goal 3.0 Provide Effective and Efficient Science and Technology Program Management Goal Score: Goal

Grade: Goal 3.0 Performance Summary Statement: Currently provide strong scientific stewardship. core

competency and excellent research and scientific personnel recruited and retained within this work are highly qualified.

Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Score: 3.9 Grade: A Weighting: 40 Objective 3.1 Performance Summary Statement: Coherent

programmatic vision within the laboratory. Strong core competency and currently retain talented and valuable scientific talent as it relates to this particular FWP.

Objective 3.2 Provide Effective and Efficient Science and Technology Project Program Planning and

Management Score: 3.4 Grade: B+ Weighting: 30 Objective 3.2 Performance Summary Statement:

Research plans include broad based expert input and plans are consistent with budgets available and are well aligned with DOE interests. The work produced follows the plan.

Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs

Score: 4.0 Grade: A Weighting: 30 Objective 3.3 Performance Summary Statement:

The personnel under this funded effort are extremely effective at maintaining communication channels with the customer and critical information both good and bad are conveyed in timely manner and in a clear and concise fashion. They are very good at keeping the DOE -NETL project manager well aware of how things are progressing within the effort as well as producing external communications of excellent quality for distribution to the wider scientific community.